COLLEGE OF HUMANITIES

SCHOOL OF EDUCATION

MICRONUTRIENT DEFICIENCY STATUS IN SCHOOL FEEDING SCHEMES: A CASE STUDY OF 5-9 YEAR OLDS IN DRIEFONTEIN AND KLEINFONTEIN SCHOOLS, LADYSMITH, UTHUKELA DISTRICT

NONTOBEKO ZAMALWANDLE DUMA

STUDENT NUMBER: (217025816)

Thesis submitted in fulfilment of the academic requirements for the degree of Master of Education in Technology Education, Cluster of Science and Technology Education School of Education, University of KwaZulu-Natal

SUPERVISOR

PROF B. P. ALANT

JULY 2025

ABSTRACT

Malnutrition, particularly micronutrient deficiencies, remains a significant public health issue affecting millions of children worldwide, including those in South Africa. This study addresses the persistent problem of micronutrient deficiencies among Foundation Phase school children in Driefontein and Kleinfontein, Ladysmith, KwaZulu-Natal, despite the implementation of the National School Nutrition Programme (NSNP). The study was guided by two critical research questions:

(i) What is the current state of micronutrient deficiencies among Foundation Phase school children in Driefontein and Kleinfontein areas?
(ii) What are the factors influencing the nutritional micronutrient status of these children?

To answer these questions, a cross-sectional case study design using mixed methods was employed. Quantitative data was gathered through dietary surveys and nutritional assessments to determine the prevalence and severity of deficiencies in key micronutrients such as iron, zinc, and vitamin A. Concurrently, qualitative data was collected through in-depth focus group interviews with various stakeholders, including cooks, suppliers, principals, and foundation phase teachers. The investigation was grounded in three pivotal frameworks developed by UNICEF: the UNICEF Conceptual Framework for Malnutrition (1990), the UNICEF Conceptual Framework for Malnutrition (1992), and the UNICEF Conceptual Framework on the Determinants of Maternal and Child Nutrition (2020).

Findings for Research Question 1 revealed that inadequate dietary intake and poor dietary diversity are prevalent among the children in Driefontein and Kleinfontein. Despite the NSNP's efforts, many children continue to suffer from deficiencies in essential micronutrients. Physical examinations showed that while most learners in School A were well-nourished with only mild deficiencies, School B exhibited more frequent signs of deficiencies, particularly in hair and skin health. The nutritional value of the meals provided by the schools lacked sufficient vegetables and fruits, essential for vitamins and minerals, and had limited sources of omega-3 fatty acids, indicating a need for more diverse protein sources.

Findings for Research Question 2 highlighted the significant impact of socioeconomic constraints, lack of nutritional balance, limited nutritional education, and the absence of food gardens on malnutrition. The school-feeding program is widely supported and plays a crucial role in addressing food insecurity and supporting children's health and academic performance. However, concerns about the adequacy and balance of the meals provided suggest a need for targeted improvements. The study also identified budget constraints, timely payments, and the need for increased funding and policy development as critical themes for the long-term sustainability of school meal programmes. Recommendations included the development and implementation of school nutrition policies, standards for healthy meals and snacks, and fostering public-private partnerships to enhance the overall effectiveness of the NSNP program.

The findings underscore the multifaceted nature of malnutrition, highlighting the need for nuanced theoretical models that consider local contexts. Practically, the study identifies critical areas for intervention, such as ensuring consistent funding and comprehensive nutritional education. Policy implications include the necessity for increased funding, robust school nutrition policies, and addressing logistical challenges. Methodologically, the mixed methods approach provided a holistic understanding, but future longitudinal studies are needed to establish causality. Overall, the study calls for improvements in meal quality, variety, and financial management to enhance the feeding scheme's effectiveness.

DECLARATION

I, **Nontobeko Zamalwandle Duma,** declare that:

(i) The research reported in this thesis, except where otherwise indicated is my original work.

(ii) This thesis has not been submitted for any degree or examination at any other university.

(iii) This thesis does not contain other persons' data, pictures, graphs, or other information, unless specifically acknowledged as being sourced from other persons.

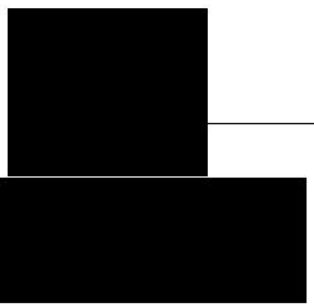
(iv) This thesis does not contain other persons' writing, unless specifically acknowledged as being sourced from other researchers. Where other written sources have been quoted, then:

- Their words have been re-written, but the general information attributed to them has been acknowledged.
- Where exact words have been used, their writing has been placed within quotation marks and referenced.

(v) The work described in this thesis was carried out in the School of Science and Technology Education, University of KwaZulu-Natal, Durban, South Africa from

2022-2024 under the supervision of Prof Busisiwe Precious Alant (Supervisor); and

(vi) The Ethical Clearance protocol reference number **HSSREC/00007016/2024** was granted prior to undertaking the fieldwork.

Signed: 

Date: June 25, 2025

As the candidate's supervisor, I, Prof Busisiwe Precious Alant, agree to the submission of this thesis.

Signed: _____

Date: July 28, 2025

ETHICAL CLEARANCE

UNIVERSITY OF KWAZULU-NATAL
INYUVESI YAKWAZULU-NATALI

18 June 2024

Nontobeko Zamalwandle Duma (217025816)
School of Education
Edgewood Campus

Dear NZ Duma,

Protocol reference number: HSSREC/00007016/2024
Project title: Micronutrient deficiency status in school feeding schemes: A case study of 5–9-year-olds in Driefontein schools- Ladysmith, uThukela District
Degree: Masters

Approval Notification – Expedited Application

This letter serves to notify you that your application received on 14 May 2024 in connection with the above, was reviewed by the Humanities and Social Sciences Research Ethics Committee (HSSREC) and the protocol has been granted **FULL APPROVAL**.

Any alteration/s to the approved research protocol i.e. Questionnaire/Interview Schedule, Informed Consent Form, Title of the Project, Location of the Study, Research Approach and Methods must be reviewed and approved through the amendment/modification prior to its implementation. In case you have further queries, please quote the above reference number.

PLEASE NOTE: Research data should be securely stored in the discipline/department for a period of 5 years.

Incidents of adverse events and serious adverse events (AEs and SAEs) should be reported in writing to HSSREC, the study sponsors, and any regulatory authority (where appropriate), within 7 working days of the occurrence for local sites and 14 days for all other South African sites.

This approval is valid until 18 June 2025.
To ensure uninterrupted approval of this study beyond the approval expiry date, a progress report must be submitted to the Research Office on the appropriate form 2 - 3 months before the expiry date. A close-out report to be submitted when study is finished.

HSSREC is registered with the South African National Health Research Ethics Council (REC-040414-040).

Yours sincerely,

[redacted]

Professor Dipane Hlalele (Chair)
/dd

Humanities and Social Sciences Research Ethics Committee
Postal Address: Private Bag X54001, Durban, 4000, South Africa
Telephone: +27 (0)31 260 8350/4557/3587 **Email:** hssrec@ukzn.ac.za **Website:** http://research.ukzn.ac.za/Research-Ethics
Founding Campuses: Edgewood Howard College Medical School Pietermaritzburg Westville

ACKNOWLEDGEMENTS

I would like to express my deepest gratitude to the Lord God Almighty for granting me the grace, strength, good health, and wisdom to overcome all the challenges faced throughout this research project. My heartfelt thanks go to the following individuals who have been instrumental to the success of this work:

- ***Prof Busisiwe Precious Alant***, my supervisor, for your continuous support, guidance, encouragement, and understanding. Your confidence in me made this study possible.
- My Mom**,** ***Miss Zandile Tugert Makhaza***, for your good advice, patience, and words of encouragement, and my uncle**,** ***Mr Thamisanqa Makhaza***, for your unwavering support.
- ***Thobelani Khulu***, for your patience and support, which are greatly appreciated.
- ***Nonsikelelo Hlubi***, your support will never go unnoticed.
- The ***Principals***, ***Food Suppliers***, ***Cooks***, Foundation Phase ***Learners***, and Foundation Phase ***Teachers*** from the schools where I conducted my research. Thank you for your support and for welcoming me into your schools. Without your cooperation, this study would not have been possible.

Thank you all for your invaluable contributions to this research project.

LIST OF ABBREVIATIONS

ASPEN - American Society for Parenteral and Enteral Nutrition

BMI - Body Mass Index

DDS - Dietary Diversity Score

DoE - Department of Education

FAO - Food and Agriculture Organization

FBDGs - Food-Based Dietary Guidelines

FFE - Food for Education (Malawi)

FGDs - Focus Group Discussions

FPLs - Foundation Phase Learners

FPTs - Foundation Phase Teachers

ID - Iron Deficiency

IDA - Iron Deficiency Anemia

MDMS - Midday Meal Scheme

MRC- Medical Research Council

NFCS - National Food Consumption Survey

NFPE - Nutrition-Focused Physical Examination

NSNP - National School Nutrition Program (South Africa)

PEM- Protein-Energy Malnutrition

PNAE - National School Feeding Program (Brazil)

RDA - Recommended Dietary Allowances

SADC - Southern Africa Development Community

SANHANES - South African National Health and Nutrition Examination Survey

SDGs- Sustainable Development Goals

SFP - School-Feeding Program

StatsSA - Statistics South Africa

UNICEF - United Nations Children's Fund

VAD - Vitamin A Deficiency

VAS - Vitamin A Supplementation

WFP - World Food Program

WHO - World Health Organization

LIST OF TABLES

Chapter 5

LIST OF FIGURES

Chapter 1

Chapter 3

Chapter 4

Chapter 5

TABLE OF CONTENTS

CHAPTER 1

Contextual Background of the Study

1.0 Introduction

Micronutrient deficiencies, often referred to as "hidden hunger," among children in low-income communities are a significant public health issue affecting millions of children worldwide. Hunger, malnutrition, and population growth are interconnected global challenges that continue to affect millions of people worldwide. According to The State of Food and Nutrition (2012), these issues are among the most significant obstacles to achieving sustainable development and improving public health (WHO, 2022). According to the Food and Agriculture Organization of the United Nations (FAO) et al. (2022), hunger and malnutrition are particularly prevalent in developing countries, where food insecurity is exacerbated by rapid population growth. This growth places additional strain on already limited resources, making it difficult for governments and organizations to provide adequate nutrition to their populations.

Malnutrition, which includes both undernutrition and overnutrition, has severe consequences for individuals and communities. Undernutrition, characterized by deficiencies in essential vitamins and minerals, weakens the immune system, impairs physical and cognitive development, and increases the risk of chronic diseases. Overnutrition, on the other hand, leads to obesity and related health problems such as diabetes, cardiovascular diseases, and certain cancers. The dual burden of malnutrition highlights the complexity of addressing nutritional issues on a global scale.

Disparities in food access and nutrition are starkly evident between different socioeconomic groups and regions. Langsford (2012) highlights the contrasting realities faced by people around the world. In affluent communities, food is abundant, and individuals often have the luxury of choosing from a wide variety of options. For these individuals, the challenge lies in deciding what to eat from an array of available choices, often influenced by personal preferences and dietary trends.

In contrast, those living in poverty face a daily struggle to secure enough food to meet their basic nutritional needs. Their diets are often monotonous and limited by financial constraints and food availability. These individuals do not have the luxury of choice; instead, they must make do with whatever food they can afford, which is often lacking in essential nutrients. This disparity in food access leads to significant differences in nutritional status and health outcomes between the privileged and the less fortunate.

Despite South Africa's classification as an upper-middle-income country, high rates of stunting, micronutrient deficiencies, and overnutrition persist among school-age children (The Mail & Guardian, 2021). These deficiencies can lead to severe health problems, including impaired cognitive development, weakened immune systems, and increased susceptibility to infections. Furthermore, they can contribute to an intergenerational cycle of poverty, malnutrition, and ill health, which has profound implications for children's physical health, cognitive development, and future economic prospects (Stoltz, 2021).

The national school-feeding program in South Africa, the National School Nutrition Programme (NSNP), was introduced as a key strategic intervention to combat malnutrition and improve the nutritional status of children (Munje & Jita, 2019). Despite the implementation of a national school-feeding program in South Africa, research conducted by the Medical Research Council indicates that micronutrient deficiencies persist in some schools (Shisana et al., 2020). This suggests that the feeding programmes may not always provide children with the necessary nutrient intake in accordance with dietary guidelines. Supporting this argument, a survey by Stevens et al. (2015) found that many learners attending a rural KwaZulu-Natal primary school—where school feeding had been in place for about two years—still exhibited micronutrient deficiencies. The principal ingredients of the meals served at this school were potatoes, rice, cabbage, and soybeans. According to Stevens et al. (2015), 21% of the children had a palpable or visible goitre, 40% had insufficient vitamin A status, 28% were anemic, and 97% had low urine iodine excretion. Remarkably, only a small percentage of children (12%) were stunted or underweight (1.8%), despite the significant frequency of nutritional deficiencies. This highlights the danger of using anthropometric status as the sole predictor of nutrition status and underscores the fact that micronutrient deficiency, sometimes referred to as "hidden hunger," can indeed be hidden (Subramaniam & Girish, 2015).

Further analysis of these children's mid-year test results revealed that those with goitre performed 5.2% worse on average on their Zulu (the local language) exam papers and 2.7%

lower on their arithmetic exam papers compared to children without goitre (Subramaniam & Girish, 2015). These findings raise critical questions about the effectiveness of the schoolfeeding program (SFP) in enhancing children's academic performance, health, and education outcomes. It remains unclear whether the SFP can reverse the failure to complete yearly grades, address illness and prevent absenteeism linked to illness, provide positive spillover effects on household finances by moderating health spending, and improve access to food.

The persistence of micronutrient deficiencies despite school feeding programmes is further supported by a systematic review of school-based nutrition interventions in sub-Saharan Africa, which found that while food supplementation and fortification can reduce deficiencies, the impact on overall nutrition status and behaviour is often limited without a facilitating environment (Kyere et al., 2020). Additionally, the 2020 South African Child Gauge highlights that high rate of stunting, micronutrient deficiencies, and overnutrition persist among school age children, reflecting the dual burden of malnutrition in the country (Legodi et al., 2020).

Given these gaps identified in both international journals and South African studies, this research aims to investigate the current state of micronutrient deficiencies among Foundation Phase school children in the Driefontein and Kleinfontein areas, Ladysmith, KwaZulu-Natal. The study argues that addressing micronutrient deficiencies through improved nutrition education and meal plan interventions is essential for promoting learners' health and academic success, ultimately breaking the cycle of poverty and improving the overall wellbeing of future generations.

1.1 Statement of the Problem

Despite the implementation of a national school-feeding program in South Africa, micronutrient deficiencies persist among school-age children, particularly in low-income communities. Research conducted by the Medical Research Council (Shisana et al., 2020) and a survey by Stevens et al. (2015) indicate that these programmes may not always provide the necessary nutrient intake in accordance with dietary guidelines. This issue is compounded by the reliance on staple foods that lack essential micronutrients, leading to hidden hunger and its associated health and cognitive impacts. The persistence of these deficiencies raises critical

questions about the effectiveness of current school-feeding programmes in enhancing children's health and academic performance. In this regard, the study aims to address the following issues:

(i) ***Persistent Micronutrient Deficiencies:*** Despite the NSNP, many children, particularly in low-income communities, continue to suffer from deficiencies in essential micronutrients such as iron, zinc, and vitamin A. This "hidden hunger" has significant health and cognitive impacts on children.

(ii) ***Effectiveness of the NSNP***: There are critical questions about the effectiveness of the NSNP in providing adequate nutrient intake in accordance with dietary guidelines. Research suggests that the program may not always meet the nutritional needs of children, leading to ongoing deficiencies.

(iii) ***Socioeconomic and Environmental Factors:*** The study seeks to understand the various factors that influence the nutritional status of children, including socioeconomic, educational, and environmental factors. These factors may contribute to the persistence of micronutrient deficiencies despite the presence of the NSNP.

(iv) ***Impact on Developmental Outcomes:*** The study is concerned with the broader developmental outcomes of children affected by micronutrient deficiencies, including their physical health, cognitive development, and academic performance. It aims to explore how these deficiencies impact children's overall well-being and their ability to succeed in school.

(v) ***Need for Improved Interventions:*** The study argues for the necessity of improved nutrition education and meal plan interventions to address micronutrient deficiencies. It suggests that enhancing the NSNP and implementing effective interventions are essential for promoting children's health and academic success, ultimately breaking the cycle of poverty.

In summary, the study's problematic revolves around the ongoing issue of micronutrient deficiencies among school children in South Africa, the effectiveness of the NSNP in addressing these deficiencies, and the need for comprehensive interventions to improve children's health and developmental outcomes.

1.2 Rationale of the Study

The rationale for this study is rooted in the significant public health implications of micronutrient deficiencies among Foundation Phase children in low-income communities. These deficiencies contribute to an intergenerational cycle of poverty, malnutrition, and ill health, which profoundly impacts children's physical health, cognitive development, and future economic prospects. Despite the implementation of the national school-feeding program, research indicates that micronutrient deficiencies persist, suggesting that the program may not always provide the necessary nutrient intake in accordance with dietary guidelines.

This study aims to provide a comprehensive understanding of the current state of micronutrient deficiencies among Foundation Phase school children in Driefontein and Kleinfontein, in Ladysmith, KwaZulu-Natal. By identifying the specific deficiencies and the factors contributing to them, the study seeks to inform more effective nutritional interventions and policies. Addressing these deficiencies through improved nutrition education and meal plan interventions is essential for promoting children's health, academic success, and overall well-being, ultimately breaking the cycle of poverty and improving future generations' prospects.

Furthermore, the research adds to the global body of knowledge on micronutrient deficiencies and school-feeding programmes, providing valuable insights that can be applied in similar contexts worldwide. This supports the global effort to combat malnutrition and promote health equity, making it a significant contribution to public health research and practice.

1.3 Significance of the Study

The significance of this study lies in its potential to inform policy and practice by providing evidence-based recommendations for enhancing the nutritional quality of school meals and implementing effective nutrition education programmes. By identifying specific deficiencies and their prevalence, the study provides essential data that can inform public health policies and targeted nutritional interventions. This is particularly important in South Africa, where

high rates of stunting, micronutrient deficiencies, and overnutrition persist among school-age children, contributing to an intergenerational cycle of poverty, malnutrition, and ill health.

The research evaluates the nutritional value of school meals and compares them to dietary guidelines, offering insights into the effectiveness of current feeding programmes. The findings can help improve meal plans to ensure they meet the nutritional needs of children, thereby reducing deficiencies. This is crucial for enhancing children's health and cognitive development, which in turn can positively impact their academic performance and future economic prospects.

The study also provides a comprehensive understanding of the determinants of health in this context by identifying socioeconomic, educational, and environmental factors influencing nutritional status. By addressing the hidden hunger among school children, this research aims to contribute to the broader goal of improving public health, educational outcomes, and socio-economic development in South Africa. In this regard, the findings can help policymakers, educators, and healthcare providers develop targeted interventions to mitigate micronutrient deficiencies and promote the well-being of learners.

Furthermore, the research adds to the global body of knowledge on micronutrient deficiencies and school-feeding programmes, providing valuable insights that can be applied in similar contexts worldwide. It supports the global effort to combat malnutrition and promote health equity, making it a significant contribution to public health research and practice.

1.4 Location of the Study

The study was conducted in the Driefontein and Kleinfontein areas, which are characterized by high levels of poverty, unemployment, and limited access to healthcare and educational resources. The selected schools, School A and School B, are in these areas and are classified as quintile 1 and 2 schools, respectively, indicating that they are among the most disadvantaged schools in the country. The surrounding community is predominantly low-income, with many households relying on social grants and informal employment to make ends meet.

The high levels of poverty and unemployment in these areas have resulted in a significant proportion of children experiencing food insecurity and malnutrition. The schools'

participation in the National School Nutrition Program (NSNP) is a critical intervention aimed at addressing the nutritional needs of these vulnerable children. By providing daily meals to learners, the NSNP aims to improve their nutritional status, health, and educational outcomes.

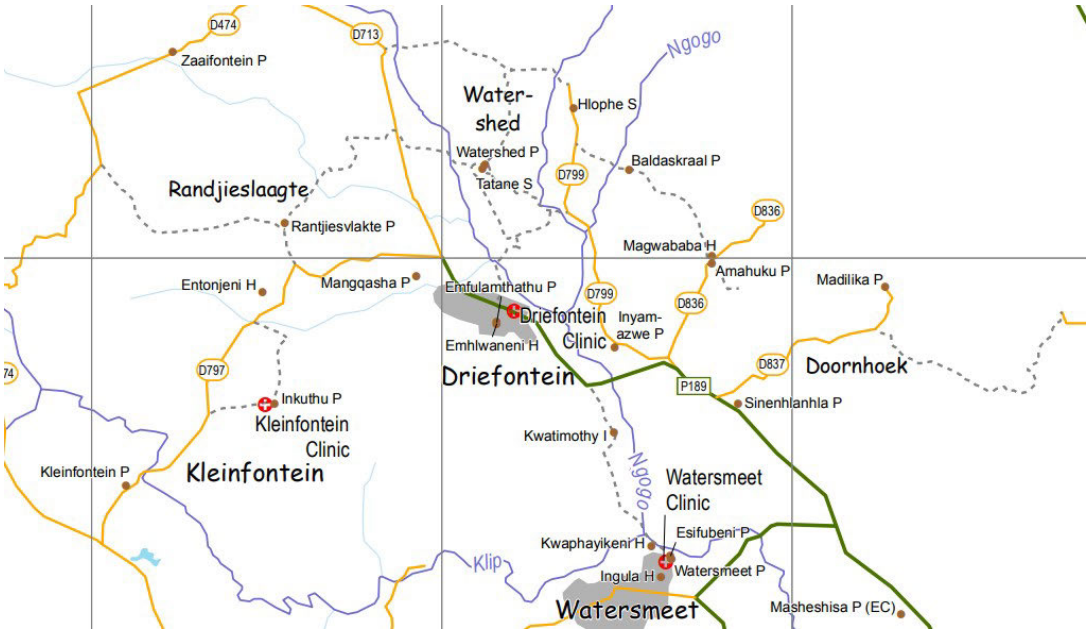


Fig 1.1 Map location of the study areas

1.5 Purpose of the Study

The aim of the study is to investigate the current state of micronutrient deficiencies among Foundation Phase school children in Driefontein, Ladysmith, KwaZulu-Natal, and to identify the factors influencing their nutritional micronutrient status.

Specifically, the study's objectives are to:

(i) Assess the Prevalence of Micronutrient Deficiencies:

- Determine the specific micronutrient deficiencies prevalent among Foundation Phase school children in Driefontein.
- Evaluate the nutritional value of meals provided by the selected schools.

(ii) Compare Nutritional Values to Dietary Guidelines:

- Analyse how the nutritional values of the selected school meals compare to the recommended dietary guidelines for children.

(iii) Identify Contributing Factors:

- Investigate the socioeconomic, educational, and environmental factors contributing to micronutrient deficiencies among these children.

(iv) Evaluate the Effectiveness of the School-Feeding Program* (SFP)*:

- Assess the effectiveness of the current school-feeding program in addressing micronutrient deficiencies.
- Explore potential improvements to the school-feeding program to better meet the nutritional needs of the children.

This comprehensive approach aims to provide a thorough understanding of the nutritional challenges faced by school children in Driefontein and to inform effective interventions that can improve their health and educational outcomes.

Thus, the two critical questions guiding the study are:

(i) What is the current state of micronutrient deficiencies among Foundation Phase school children in Driefontein?

- What specific micronutrient deficiencies are prevalent among these children?
  - As per the physical examinations.
  - As per the School Menus.
- How do the nutritional values of the meals provided by the selected schools compare to the NSNP Menu and the recommended dietary guidelines for children?

(ii) What factors influence the nutritional micronutrient status of these children?

- What socioeconomic, educational, and environmental factors contribute to these deficiencies?
- How effective is the current school-feeding program in addressing these micronutrient deficiencies?

1.6 Conceptual Framework

The UNICEF conceptual framework for malnutrition was used to guide the analysis of the study. This framework is widely recognized for its comprehensive approach to identifying the ***immediate***, ***underlying***, and ***basic causes*** of malnutrition. By categorizing the responses from stakeholders according to these levels, the study was able to systematically analyse the factors contributing to micronutrient deficiencies and the effectiveness of the school-feeding program. This approach provided a structured and comprehensive understanding of the research problem, aligning with the study's objectives.

The UNICEF conceptual framework categorizes the causes of malnutrition into three levels:

Level 1: Immediate Causes

- Inadequate Dietary Intake: The direct consumption of insufficient nutrients, which can lead to deficiencies.
- Disease: Illnesses that affect nutrient absorption, increase nutrient requirements, or reduce appetite.

Level 2: Underlying Causes

- Household Food Security: The availability and access to sufficient, safe, and nutritious food at the household level.
- Care for Mothers and Children: The practices related to feeding, caregiving, and health seeking behaviours that affect nutritional status.
- Health Services and Environment: The availability and quality of health services, as well as the overall living conditions, including sanitation and access to clean water.

Level 3: Basic Causes

- Socio-Economic and Political Context: The broader social, economic, and political environment that influences resource allocation and access to services.
- Resources and Control: The distribution of resources and power within society, which affects the ability of households and communities to secure adequate nutrition.

Immediate causes include inadequate dietary intake and disease. In this study, dietary intake data were analysed to identify specific micronutrient deficiencies prevalent among the children. However, due to time constraints, the prevalence of diseases that could affect nutrient absorption and utilization was not examined.

Underlying causes encompass household food security, care for mothers and children, and the availability and quality of health services and the environment. These factors were investigated indirectly through the perceptions of educators, cooks, suppliers, and principals of the selected schools. This approach provided insights into the socio-economic status of households, feeding practices, and access to healthcare and sanitation, without directly surveying the households themselves.

Basic causes refer to the broader socio-economic and political context, including resource distribution and control. The study explored these factors to understand how they influence nutritional outcomes. This involved examining the broader social, economic, and political environment that affects resource allocation and access to services.

The use of the UNICEF conceptual framework for malnutrition in this study has significant implications for understanding, addressing, and preventing malnutrition among school children. It provides a structured and comprehensive approach that ensures all potential factors are considered, leading to more effective and targeted interventions. By informing policy and program development, prioritizing resources, and raising awareness, the framework supports the study's aim of promoting learners' health and academic success, ultimately breaking the cycle of poverty and improving the overall well-being of future generations.

1.7 Methodology

1.7.1 Research Design

This study employed a cross-sectional case study design using mixed methods to investigate the current state of micronutrient deficiencies among Foundation Phase school children in Driefontein and to identify the factors influencing their nutritional micronutrient status. The cross-sectional approach was chosen to provide a snapshot of the current state of micronutrient deficiencies and the effectiveness of the school-feeding program at a specific point in time.

This design allows for the collection of data from multiple sources simultaneously, facilitating a comprehensive analysis of the research problem (Hassan, 2024).

1.7.2 Mixed Methods Approach

The mixed methods approach was adopted to leverage the strengths of both quantitative and qualitative data collection and analysis techniques. This approach enables a more holistic understanding of the research problem by combining the breadth of quantitative data with the depth of qualitative insights (Simkus, 2023). Regarding Quantitative Data, surveys were administered to gather numerical data on the prevalence of specific micronutrient deficiencies among the children and to assess the nutritional values of the meals provided by the school. This data provided a broad overview of the issues and allowed for the identification of patterns and trends.

Regarding Qualitative Data, in-depth interviews and focus groups were conducted with various stakeholders, including cooks, suppliers, principals, and foundation phase teachers. These qualitative methods provided rich, contextual insights into the experiences, perceptions, and challenges faced by the stakeholders. The qualitative data helped to explore the underlying reasons behind the quantitative findings, offering a deeper understanding of the factors contributing to micronutrient deficiencies and the effectiveness of the school-feeding program. The integration of quantitative and qualitative data in this mixed methods study allowed for a more comprehensive analysis, addressing both the “what” and the “why” of the research problem.

1.7.3 Sampling Method

A stratified sampling method was used to ensure that the sample was representative of the diverse stakeholder groups involved in the school-feeding program. Stratified sampling involves dividing the population into distinct subgroups (strata) and then randomly selecting samples from each stratum (Thomas, 2020). This method was chosen for several reasons:

- ***Representation of Diverse Stakeholders:***

The study aimed to capture the perspectives of various stakeholders, including cooks, suppliers, principals, foundation teachers, and students. Stratified sampling ensured that each of these groups was adequately represented in the sample, providing a comprehensive view of the research problem (McBride et.al., 2019).

- ***Enhanced Accuracy and Precision:***

By ensuring that each subgroup was proportionately represented, stratified sampling increased the accuracy and precision of the findings. This method reduced sampling bias and ensured that the results were reflective of the entire population (Pluye, 2013).

- ***Facilitation of Comparative Analysis:***

Stratified sampling allowed for the comparison of responses across different stakeholder groups. This facilitated the identification of common trends, patterns, and differences in perspectives, contributing to a more nuanced understanding of the factors influencing micronutrient deficiencies and the effectiveness of the school-feeding program.

1.7.4 Data Collection and Analysis

Data collection involved administering surveys to gather quantitative data and conducting in-depth interviews and focus groups to collect qualitative data. The quantitative data were analysed using statistical methods to identify patterns and trends, while the qualitative data were analysed thematically to explore deeper insights and contextual factors. The integration of quantitative and qualitative data provided a comprehensive understanding of the research problem, addressing both the prevalence and underlying causes of micronutrient deficiencies, as well as the effectiveness of the school-feeding program. The use of a cross-sectional case study design with mixed methods and stratified sampling ensured that the study was both comprehensive and representative, providing valuable insights to inform policy and program improvements.

1.8 Limitations of the Study

In conducting this study on micronutrient deficiencies among Foundation Phase school children in Driefontein, we employed a cross-sectional case study design using mixed methods. This approach was chosen to provide a comprehensive snapshot of the current state of micronutrient deficiencies and to evaluate the effectiveness of the school-feeding program at a specific point in time. While this design allowed us to gather data from multiple sources simultaneously, it inherently limited our ability to establish causality or observe changes over time. The absence of longitudinal data means we cannot track the progression of deficiencies or the long-term impact of the feeding program.

The mixed methods approach, which combined quantitative and qualitative data collection and analysis techniques, was instrumental in providing a holistic understanding of the research problem. Quantitative data from surveys offered a broad overview of the prevalence of specific micronutrient deficiencies and the nutritional values of the meals provided. However, surveys have their limitations, including potential self-reporting biases and inaccuracies in recall. Additionally, assessing nutritional values through surveys may not yield precise measurements, leading to possible underestimation or overestimation of nutrient intake.

On the qualitative side, in-depth interviews and focus groups with various stakeholders, such as cooks, suppliers, principals, and foundation teachers, provided rich, contextual insights into their experiences and perceptions. These qualitative methods helped us explore the underlying reasons behind the quantitative findings. However, the subjective nature of these methods introduces potential biases, and the insights gained may not be generalizable to other settings or populations.

Our use of stratified sampling ensured that diverse stakeholder groups were adequately represented, enhancing the accuracy and precision of our findings. This method facilitated comparative analysis across different groups, contributing to a nuanced understanding of the factors influencing micronutrient deficiencies and the effectiveness of the school-feeding program. Nonetheless, stratified sampling may not account for all potential subgroups within the population, potentially excluding important perspectives. Additionally, the sample size within each stratum may be limited, affecting the statistical power of our analysis.

The integration of quantitative and qualitative data provided a comprehensive understanding of the research problem, addressing both the prevalence and causes of malnutrition. However, integrating these two types of data posed challenges, as discrepancies between them could complicate the interpretation of findings. The complexity of analysing both thematic qualitative data and statistical quantitative data required significant resources and expertise, which may have constrained the scope and depth of our study. Another limitation is the absence of biochemical analysis which may have provided additional insight into participants nutritional status. The study did not account for home dietary intake alongside school meals which could have impacted the findings. Additionally, the reliance on physical examination and dietary assessment methods may introduce potential bias.

In reflecting on these limitations, while our study offers valuable insights into the current state of micronutrient deficiencies and the effectiveness of the school-feeding program, there are areas for improvement. Future research could benefit from a longitudinal design to track changes over time and establish causality and also incorporating biochemical analysis and comprehensive dietary assessments to provide a more nuanced understanding of the research question. Additionally, employing more precise methods for nutritional assessment and expanding the sample size could enhance the reliability and generalizability of the findings. Despite these limitations, our study provides a critical foundation for understanding and addressing micronutrient deficiencies among school children in Driefontein.

1.9 Delimitation of the Study

The study is delimited to Foundation Phase school children in the Driefontein area, Ladysmith, KwaZulu-Natal. It focuses on assessing micronutrient deficiencies, evaluating the nutritional value of school-provided meals, and comparing these meals to dietary guidelines. The study does not cover other age groups or regions outside the specified area. Additionally, the research is limited to the data collected during the study period (state the dates here) and may not account for seasonal variations in dietary intake and nutritional status.

1.10 Outline of the Thesis

The study consists of the following six chapters:

- ***Chapter 1***

Chapter 1 provides the contextual background of the study, introducing the topic of micronutrient deficiencies among school children in low-income communities. It highlights the significance of the problem, discussing how hunger, malnutrition, and population growth are interconnected global challenges. The chapter outlines the research problem and raises critical questions about the effectiveness of the program in addressing these deficiencies. It also explains the rationale and significance of the study, emphasizing the importance of addressing micronutrient deficiencies to promote children's health, academic success, and overall wellbeing.

Additionally, the chapter outlines the purpose, objectives, and research questions guiding the study. It discusses the methodology, limitations, and delimitations of the study, providing an overview of the research design, data collection methods, and analysis techniques used. Finally, the chapter provides an outline of the thesis, listing the six chapters and their respective contents.

- ***Chapter 2***

Chapter 2 presents the literature review presents an overview of global issues related to hunger, malnutrition, and population growth, as well as disparities in food access and nutrition. It delves into the specific nutritional challenges faced in South Africa, including undernutrition, micronutrient deficiencies, and overnutrition. The review also examines the impact of malnutrition on children, the prevalence of micronutrient deficiencies, and the role of school meal programmes. It specifically highlights the importance of nutrition education and interventions and identify gaps in the current literature.

- ***Chapter 3***

Chapter 3 unpacks the three UNICEF conceptual frameworks that underpin the study. It begins with a detailed explanation of the UNICEF Conceptual Framework for Malnutrition (1990), focusing on its identification of the immediate, underlying, and basic causes of malnutrition. The chapter delves into the UNICEF Conceptual Framework for Malnutrition (1992), examining its simplified approach to basic causes. This section highlights how the streamlined focus on resources and control provides clarity in understanding the impact of resources on malnutrition. Finally, the chapter explores the UNICEF Conceptual Framework on the Determinants of Maternal and Child Nutrition (2020), examining its expanded scope to include the triple burden of malnutrition. Furthermore, the chapter also addresses the specific issues faced in South Africa, where hunger and poverty remain pressing concerns.

- ***Chapter 4***

Chapter 4 describes the methodology and research design employed in the study. It provides a detailed description of the research design, data collection methods, and analysis techniques used in the study. It also provides a justification for the chosen methodology, highlighting its suitability for addressing the research questions and achieving the study's objectives. The chapter concludes with a discussion on the limitations of the study and the measures taken to mitigate potential biases and ensure the reliability and validity of the findings.

- ***Chapter 5***

Chapter 5 presents the results of study. The provides the demographic information of the sample. The second section summarizes the main results, highlighting the key findings related to micronutrient deficiencies and the nutritional content of the school meals. The third sand the fourth sections present the results to Research questions 1 and 2ection discusses the main trends, patterns, and connections that emerged from the data, offering insights into the broader implications of the results. Finally, the chapter concludes with a summary of the main results, addressing the specific research questions posed at the outset of the study.

- ***Chapter 6***

Chapter 6, the concluding chapter, discusses the study's results and relates them to the reviewed literature. It explores the implications of the findings for theoretical, methodological, policy, and practice levels, while also providing recommendations for future research endeavours.

CHAPTER 2

Literature Review

2.0 Introduction

Hunger and poverty remain significant issues in South Africa, with 6.8 million South Africans experiencing hunger daily, including 4.7 million individuals in households with young children (Statistics South Africa, 2019). These figures are alarming, especially given the negative correlation between poverty and poor developmental outcomes (Lu et al., 2016). To address this, the South African government introduced the National School Nutrition Programme (NSNP), aimed at improving the developmental outcomes of underprivileged children (Munje & Jita, 2019; World Food Programme, 2019).

Despite the implementation of the NSNP, micronutrient deficiencies persist among school-age children, particularly in low-income communities. Research conducted by the Medical Research Council (Shisana et al., 2020) and a survey by Stevens et al. (2015) indicate that these programmes may not always provide the necessary nutrient intake in accordance with dietary guidelines. This issue is compounded by the reliance on staple foods that lack essential micronutrients, leading to hidden hunger and its associated health and cognitive impacts. The persistence of these deficiencies raises critical questions about the effectiveness of current school-feeding programmes in enhancing children's health and academic performance.

International research initially viewed school feeding programmes (SFPs) as antihunger initiatives designed to enhance the nutritional status of underprivileged children (Watson et al., 2020). However, studies by Bundy et al. (2009), Finan (2009), and Metwally et al. (2020) revealed that these programmes had minimal impact on children's nutritional status. This prompted new theories to reconsider the influence of SFPs on other developmental outcomes. Research has since examined the effects of SFPs on health and education outcomes (Drake et al., 2017; Pac et al., 2017; Aurino et al., 2018; Gelli et al., 2019), but gaps remain, particularly

regarding the concurrent effects on parents' health spending and children's education and health outcomes.

In South Africa, the NSNP has shown positive impacts on educational outcomes, such as increased school enrollment and attendance (de la Monalis & Mothe, 2010; Graham et al., 2015). Schools with breakfast programmes reported higher rates of zero absenteeism compared to those without (Devereux et al., 2018). Despite these successes, research by Shisana et al. (2020) indicates that micronutrient deficiencies persist in some South African schools.

This literature review aims to explore various aspects of food and nutrition, with a particular focus on the challenges faced in South Africa. Specifically, this study aims to provide a comprehensive understanding of the current state of micronutrient deficiencies among Foundation Phase school children in Driefontein, Ladysmith, KwaZulu-Natal. The review will address the following questions:

- *What are the global issues related to hunger, malnutrition, and population growth, and how do they impact food access and nutrition disparities?*
- *What are the specific nutritional challenges faced in South Africa, including stunting, micronutrient deficiencies, and overnutrition?*
- *How does malnutrition impact the physical and cognitive development of children, and what are the intergenerational effects of poverty and malnutrition?*
- *What is the prevalence of specific micronutrient deficiencies, such as iron, zinc, and vitamin A, globally and in South Africa?*
- *How effective are school meal programmes in addressing nutritional deficiencies, and how do the nutritional values of school-provided meals compare to recommended dietary guidelines?*
- *What role does nutrition education play in improving child nutrition, and what successful interventions and programmes have been implemented?*
- *What gaps exist in the current literature regarding the effectiveness of school-feeding programmes and their impact on children's health and academic performance?*

The scope of this review includes an overview of global issues related to hunger, malnutrition, and population growth, as well as disparities in food access and nutrition. It will delve into the specific nutritional challenges faced in South Africa, including stunting, micronutrient deficiencies, and overnutrition. The review will also examine the impact of malnutrition on

children, the prevalence of micronutrient deficiencies, and the role of school meal programmes. Specific micronutrients of concern include iron, zinc, and vitamin A, which are commonly deficient and critical for children's growth and development. Additionally, it will highlight the importance of nutrition education and interventions and identify gaps in the current literature that this study aims to address.

2.1 The State of Food and Nutrition

2.1.1 Global Issues of Hunger, Malnutrition, and Population Growth

Hunger, malnutrition, and population growth are interconnected global challenges that continue to affect millions of people worldwide. According to The State of Food and Nutrition (2012), these issues are among the most significant obstacles to achieving sustainable development and improving public health (WHO, 2022). Hunger and malnutrition are particularly prevalent in developing countries, where food insecurity is exacerbated by rapid population growth (Food and Agriculture Organization of the United Nations (FAO) et al., 2022). This growth places additional strain on already limited resources, making it difficult for governments and organizations to provide adequate nutrition to their populations.

Malnutrition, which includes both undernutrition and overnutrition, has severe consequences for individuals and communities. Undernutrition, characterized by deficiencies in essential vitamins and minerals, weakens the immune system, impairs physical and cognitive development, and increases the risk of chronic diseases. Overnutrition, on the other hand, leads to obesity and related health problems such as diabetes, cardiovascular diseases, and certain cancers. The dual burden of malnutrition highlights the complexity of addressing nutritional issues on a global scale.

In 2021, the number of people affected by hunger globally rose to as many as 828 million, an increase of about 46 million since 2020 and 150 million since the outbreak of the COVID-19 pandemic. Around 2.3 billion people in the world were moderately or severely food insecure in 2021, with nearly 924 million facing severe levels of food insecurity. The gender gap in food insecurity also continued to rise, with 31.9% of women experiencing moderate or severe food insecurity compared to 27.6% of men. These statistics underscore the urgent need for comprehensive strategies to combat hunger and malnutrition worldwide.

2.1.2 Disparities in Food Access and Nutrition

Disparities in food access and nutrition are starkly evident between different socioeconomic groups and regions. Langsford (2012) highlights the contrasting realities faced by people around the world. In affluent communities, food is abundant, and individuals often have the luxury of choosing from a wide variety of options. For these individuals, the challenge lies in deciding what to eat from an array of available choices, often influenced by personal preferences and dietary trends.

In contrast, those living in poverty face a daily struggle to secure enough food to meet their basic nutritional needs. Their diets are often monotonous and limited by financial constraints and food availability. These individuals do not have the luxury of choice; instead, they must make do with whatever food they can afford, which is often lacking in essential nutrients. This disparity in food access leads to significant differences in nutritional status and health outcomes between the privileged and the less fortunate.

Food insecurity and the lack of access to affordable nutritious food are associated with increased risks for multiple chronic health conditions such as diabetes, obesity, heart disease, and mental health disorders. These disparities are not limited to any one region but are a global issue. For example, in Sub-Saharan Africa and South Asia, food insecurity rates are among the highest in the world, driven by poverty, conflict, and climate change. In contrast, high-income countries face food insecurity linked to economic disparities and social inequalities. These disparities highlight the need for targeted interventions to ensure equitable access to nutritious food for all populations.

2.2 Nutritional Challenges in South Africa

2.2.1 Overview of Nutritional Issues in South Africa

South Africa faces a complex nutritional landscape characterized by the coexistence of undernutrition, micronutrient deficiencies, and overnutrition. This "triple burden" of malnutrition presents significant public health challenges. Stunting, a condition where children are too short for their age due to chronic undernutrition, remains a critical issue. According to the Global Nutrition Report, 21.4% of children under five in South Africa are affected by stunting, which, although lower than the average for the Africa region (30.7%), still represents a significant concern (Global Nutrition Report, 2022).

Micronutrient deficiencies, particularly in vitamin A, iron, and zinc, are prevalent among South African children. The 2020 South African Child Gauge highlights that these deficiencies are a major contributor to poor health outcomes. For instance, the prevalence of vitamin A deficiency among children under five increased from 33% in 1994 to 43.6% in 2012 (May et al., 2020). Iron deficiency is also a significant issue, with 11% of children under five affected (May et al., 2020). Overnutrition, characterized by overweight and obesity, is also a growing problem. The prevalence of overweight children under five is 11.6%, and South Africa is on course to prevent this figure from increasing (Global Nutrition Report, 2022). However, the rates of obesity among adults are alarming, with 42.9% of women and 18.2% of men living with obesity. This trend is attributed to the "nutrition transition," where traditional diets are replaced by Western diets high in sugar, fat, and processed foods (The Conversation, 2022).

2.2.2 The Slow Violence of Malnutrition

The 2020 South African Child Gauge provides a comprehensive analysis of the state of child nutrition and food security in the country, emphasizing the "slow violence" of malnutrition. This term refers to the long-term impacts of malnutrition on children's health, education, and future employment prospects (May et al., 2020). Stunting and obesity represent the dual burden of malnutrition in South Africa. Stunting affects 27% of South African children, while the prevalence of overweight children has increased from 10.6% in 2005 to 13.3% in 2016 (The Conversation, 2022). This dual burden results from poor-quality diets and limited access to nutritious food.

Micronutrient deficiencies are another critical aspect of malnutrition. The Child Gauge underscores the high prevalence of these deficiencies, with vitamin A deficiency affecting 43.6% of children under five in 2012 (May et al., 2020). The report calls for urgent, early, and sustained investment in interventions to reduce these deficiencies and improve children's health outcomes.

Food insecurity remains a significant challenge, with 26% of the population experiencing hunger and 28.3% at risk of hunger (May et al., 2020). The report identifies critical points for intervention across the life course, from maternal nutrition to school feeding programmes, to address food insecurity and improve nutrition. The Child Gauge provides several policy recommendations to address the nutritional challenges in South Africa. These include enhancing social protection programmes, improving maternal and child nutrition, and promoting healthy diets through education and community-based interventions (May et al., 2020). The nutritional challenges in South Africa are multifaceted and require a comprehensive approach to address. Economic inequality and social disparities play a significant role in these challenges, limiting access to nutritious food and leading to both undernutrition and overnutrition. Addressing these underlying social determinants is crucial for improving nutrition outcomes.

While South Africa has implemented several policies and programmes to address malnutrition, such as the National School Nutrition Programme and vitamin A supplementation, the effectiveness of these interventions needs continuous evaluation and improvement. Ensuring that these programmes reach the most vulnerable populations is essential. Engaging communities in nutrition education and promoting healthy eating habits can help address the cultural and behavioural factors contributing to poor nutrition. Community-based interventions that involve local stakeholders can be more effective in promoting sustainable dietary changes.

Addressing the nutritional challenges in South Africa requires collaboration across different sectors, including health, education, agriculture, and social development. Integrated approaches that consider the broader social and economic context can lead to more effective and sustainable solutions.

2.2.3 Factors Affecting the Nutritional Status of Children in South Africa

2.2.3.1. Food Insecurity

The primary factor influencing nutritional status in South Africa was found to be food insecurity. This suggests that, despite the implementation of various strategies aimed at reducing food insecurity in the country, including the food integrated nutrition programme, zero hunger social grant programmes, and food parcels, food insecurity remains a problem (Mkhize & Sibanda, 2022). Madiba et al., as cited in Mkhize and Sibanda (2022) state that children experiencing food insecurity are susceptible to malnutrition due to improper or reduced food consumption. Additionally, trade-offs employed by households, such as consuming less food and adopting monotonous diets, may have a detrimental effect on the nutritional status of children. The results of this review are corroborated by research from other countries. For instance, a study carried out in Tanzania by McQuade et al. (2019) confirmed that seasonal family food insecurity has a significant impact on children's nutritional status and eventually leads to malnutrition.

In a similar vein, Agho et al. (2019) found a positive link between childhood malnutrition and household food insecurity. According to Agho et al. (2019), children's dietary intake is impacted by household food insecurity, which can lead to undernutrition. Numerous academics from throughout the world have concurred with this conclusion, stating that the main cause of childhood malnutrition is household food insecurity (Agho et al., 2019).

2.2.3.2. Household Income

Low household income, according to Shinsugi et al. (2019), impacts the consumption pattern in the household, which in turn affects the nutritional condition of the household and results in malnutrition in children. Comparably, the review's findings indicate that poor household income plays a role in influencing children's nutritional status, which in turn leads to malnutrition. There is a significant frequency of child malnutrition, according to studies from this analysis that found that low household income affects children's nutritional health. This result is consistent with the national survey conducted in South Africa, which reported that 2.5 million children under the age of five live in households where there is less than the federal poverty line (Mkhize & Sibanda, 2020).

Foods having low nutritional content are more likely to be purchased by households with low incomes. Children's nutritional status is consequently adversely impacted. According to a study by Mkhize and Sibanda (2020), children from families who get social grants are stunted compared to children from households that do not receive social grants, even if social grants are provided to low-income households. In a similar vein, Otterbach and Rogan (2019) point out that households in underprivileged environments continue to eat foods that are low in nutrition, even in spite of the critical role social subsidies play in decreasing food deprivation. Therefore, the social grant system alone is not adequate to enhance household income. A systematic review conducted in developing countries by Black et al., as cited in Mkhize and Sibanda (2020) elucidates that low household income is one of the drivers of child malnutrition. A study conducted by Asim and Nawaz (2018) also agrees that household income correlates positively with child malnutrition.

2.2.3.3 Caregivers Level of Education

The results of this review indicate that the level of education of the caregiver affects the nutritional status of the child. Nguyen et al. (2018) demonstrate that a caregiver's low level of education affects the nutritional status of the child by affecting the household income, which has a significant impact on the amount of food consumed in a household. Ji et al. (2017) also supports the idea that a caregiver's level of education lowers household income. Caregivers with low levels of education have a decreased likelihood of obtaining well-paying jobs. Phooko-Rabodiba et al. (2019) discovered that children whose caregivers had only a primary level of education were wasting and at risk of being underweight. Further clarification of the relationship between education and household income, cleanliness habits, and health issues was provided by Phooko-Rabodiba et al. (2019). As a result, caregivers with little education may not be aware of many health risks and proper cleanliness measures. Fonyuy and Jocelyne (2018) assert that the caregiver's level of education affects their understanding of feeding techniques, which have a big impact on the child's nutritional condition. A child's nutritional status can be influenced by a caregiver's nutrition education, according to several research included in this review. According to this research, a caregiver's understanding of nutrition plays a critical role in a child's overall health.

According to Fonyuy and Jocelyne (2018), one important element influencing a child's nutritional status and, ultimately, malnutrition is their lack of awareness about a balanced diet and the kinds of nutrients the body needs. Onyeneke et al. (2019), who demonstrated that a caregiver's understanding of nutrition is crucial to a child's survival and growth, corroborate this conclusion. Low-educated caregivers are more likely to have inadequate nutritional understanding, which substantially contributes to child malnutrition, as confirmed by Chege and Kuria (2017). The finding showed children who had caregivers who were knowledgeable about nutrition were healthier than those who did not, as confirmed by Sinha et al. (2017). Therefore, enhancing nutrition education for caregivers can act as a tool among others to fight against all forms of malnutrition.

2.2.3.4. Household Unemployment

Previous research findings have indicated that children's nutritional status is influenced by unemployment (Mkhize & Sibanda, 2020). The bulk of the evaluated research were mostly conducted in rural areas, which may account for the high rates of unemployment reported in those studies. In South Africa, rural areas continue to be categorized as having high rates of unemployment. According to Phooko-Rabodiba et al. (2019), as reported in Mkhize and Sibanda (2020), men move to metropolitan areas to work, while women and child caretakers in rural areas are required to take care of the household instead of being able to work. Unemployment has an impact on household income and purchasing power, which in turn affects children's nutritional health.

Page et al. (2011), on the other hand, contend that there is no significant relationship between a mother's employment status and her child's nutritional status because unemployed caregivers have more time to care for their children. Rashad and Sharaf (2019) concur that, although maternal employment status contributes to household income, there is a positive correlation between maternal employment and malnutrition in children. Brauner-Otto et al. (2019) also supports this finding, classifying maternal employment as a factor that deteriorates a child's health and nutritional status. Meanwhile, Manzione et al. (2019) assert that formal maternal work conditions are associated with improved child nutritional and health status. In general, in households with no one employed, the child's nutritional status is said to be low, and the child is more vulnerable to malnutrition and other health implications.

2.2.3.5. The Child's Dietary Intake

A child's growth and development are greatly influenced by their dietary consumption, particularly during the first 1000 days of their existence (Mkhize & Sibanda, 2020). According to Perez-Escamilla and Bermudez (2018), a child's growth and development may be stunted by an inadequate food intake, which could increase the child's susceptibility to infections and illnesses that could eventually lead to malnutrition. The results of this study demonstrate that, as indicated by the studies under consideration, dietary intake significantly affects a child's nutritional status. According to Nasreddine et al. (2018), eating foods low in vital nutrients and vitamins—like iron, calcium, zinc, folic acid, vitamin A, and vitamin B12—is linked to insufficient dietary intake. Protein-energy malnutrition (PEM) is characterized by the ingestion of foods deficient in vitamins and critical nutrients, as seen by kwashiorkor, marasmus, and kwashiorkor-marasmus. Nasreddine et al. (2018) go on to say that all forms of malnutrition are linked to insufficient food intake. According to Boadu et al. (2018), children's poor nutritional status is caused by stunted growth and delayed cognitive development as a result of inadequate dietary intake.

According to Bustan et al. (2018), stunting is greatly exacerbated by low birth weight. Researchers find that low birth weight is a major contributing factor to childhood malnutrition worldwide. For example, Trivedi et al. (2019) classified low birth weight as a predictor for childhood mortality, morbidity, and malnutrition. Similarly, Meshram et al. (2019) found that children with a low birth weight of less than 2500 g have a higher chance to be underweight compared to those with an average birth weight (>2500 g). Lestari et al. (2018) also found a strong association between low birth weight and stunting in children under the age of five years. When comparing the nutritional status of developing nations with eating disorders in developed nations, it can be observed that the former is more heavily influenced by factors such as poverty, poor economic growth, and disease frequency, while the latter is more strongly influenced by eating disorders. In developed nations, eating disorders are most commonly associated with binge-eating disorder, bulimia nervosa, and anorexia nervosa, all of which can lead to severe weight loss, overweight, and obesity (Mkhize & Sibanda, 2020).

2.2.3.6. Child Illness

A child's nutritional status may be impacted by recurrent and protracted illness, which can result in lack of appetite, absorption issues, metabolic disorders, and behavioural abnormalities (Mkhize & Sibanda, 2020). However, inadequate nutrition can make kids more susceptible to disease or make recovery take longer (Oldernburg et al., 2018). The results of this review also show that child illness is a factor that affects kids' nutritional status. Numerous academics have corroborated this conclusion, demonstrating that illnesses including malaria, diarrhea, vomiting, and fever have a detrimental impact on children under the age of five's nutritional health (Oldernburg et al., 2018). At the same time, malnutrition lowers the body's capability to fight against infections by undermining the functioning of the immune response mechanism (Heilmann & Grandjean, 2020).

2.2.3.7. Consumption of a Monotonous Diet

This review has determined that one element influencing the nutritional status of children under five in South Africa is the intake of a monotonous diet. Eating food that lacks other vital nutrients, such as vitamins and minerals, and is not nutrient-diversified is what is meant by a monotonous diet (Panda et al., 2019). A diet lacking in variety can prevent children from getting enough important vitamins and minerals, which can have an impact on their nutritional condition (Nyati et al., 2019). This result is consistent with a study carried out in Tanzania by Blakstad et al. (2019), which discovered that mothers and children who ate a repetitive diet were malnourished in comparison to those who ate a varied diet. Similarly, Shakya (2017) showed that children who mainly consumed monotonous food, comprised primarily of carbohydrates, were nutritionally deprived. Therefore, the nutritional deprivation due to the consumption of a monotonous diet may contribute to child malnutrition.

2.2.3.8. Poor Access to Water and Sanitation

According to Statistics South Africa (2020), 17.20% of South African households are predicted to still have inadequate access to water and sanitation. A person's health is negatively impacted by inadequate access to water and sanitation. The results of this review concur with the findings

that children under five years old's nutritional status are influenced by factors such as inadequate access to water and sanitation. Researchers from all around the world also find that inadequate access to sanitary facilities and water is the primary factor influencing children's nutritional condition, which in turn leads to malnutrition (Otsuka et al., 2019). Singh et al. (2019) indicated that poor access to clean water often leads to child malnutrition, since the consumption of unpurified water can lead to diarrhea and other waterborne infections. This finding is also validated by Ravindranath et al., (2019).

2.2.3.9. Poor Weaning Practices

It has also been discovered that inadequate weaning methods play a major role in a child's nutritional status. Poor weaning techniques, such as substituting sugar feeding for breastfeeding, can deprive the kid of essential nutrients, claim Akombi et al. (2017). A number of academics have also linked inadequate weaning techniques to the malnourishment of children. According to WHO guidelines, children should only be breastfed for a minimum of six months before being introduced to complementary, nutrient-dense foods. For this reason, proper weaning techniques are required to improve a child's nutritional health. A study conducted by Syeda et al. (2019) shows that children who are poorly weaned and not breastfeed are underweight and stunted as they grow.

2.2.3.10. Gender and Age of the Child

A child's age and gender could be important determinants of their nutritional status. There are several discussions regarding children's nutritional status based on gender because boys and girls require different nutrients. Nonetheless, a number of research show that malnutrition is more common in males. The results of this review also demonstrate that a child's gender has a significant role in determining their nutritional condition, with boys being more likely than girls to be undernourished. There is no clear justification for this. However, Olack et al., as cited in Mkhize and Sibanda (2020) stated that boys are more likely to be malnourished because they are more influenced by environmental stress, which largely contributes to malnutrition. Schoenbuchner (2019) also substantiated that a boy child is highly subjected to undernutrition.

In contrast, Afolabi et al. (2020) found that the likelihood of malnutrition in females was 1.33 times higher than in boys. In addition to a child's gender, age has also been found to be a factor that can affect their nutritional health.

According to The Mother and Child Nutrition (2019), children under the age of five are particularly susceptible to malnutrition because their bodies need enough nutrients for healthy growth and development and because illnesses that might lead to malnutrition can strike them easily. Children under the age of five have a significant prevalence of malnutrition, according to Kassie and Workie (2020). Numerous academics from all around the world agree with this observation (Mkhize & Sibanda, 2020). Likewise, the conclusions of this review provide credence to the claim that a child's age may affect their nutritional health. The high risk of malnutrition in children under five years old may be explained by inadequate weaning techniques used (Mkhize & Sibanda, 2020). As a result, children may not have complete access to an adequate supply of nutrient-rich solid food due to this circumstance. Finally, but just as importantly, this review also found that the caregiver's age affects the child's nutritional status. The literature reveals that children who have caregivers that are older (more than 50 years of age) may be highly prone to malnutrition because of the high prevalence of illiteracy among old-age adults (Mkhize & Sibanda, 2020). By considering the factors impacting the nutritional status of children, this study will provide significant insights into correcting micronutrient deficits in school feeding systems and improving nutritional status among the children of south Africa.

2.3 The Impact of Undernutrition on Children's Physical Growth, Health, Development, and Education

2.3.1 Physical Growth and Health

Research from various countries, including Brazil, China, India, and South Africa, consistently shows that early childhood stunting negatively impacts older children's and adolescents' educational performance across diverse social settings (Martins et al., 2011). However, less research has been conducted on the effects of wasting. Recent studies have primarily focused on psychological development and psychosocial stimulation, revealing persistent negative

outcomes, particularly in cognitive development and school achievement, although the data is less consistent than for stunting (Martins et al., 2011).

The extent to which undernutrition affects learning capacity remains unclear, but learning is a crucial pathway. Other potential channels include second-generation effects due to damage to mothers' physical and mental health, partly resulting from undernutrition. Research on the impact of acute malnutrition on child development is limited and presents mixed evidence. Severe acute malnutrition can have long-term effects in high-mortality settings (Martins et al., 2011).

Evidence from India indicates that severe, but not moderate, wasting is significantly negatively correlated with language development at one year of age, even after adjusting for various confounding factors. Conversely, studies in North Vietnam suggest that mild wasting may initially impact psychomotor development, but these effects nearly disappear when other child characteristics and home environment factors are considered (Martins et al., 2011).

2.3.2 Cognitive Development

Lack of vital nutrients can significantly impair a young child's brain development, leading to long-term negative effects on learning and development (Chase & Martins, 1970). Growth retardation and clinical malnutrition, such as dermatoses and physical and hair abnormalities, can have serious direct and indirect impacts on cognitive development and functioning. Direct physical and biological pathways include reduced blood flow to the brain, altered brain structure, and abnormal development of the blood-brain barrier, which can cause cerebral damage and vasomotor disturbances (Chase & Martins, 1970).

Indirect pathways involve inadequate diets, persistent periods of insufficient cognitive and brain growth, and impaired preterm infant stimulation. Malnutrition-related neurocognitive impairments can result in children being more passive and inattentive, disrupting early sensory and emotional environments (Chase & Martins, 1970).

2.3.3 Academic Performance

A person's health significantly impacts their academic achievement. Although the human brain constitutes only 2% of body weight, it consumes 20–25% of the body's energy, while muscles use only 8% at rest (Martins et al., 2011). The brain's rapid growth in early childhood underscores the importance of nutrition. At birth, the brain is 10% of body weight, rising to 60% at one year and 80% at three years. Neurons in the cerebral cortex form between 20,000 and 15,000 synapses between birth and age six, which are crucial for learning and memory (Martins et al., 2011).

Elevated levels of vital nutrients, such as zinc, omega-3 fatty acids, and glucose, are essential for memory and learning. Malnutrition is linked to reduced activity levels and learning difficulties, including memory and focus issues. Behavioural problems in schools, such as inability to focus, impatience, and exhaustion, are also associated with hunger. These conditions make it challenging to concentrate, pay attention, and learn, affecting academic performance as measured by test scores (Martins et al., 2011).

Good nutrition maximizes a child's capacity for cognitive and behavioural development, optimizing learning in all its forms. Inadequate nutrition is a major factor contributing to underachievement and educational disadvantage in schools. Improved nutrition can directly support education by enhancing cognitive and academic outcomes (Martins et al., 2011).

2.3.4 The Impact of Undernutrition on School Attendance and Dropout Rates

Malnourished children's school attendance is significantly affected by starvation, primarily due to the direct effects of malnutrition, such as reduced immunity and recurring illnesses, which result in a high number of sick days and inconsistent school attendance (Martins et al., 2011). A study conducted in Burkina Faso on school-age children (6–12 years old) found that children with chronic malnutrition had a 10% lower probability of attending school, while those with acute malnutrition had a 26% lower probability (Martins et al., 2011). The lack of a significant gender difference in these findings suggests that children with acute malnutrition are particularly vulnerable, potentially leading to higher dropout rates.

Addressing both acute and chronic malnutrition is crucial, as the effects on dropout rates may be exacerbated by slow responses from schools. Several initiatives and treatments have been proposed to prevent acutely malnourished children from dropping out. Serving quality meals in schools, implementing school feeding programmes, and providing nutritional interventions can help ensure consistent student attendance. Additionally, cash transfers can enhance the amount of money available for food, supporting families and preventing children from dropping out due to the need to work (Martins et al., 2011). Health insurance and subsidized medical care can also prevent school dropouts by covering the medical costs associated with malnutrition.

The World Health Organization (2022) concurs that malnutrition and undernourishment can have permanent and widespread effects on a child's growth, development, and general well-being. Early life stunting is linked to lower academic achievement because malnutrition impacts brain development, and undernourished children are more likely to become sick and miss school. Hidden hunger, resulting from deficiencies in essential nutrients, can lead to severe health issues such as blindness from vitamin A deficiency, learning impairments from iodine deficiency, and increased maternal mortality from iron deficiency (Bhandari & Banjara, 2015). Overweight and obesity can also lead to severe conditions like type 2 diabetes and cardiovascular disease (Goran et al., 2003). The disruption of children's physical and cognitive growth persists into adulthood, jeopardizing their prospects and economic stability (Goran et al., 2003).

2.4 Micronutrient Deficiencies

Micronutrient deficiencies have severe and long-lasting negative effects on the physical and intellectual development of children (Agüero et al., 2006). Without adequate nutrition from birth throughout childhood, many children will not fulfil their intellectual, physical, social, and, later, their employment potential (Mawela, 2018). High levels of poverty, inequality, and discrimination are key barriers to adequate nutrition for many children globally (Iverson et al., 2011). Improved nutrition in childhood has positive effects not only for the child's future but also for whole societies in the long term, producing positive social and economic returns (Mjali, 2019). School nutrition programmes are widely praised as an effective way to reduce short term hunger and invest in children's long-term nutritional health (Mawela, 2018). They also

have important social and achievement effects, such as improved school enrollment, attendance, and achievement in terms of test scores, attention span, memory, and cognitive, psychomotor, and mental development (World Food Programme, 2009).

2.4.1 Prevalence of Micronutrient Deficiencies

Children in South Africa continue to suffer from micronutrient deficiencies, including vitamin A, iron, and zinc (Siwela, 2020). The primary cause is a diet deficient in these micronutrients (Labadarios et al., as cited in Siwela et al., 2020). The latest National Health and Nutrition Examination Survey reported an average Dietary Diversity Score (DDS) of 4.2 across all age groups. However, there are disparities based on race and province. For instance, the Northwest (61.3%) and Limpopo (65.6%) had the highest percentages of individuals with low DDS, while the Western Cape (28.2%) and Gauteng (26.3%) had the lowest (Siwela et al., 2020). White individuals had a higher average nutritional diversity score compared to other racial groups.

Black African participants had the lowest nutritional scores and the highest percentage of individuals with low dietary diversity (44.9%) in the South African National Health and Nutrition Examination Survey (SANHANES) (Shisana et al., 2013). This disparity suggests that nutrition programmes should target the most marginalized groups, considering geography and demography. While supplementation and fortification measures have been implemented sustainably, they have not effectively reached children aged 12-59 months, as they are not frequently brought to medical facilities for immunizations beyond 18 months (Shisana et al., 2013).

A 1999 national survey found that 32-53% of South African children aged 1-9 had zinc intakes below the Recommended Dietary Allowances (RDA) (Labadarios, 2005). A follow-up study in 2005 revealed that 45.3% of children in the same age group did not consume enough zinc, raising public health concerns (Hotz, 2007). The recommended daily allowance for zinc is 3, 4, and 8 mg/day for children aged 1 to 13, respectively (Wessels et al., 2012). Despite the lack of specific zinc storage in the body, dietary zinc intake is considered a sufficient surrogate indicator of zinc status in a population (Wessels et al., 2012).

The percentage of South African children under five lacking vitamin A increased from 33% in 1994 to 43.6% in 2012 (Shisana et al., 2013). This may be due to diets low in vitamin A (Labadarios et al., as cited in Shisana et al., 2020). The 1999 National Food Consumption Survey showed that 50% of children had vitamin A intakes less than half of the RDA, which is the amount of food consumed daily to meet the nutritional needs of almost all healthy individuals in a group (Qubry, 2022). Furthermore, more than 63% of South African children aged 1-9 were found to be vitamin A deficient in the 2005 National Food Consumption Survey (NFCS). In response, the National Department of Health established a vitamin A supplementation (VAS) strategy for children under five years old in 2012 (Department of Health, 2012).

There is strong evidence to support the continued use of effective therapies such as provitamin A carotenoid biofortification, vitamin A supplementation, and fortification due to the high incidence of VAD in South Africa (Shisana et al., 2020). Serum retinol levels significantly improved in school-age children in rural KwaZulu-Natal who were part of an intervention program for school meals that included fortifying biscuits with β-carotene and other micronutrients. However, serum retinol levels returned to pre-intervention levels after the summer break (Stuijvenberg et al., as cited in Shisana et al., 2020). These findings imply that either the children weren't eating enough vitamin A-rich meals at home over the holidays, or their families couldn't afford to provide them. Growing vegetables at home may offer an additional benefit in reducing VAD. Children from rural parts of South Africa have significantly higher blood retinol levels when caregivers plant biofortified crops and feed their children biofortified diets (Faber et al., 2002).

Iron deficiency is another type of malnutrition. Serum ferritin levels indicate an increased risk of iron deficiency (ID) in children (Shisana et al., 2020). The frequency of ID among children under five years old rose from 10% in 1994 (Coutsoudis et al., 1994) to 11% in 2013 (Shisana et al., 2013). Conversely, iron deficiency anemia (IDA) declined from 5% in 1994 to 2.1% in 2013. The national food fortification program, enacted in 2003, may account for part of the decline in IDA prevalence (Shisana et al., 2013). Despite mandated fortification of staple foods, most children's diets lack iron-fortified foods, resulting in poor dietary iron intake (National Food Fortification, 2002). In KwaZulu-Natal province, primary school children have a high prevalence of ID (Taljaard et al., 2013). Micronutrient fortification through the school feeding program was implemented to address this. Stuijvenberg et al. (as

cited in Shisana et al., 2020) assessed the program's long-term impact on the micronutrient status of elementary school students, ages 6 to 11, who received biscuits fortified with βcarotene, iron, and iodine. The findings showed significant improvement in iron status indicators, such as serum ferritin, haemoglobin, and transferrin saturation. However, all iron status indicators returned to pre-intervention levels after the summer holidays.

In 2012, 66 million children throughout the developing world attended school hungry (World Food Programme, 2012). Nutritional deprivation in childhood can have severe and long-lasting negative effects on the physical and intellectual development of children (Agüero et al., 2006). Without adequate nutrition from birth throughout childhood, many children will not fulfil their intellectual, physical, social, and, later, their employment potential (Mawela, 2018). Globally, high levels of poverty, inequality, and discrimination constitute key barriers to adequate nutrition for many children (Iverson et al., 2011). Improved nutrition in childhood has positive effects not only for the child's future but also for whole societies in the long term, producing positive social and economic returns (Mjali, 2019). School nutrition programmes are widely praised as an effective way to reduce short-term hunger and invest in children's long-term nutritional health (Mawela, 2018). They also have important social and achievement effects, such as improved school enrollment, attendance, and achievement in terms of test scores, attention span, memory, and cognitive, psychomotor, and mental development (World Food Programme, 2009).

Despite being a middle-income country, South Africa faces significant challenges with poverty and food insecurity due to stark inequality. According to the South African National Health and Nutrition Examination Survey (SANHANES) conducted in 2012, 26% of the population experiences hunger, with a further 28.3% at risk of hunger (Shisana et al., 2014). Of the approximately 18 million children aged 0-18 in South Africa, 22.8% have inadequate access to food, and 7.8% have severely inadequate access. The worst cases are in the Northwest, Northern Cape, and Eastern Cape provinces, with the latter having a food insecurity prevalence rate of 39.1% (StatsSA, 2013). Although this is an improvement from 47% in 2002, it remains unacceptably high. The South African government has implemented three policy initiatives to address insufficient nutrient intake: social grants, the Integrated Food Security and Nutrition Programme, and the National School Nutrition Programme (Hendricks & Bourne, 2010).

2.5 School Feeding Programmes

2.5.1 The role of school meal programmes in addressing nutritional deficiencies

School feeding programmes represent a significant global investment, with annual expenditures estimated between US$47 billion and US$75 billion in 2013, primarily funded by government budgets (World Food Programme, 2013). These programmes form the largest global social safety net, with a long history in the developed world, dating back to the 1890s in Europe (Gunderson, 1971).

Globally, school meal programmes play a crucial role in addressing nutritional deficiencies, which are a significant public health concern. In many low- and middle-income countries, children suffer from malnutrition due to inadequate access to nutritious food. School feeding programmes provide a reliable source of essential nutrients, helping to combat deficiencies in vitamins and minerals such as iron, iodine, and vitamin A. For example, in Latin America, countries like Brazil and Mexico have implemented large-scale school feeding programmes that have significantly improved the nutritional status of children, reducing rates of anemia and other micronutrient deficiencies (Sidaner et al., 2013).

In Asia, countries like India and China have also seen positive outcomes from their school feeding initiatives. India's Midday Meal Scheme has not only improved school attendance and academic performance but has also addressed widespread malnutrition among children. Similarly, China's National School Lunch Program has been instrumental in improving the dietary intake of rural children, ensuring they receive balanced meals that contribute to their overall growth and development (Singh et al., 2013).

In Africa, school feeding programmes are often supported by international organizations such as the World Food Programme (WFP). These programmes are vital in regions affected by food insecurity and poverty. For instance, in Kenya, the Home-Grown School Feeding Program sources food locally, providing nutritious meals to children while supporting local farmers. This dual approach helps to improve children's nutrition and stimulate the local economy (Gelli et al., 2010).

School feeding programmes also play a critical role in emergency situations, such as natural disasters or conflicts. In these contexts, they ensure that children continue to receive

nutritious meals, which is essential for their survival and well-being. For example, in Syria, the WFP has implemented emergency school feeding programmes to support children affected by the ongoing conflict, providing them with a sense of normalcy and stability (World Food Programme, 2013).

School meals offer numerous advantages, including encouraging school attendance and reducing temporary hunger. Children who receive one meal a day at school may experience improved academic performance and are more likely to complete their primary education (Mueller et al., 2014). School feeding programmes are particularly potent interventions in developing countries, helping to mitigate the nutritional effects of environmental shocks and supporting children's growth and development. Singh et al. (2012) note that while growth deficits can persist into early adulthood if children remain in unfavourable conditions, improvements such as nutritional supplementation can enable catch-up growth.

School feeding programmes are popular social security measures due to their widespread support and ease of implementation. They support families in raising their children, ensure food access during emergencies, and act as income transfers for households. Across the developing world, school meals help mitigate nutrient deficiencies, directly impacting the health, wellbeing, and future productivity of school-going children. These programmes also effectively target vulnerable populations, such as orphans and children from single-parent or grandparent-headed households (World Food Programme, 2013).

2.5.2 The National School Nutrition Programme (NSNP)

The National School Nutrition Programme (NSNP) is a state-funded initiative in South Africa that provides daily meals to 8.8 million underprivileged children across all nine provinces (Department of Basic Education, 2014). This program, which aims to enhance learning capacity, support food production, and strengthen nutrition education, has become a cornerstone of the country's efforts to combat child hunger and improve educational outcomes.

Historically, feeding schemes in South Africa date back to 1916, but they were initially designed to benefit only white children (Swartz, 2009). By the end of apartheid, child hunger among the poorest South Africans, largely black, was severe. With the advent of democracy in

1994, addressing this issue became a primary concern. The NSNP was launched that same year, emphasizing the right to basic nutrition as enshrined in Section 28(1)(c) of the South African Constitution. Initially managed by the Department of Health, the program is now overseen by the Department of Basic Education and targets the most deprived schools, known as Quintiles 1 through 3 (Republic of South Africa National Treasury, 2014).

The NSNP operates with significant financial support, receiving R5.2 billion in the 2013–2014 fiscal year (Republic of South Africa National Treasury, 2015). The program provides mid-morning meals that include one protein, one carbohydrate, and one vegetable, adhering to national guidelines while considering local taste preferences. Meal size, cooking practices, and hygiene are said to be strictly regulated and monitored by district officials to ensure consistency and safety.

The relationship between diet and education is a central focus of the NSNP. Research has shown that poor nutrition is strongly linked to poor school performance, attendance, and cognitive abilities (Singh et al., 2013). In Africa, including South Africa, school feeding programmes have been demonstrated to improve enrolment, attendance, and reduce dropout rates (Hochfeld et al., 2013). The NSNP's objectives are to enhance learning capacity through school feeding, promote food production and improve food security, and strengthen nutrition education in schools and communities (Department of Basic Education, 2021). Despite its many benefits, the NSNP has not fully eradicated child hunger due to the high unemployment and poverty rates in South Africa (Hall & Wright, 2011). In the 2013/2014 financial year, the program provided meals to 8,827,419 learners in 19,877 schools (Department of Basic Education, 2014). The average cost per meal was R2.73 for primary school learners and R3.55 for secondary school learners, which included feeding costs, gas for cooking, transport, and a monthly stipend of R900 for Food Handlers (Department of Basic Education, 2014).

2.5.2.1 The Challenges of the NSNP

The National School Nutrition Programme (NSNP) faces several significant challenges, as highlighted by Mafugu (2021). One of the primary issues is the late payment to suppliers and service providers. Delays in payments, which can extend up to five months or longer, severely impact the quality and timeliness of food delivery to schools. Despite service providers signing

contracts to deliver food daily, the bureaucratic processes required before payments can be made often cause these delays. This has a detrimental effect on the students, as they may not receive their meals on time, and the quantity and quality of the meals are compromised, with fruits being infrequently provided (Mafugu, 2021).

Another challenge is the lack of consideration for school food preferences. A product that is well-received in one school may not be suitable for another. Food suppliers are often not informed of the specific dietary preferences of the schools they serve. This can lead to situations where students are unwilling to eat certain foods, such as soy mince, which they do not consume at home. Cultural factors, illnesses, and allergies also play a role in food avoidance. For instance, some students may avoid fish due to traditional Zulu medicine practices, or beans due to past stomach issues, with no alternative meals available to cater to these needs (Mafugu, 2021).

Inadequate training for food handlers is another significant issue. Food handlers sometimes miss training sessions due to logistical challenges or lack of transportation provided by school principals. This results in a lack of business skills among service providers and insufficient cooking techniques among food handlers. Feeding delays, inadequate food supply, and tense interactions between stakeholders further exacerbate the problem. Unreliable suppliers and conflicts between food handlers and suppliers can lead to disruptions in the meal service, affecting the school's schedule and requiring adjustments to accommodate the delays (Mafugu, 2021).

Additionally, the NSNP's effectiveness is hindered by broader socio-economic issues. High unemployment and poverty rates in South Africa contribute to the challenges faced by the program (Hall & Wright, 2011). The program's budget constraints also limit its ability to provide consistent and high-quality meals (Republic of South Africa National Treasury, 2015). Furthermore, the logistical challenges of transporting food to remote and rural areas can result in delays and spoilage, further impacting the program's effectiveness (Department of Basic Education, 2014).

We can surmise that the NSNP's effectiveness is hindered by late payments, lack of consideration for food preferences, inadequate training for food handlers, logistical challenges, and broader socio-economic issues. Addressing these issues is crucial to ensure the program

can consistently provide nutritious meals to students and support their educational and health outcomes.

2.5.2.2 A Comparison of the nutritional value of school-provided meals to recommended dietary guidelines

The National School Nutrition Programme (NSNP) in South Africa is designed to provide balanced and nutritious meals to approximately 9 million children in over 20,000 public schools (Department of Basic Education, 2021). The program adheres to national nutritional standards, which mandate that each meal should include a protein, a carbohydrate, and a vegetable, ensuring that children receive essential nutrients for their growth and development. Despite these national guidelines, there are variations in meal plans and menus across different provinces to accommodate local preferences and available resources.

Here is a comparative analysis of the meal plans across various provinces, considering the nutritional standards of the NSNP and evaluating their adherence to recommended dietary guidelines, specifically for foundation phase learners (grades R-3).

2.5.2.2.1 Gauteng

In Gauteng, the menu focuses on balanced meals that include a variety of proteins, carbohydrates, and vegetables, in line with NSNP standards. Local staples such as maize meal and samp are commonly incorporated into the meals. The province places a strong emphasis on fresh fruits and vegetables, often sourced from local farmers, to ensure that the meals are both nutritious and appealing to the students. For foundation phase learners, these meals provide essential nutrients needed for their rapid growth and cognitive development. The inclusion of fresh produce helps meet the recommended dietary guidelines for vitamins and minerals.

2.5.2.2.2 KwaZulu-Natal

KwaZulu-Natal emphasizes nutrient-dense meals with a focus on traditional foods, adhering to the NSNP's requirement for balanced nutrition. The menu includes dishes like "isijingi" (pumpkin porridge) and "ujeqe" (steamed bread), which are popular in the region. The use of local produce and traditional cooking methods helps to maintain the cultural relevance of the meals while providing essential nutrients to the children. For young learners, these meals ensure adequate intake of carbohydrates and vitamins, crucial for their energy needs and overall health.

2.5.2.2.3 Western Cape

In the Western Cape, the menu is diverse, offering a mix of proteins, grains, and vegetables, meeting the NSNP's nutritional standards. The inclusion of seafood and locally grown vegetables reflects the province's coastal location and agricultural strengths. Partnerships with local agricultural projects ensure that the ingredients are fresh and sustainably sourced, contributing to the overall quality of the meals. For foundation phase learners, the variety in the menu supports a balanced diet, providing essential omega-3 fatty acids from seafood, which are important for brain development.

2.5.2.2.4 Eastern Cape

The Eastern Cape focuses on simple, nutritious meals that highlight local staples, in line with NSNP guidelines. Dishes such as "umngqusho" (samp) and "imifino" (wild greens) are commonly served, emphasizing the use of indigenous ingredients and traditional recipes. This approach not only provides nutritional benefits but also helps to preserve local culinary traditions. For young children, these meals offer a good balance of protein, fibre, and essential micronutrients, supporting their physical and cognitive growth.

2.5.2.2.5 Limpopo

Limpopo's meal plans prioritize high-energy meals with a variety of grains and vegetables, adhering to the NSNP's nutritional standards. The menu includes traditional dishes like "ting" (fermented sorghum) and "morogo" (wild spinach), which are well-suited to the local climate and agricultural practices. The province places a strong emphasis on using locally sourced, seasonal produce to ensure the meals are both nutritious and sustainable. For foundation phase learners, these meals provide the necessary energy and nutrients to support their active lifestyles and developmental needs.

2.5.2.2.6 Mpumalanga

In Mpumalanga, the focus is on balanced meals that include a mix of proteins, carbohydrates, and vegetables, in accordance with NSNP standards. Common dishes include pap (maize porridge) and beef stew, which are popular in the region. The province collaborates with local farmers to ensure a steady supply of fresh and diverse ingredients, enhancing the nutritional value of the meals. For young learners, these meals ensure a balanced intake of macronutrients and micronutrients, essential for their growth and learning.

2.5.2.2.7 Northern Cape

The Northern Cape emphasizes nutrient-rich meals that incorporate local grains and vegetables, meeting the NSNP's nutritional requirements. Dishes such as boerewors (farmers' sausage) and pumpkin are commonly served, reflecting the province's agricultural strengths. The focus on sustainable sourcing and reducing food waste helps to ensure that the meals are both nutritious and environmentally friendly. For foundation phase learners, these meals provide a good mix of protein, vitamins, and minerals, supporting their overall health and development.

2.5.2.2.8 Free State

In the Free State, the menu features simple, balanced meals with a variety of proteins and vegetables, in line with NSNP standards. Dishes like maize meal porridge and chicken stew are commonly served, providing essential nutrients to the children. Partnerships with local cooperatives support small-scale farmers and ensure that the ingredients are fresh and locally sourced. For young children, these meals offer a balanced diet that supports their physical growth and cognitive development.

2.5.2.2.9 North West

The North West province prioritizes high-protein meals with a mix of grains and vegetables, adhering to the NSNP's nutritional guidelines. Dishes such as sorghum porridge and beef stew are commonly included in the menu, reflecting the local dietary preferences. The province emphasizes community involvement in meal planning and preparation, ensuring that the meals are both nutritious and culturally appropriate. For foundation phase learners, these meals provide the necessary protein and energy to support their growth and learning.

2.5.2.2.10 Evaluation of Adherence to Recommended Dietary Guidelines

Overall, the meal plans across the various provinces generally adhere to the NSNP's nutritional standards and recommended dietary guidelines. The focus on providing a balanced mix of proteins, carbohydrates, and vegetables ensures that foundation phase learners receive essential nutrients for their growth and development. The incorporation of local staples and traditional foods helps to maintain cultural relevance while meeting nutritional needs. However, challenges such as funding constraints, supply chain issues, and infrastructure limitations can impact the consistency and quality of the meals. Addressing these challenges is crucial to ensure that all children receive the full benefits of the NSNP.

2.6 Nutrition Education and Interventions

2.6.1 Importance of Nutrition Education in Schools

Nutrition education in schools is essential for promoting healthy eating habits and preventing undernutrition among children. It plays a significant role in shaping children's dietary behaviours, which can have long-term impacts on their physical growth, health, development, and academic performance. Undernutrition, as discussed, can lead to stunted growth, cognitive impairments, and poor academic outcomes (Martins et al., 2011). By integrating nutrition education into the school curriculum, children can learn about the importance of a balanced diet, the benefits of consuming various nutrients, and the risks associated with poor dietary choices (World Health Organization, 2022).

Nutrition education helps children understand the relationship between food and health, empowering them to make informed decisions about their diets. It also fosters a supportive environment where healthy eating is encouraged and normalized. This is particularly important in the foundation phase, where early dietary habits are established and can influence lifelong health and well-being (Bhandari & Banjara, 2015).

Globally, nutrient deficiencies among children remain a significant public health challenge. According to the World Health Organization (2022), malnutrition, including undernutrition and micronutrient deficiencies, affects millions of children worldwide, leading to severe health and developmental issues. In low- and middle-income countries, children often suffer from deficiencies in essential nutrients such as iron, iodine, vitamin A, and zinc, which are critical for growth and cognitive development. These deficiencies can result in conditions like anemia, impaired cognitive function, and increased susceptibility to infections.

In South Africa, the situation is similarly concerning. The South African National Health and Nutrition Examination Survey (SANHANES-1) revealed that a significant proportion of children, particularly those in the foundation phase, suffer from nutrient deficiencies. Iron deficiency anemia, vitamin A deficiency, and stunting are prevalent among young children, impacting their physical and cognitive development (Shisana et al., 2013). These deficiencies are often exacerbated by socio-economic factors, including poverty, food insecurity, and limited access to diverse and nutritious foods.

Addressing nutrient deficiencies among children, especially foundation phase learners, presents several challenges. Socio-economic barriers such as poverty and food insecurity make it difficult for many families to afford nutritious foods, leading to diets that lack essential nutrients (Shisana et al., 2013). Additionally, limited access to healthcare services can hinder early detection and treatment of nutrient deficiencies. Educational and awareness gaps also play a role, as many schools lack comprehensive nutrition education programmes, leaving children and parents unaware of the importance of a balanced diet and the risks of nutrient deficiencies (World Health Organization, 2022). Cultural and dietary practices may not always align with nutritional guidelines, making it challenging to promote healthy eating habits.

Infrastructure and resource constraints further complicate efforts to address nutrient deficiencies. Some schools lack the necessary facilities to support nutrition education and meal programmes, such as kitchens and storage facilities (Department of Basic Education, 2021). Limited funding and resources can affect the implementation and sustainability of nutrition education and school feeding programmes.

Despite these challenges, several successful interventions and programmes have demonstrated the effectiveness of nutrition education and school feeding in improving child nutrition and mitigating nutrient deficiencies, as discussed in the next section.

2.6.2 Successful Interventions and Programmes that have Improved Child Nutrition Globally

India's Midday Meal Scheme (MDMS) stands out as one of the largest school feeding programmes globally. By 2003, most Indian states were providing cooked meals daily, and by 2006, 120 million schoolchildren were fed under the MDMS (Singh et al., 2013). This initiative has significantly improved school enrollment, attendance, and retention rates, particularly among disadvantaged groups. By ensuring that children receive essential nutrients, the MDMS has helped reduce malnutrition and improve overall health. However, despite its successes, the program faces challenges such as irregular meal quality, corruption, and logistical issues. Ensuring consistent meal quality and addressing administrative inefficiencies are crucial for the program's sustainability. The large scale of the MDMS demonstrates its potential for

replication in other countries, but it requires strong government commitment and adequate funding (Singh et al., 2013).

Brazil's National School Feeding Program (PNAE) is another exemplary initiative, providing nutritious meals to millions of students and improving their dietary habits. The program supports local agriculture by sourcing food from small-scale farmers, promoting food security and social inclusion. The integration of nutrition education into the program has helped children understand the importance of healthy eating, leading to better health outcomes. However, the program's reliance on local agriculture, while a strength, also requires continuous support and investment to ensure sustainability. Ensuring equitable access to nutritious meals across different regions remains a challenge, particularly in remote and underserved areas (Sidaner et al., 2013).

Within the Southern Africa Development Community (SADC), several school feeding programmes exist, often partially or fully funded by international donors. Malawi's Food for Education (FFE) program, for example, aims to promote learning, increase school enrollment and attendance, and reduce short-term hunger by providing students with daily snacks or meals. The program has led to improved academic performance and overall health of students. Community engagement is a key component, with local communities involved in meal preparation and delivery, fostering a sense of ownership and sustainability. However, limited funding and resources can affect the program's reach and effectiveness. Ensuring consistent funding and regular monitoring and evaluation are essential for long-term success (Mueller et al., 2014).

Kenya's Home-Grown School Feeding Program sources food locally to provide meals to schoolchildren, supporting both education and local agriculture. The program has improved school attendance and performance while boosting the local economy. By sourcing food locally, the program supports local farmers and ensures fresh, nutritious meals. However, the program's success in Kenya highlights its potential for replication in other countries, but it requires strong community involvement and support. Adequate infrastructure and logistics are crucial for the program's success, particularly in remote areas (Gelli et al., 2010).

Ghana's School Feeding Program provides meals to primary school children, leading to increased enrollment and attendance, particularly among girls. The program has improved children's nutritional status and supported local farmers by sourcing food locally. Nutrition

education initiatives have been integrated to promote healthy eating habits among students. However, ensuring consistent funding is a challenge that affects the program's sustainability and reach. Adapting the program to local dietary preferences and cultural practices is essential for its acceptance and success (Afoakwa et al., 2013).

Successful nutrition education and school feeding programmes, such as India's MDMS, Brazil's PNAE, Malawi's FFE, Kenya's Home-Grown School Feeding Program, and Ghana's School Feeding Program, have demonstrated significant improvements in child nutrition and educational outcomes. These programmes highlight the importance of government support, community involvement, and sustainable funding. However, challenges such as resource constraints, logistical issues, and ensuring equitable access remain. Addressing these challenges is crucial for the long-term success and scalability of these programmes.

2.7 Gaps in Existing Research

2.7.1 Gaps in the Current Literature that my Study Aims to Address

Despite the implementation of a national school-feeding program in South Africa, micronutrient deficiencies persist among school-age children, particularly in low-income communities. Research conducted by the Medical Research Council (Shisana et al., 2020) and a survey by Stevens et al. (2015) indicate that these programmes may not always provide the necessary nutrient intake in accordance with dietary guidelines. This issue is compounded by the reliance on staple foods that lack essential micronutrients, leading to hidden hunger and its associated health and cognitive impacts. The persistence of these deficiencies raises critical questions about the effectiveness of current school-feeding programmes in enhancing children's health and academic performance.

One major gap in the existing literature is the persistent micronutrient deficiencies among children, despite the presence of the National School Nutrition Programme (NSNP). Many children, especially those in low-income communities, continue to suffer from deficiencies in essential micronutrients such as iron, zinc, and vitamin A. This "hidden hunger" has significant health and cognitive impacts on children, affecting their overall well-being and development.

Another critical gap is the effectiveness of the NSNP in providing adequate nutrient intake in accordance with dietary guidelines. Research suggests that the program may not always meet the nutritional needs of children, leading to ongoing deficiencies. This raises important questions about how well the program is functioning and whether it is truly addressing the nutritional needs of school-age children. Addressing nutrient deficiencies among children, especially foundation phase learners, presents several challenges. Socioeconomic barriers such as poverty and food insecurity make it difficult for many families to afford nutritious foods, leading to diets that lack essential nutrients (Shisana et al., 2013). Additionally, limited access to healthcare services can hinder early detection and treatment of nutrient deficiencies. Educational and awareness gaps also play a role, as many schools lack comprehensive nutrition education programmes, leaving children and parents unaware of the importance of a balanced diet and the risks of nutrient deficiencies (World Health Organization, 2022). Cultural and dietary practices may not always align with nutritional guidelines, making it challenging to promote healthy eating habits.

Infrastructure and resource constraints further complicate efforts to address nutrient deficiencies. Some schools lack the necessary facilities to support nutrition education and meal programmes, such as kitchens and storage facilities (Department of Basic Education, 2021). Limited funding and resources can affect the implementation and sustainability of nutrition education and school feeding programmes.

2.7.2 Contributions of This Study

This study aims to address the gap of persistent micronutrient deficiencies by providing a detailed analysis of the nutritional content of meals provided by the NSNP and assessing their adequacy in meeting the dietary needs of children. By evaluating the nutritional content, the study will identify specific deficiencies and propose adjustments to meal plans to ensure they meet dietary guidelines.

To address the gap regarding the effectiveness of the NSNP, this study will evaluate the implementation of the program across different regions and identify factors that influence its effectiveness. By examining regional variations and local dietary preferences, the study will

provide insights into how the NSNP can be tailored to better meet the nutritional needs of children in diverse contexts.

In exploring the socio-economic and environmental factors that influence the nutritional status of children, this research will contribute to a more comprehensive understanding of the barriers to addressing nutrient deficiencies. By examining the interplay between these factors and the nutritional outcomes of children, the study will propose strategies to overcome these challenges and improve the effectiveness of nutrition programmes. The study will also examine infrastructure and resource constraints that affect the implementation of nutrition education and meal programmes. By identifying specific infrastructure needs and resource limitations, the research will suggest ways to improve facilities and resource allocation to support effective nutrition programmes.

Finally, this study will argue for the necessity of improved nutrition education and meal plan interventions to address micronutrient deficiencies. By proposing evidence-based recommendations for enhancing the NSNP and implementing effective interventions, the research aims to promote children's health and academic success, ultimately breaking the cycle of poverty.

2.8 Conclusion

The literature review provided a comprehensive overview of global issues related to hunger, malnutrition, and population growth, highlighting disparities in food access and nutrition. It delved into the specific nutritional challenges faced in South Africa, including stunting, micronutrient deficiencies, and overnutrition. The review examined the impact of malnutrition on children, emphasizing the prevalence of deficiencies in critical micronutrients such as iron, zinc, and vitamin A, which are essential for children's growth and development. Additionally, it explored the role of school meal programmes in addressing these nutritional challenges and underscored the importance of nutrition education and interventions.

Despite the implementation of the National School Nutrition Programme (NSNP) in South Africa, the persistence of micronutrient deficiencies among school-age children, particularly in low-income communities, remains a significant concern. Research indicates that

the NSNP may not always provide the necessary nutrient intake in accordance with dietary guidelines, leading to hidden hunger and its associated health and cognitive impacts. Socioeconomic barriers, limited access to healthcare services, educational and awareness gaps, and infrastructure and resource constraints further complicate efforts to address nutrient deficiencies.

This study aims to provide a comprehensive understanding of the current state of micronutrient deficiencies among Foundation Phase school children in Driefontein, Ladysmith, KwaZulu-Natal. By evaluating the implementation of the NSNP in this area, the study will offer valuable insights into how the program can be tailored to better meet the nutritional needs of children in this specific context. Furthermore, by exploring the socio-economic and environmental factors that influence the nutritional status of children, the research will contribute to a more comprehensive understanding of the barriers to addressing nutrient deficiencies and propose strategies to overcome these challenges.

Ultimately, this study will argue for the necessity of improved nutrition education and meal plan interventions to address micronutrient deficiencies. By proposing evidence-based recommendations for enhancing the NSNP and implementing effective interventions, the research aims to promote children's health and academic success, ultimately breaking the cycle of poverty. This contribution is vital for informing policy decisions and improving the effectiveness of school-feeding programmes, ensuring that they fulfil their intended purpose of enhancing the health and development of school-age children.

Building on the insights gained from the literature review, the next chapter will present the conceptual framework that underpins this study, namely the United Nations Children's Fund (UNICEF) conceptual framework for malnutrition (UNICEF, 1990).

CHAPTER 3

Conceptual Framework of the Study

3.0 Introduction

Building on the insights gained from the literature review, this chapter presents the conceptual frameworks that underpin this study. The investigation into the current state of micronutrient deficiencies among Foundation Phase school children in Driefontein and Kleinfontein , Ladysmith, KwaZulu-Natal, is grounded in three pivotal frameworks developed by UNICEF: the ***UNICEF Conceptual Framework for Malnutrition (1990)***, the ***UNICEF Conceptual Framework for Malnutrition (1992)***, and the ***UNICEF Conceptual Framework on the Determinants of Maternal and Child Nutrition (2020)***. These frameworks serve as essential tools in understanding and addressing the multifaceted nature of malnutrition, providing a comprehensive lens through which the study's objectives are examined.

The ***1990 UNICEF Conceptual Framework for Malnutrition*** offers a foundational perspective, identifying the immediate, underlying, and basic causes of malnutrition. This framework emphasizes the interplay between inadequate dietary intake, disease, household food security, care practices, and the broader socio-economic and political context. By utilizing this framework, the study dissects the immediate and underlying causes of micronutrient deficiencies among the children. This approach provides a structured method to identify specific deficiencies and evaluate the nutritional value of school-provided meals against recommended dietary guidelines.

The ***1992 UNICEF Conceptual Framework for Malnutrition*** builds on the 1990 framework but simplifies the representation of basic causes. While it retains the immediate and underlying causes, it reduces the basic causes to focus on resources and control, omitting the detailed depiction of institutions and structures. This streamlined approach aims to provide a clearer understanding of how resources impact malnutrition, making it easier to identify and address key factors.

Building on these foundations, the ***2020 UNICEF Conceptual Framework on the Determinants of Maternal and Child Nutrition*** expands the scope to include the triple burden of malnutrition: undernutrition, micronutrient deficiencies, and overweight/obesity. This updated framework highlights the critical role of diet quality and care practices, offering a more nuanced understanding of the factors influencing nutritional status. By incorporating this framework, the study explores the broader determinants of micronutrient deficiencies, including socioeconomic, educational, and environmental factors, and assesses the effectiveness of the current school-feeding program in addressing these issues.

Before embarking on the overview of the different UNICEF conceptual frameworks, a detour is taken into the historical context and development of these UNICEF conceptual frameworks. This approach ensures that the frameworks are not viewed in isolation but are understood within the broader context of their development. By starting with a historical overview, we can appreciate the socio-economic, political, and global factors that influence the creation and evolution of these frameworks. This background sets the stage for a deeper understanding of the frameworks' significance and relevance in contemporary research and policymaking.

The overview of the different UNICEF conceptual frameworks begins with a detailed explanation of the UNICEF Conceptual Framework for Malnutrition (1990), focusing on its identification of the immediate, underlying, and basic causes of malnutrition. The chapter then illustrates how this framework is applied to identify specific micronutrient deficiencies among Foundation Phase school children in Driefontein and evaluate the nutritional value of the meals provided by the school against recommended dietary guidelines. Following this, the chapter delves into the UNICEF Conceptual Framework for Malnutrition (1992), examining its simplified approach to basic causes. This section highlights how the streamlined focus on resources and control provides clarity in understanding the impact of resources on malnutrition. Finally, the chapter explores the UNICEF Conceptual Framework on the Determinants of Maternal and Child Nutrition (2020), examining its expanded scope to include the triple burden of malnutrition. This section emphasizes the critical role of diet quality and care practices in influencing nutritional status and explores the broader determinants of micronutrient deficiencies, including socioeconomic, educational, and environmental factors.

The chapter also addresses the specific issues faced in South Africa, where hunger and poverty remain pressing concerns. By examining these, the chapter aims to establish a solid

foundation for arguing the applicability of the UNICEF conceptual frameworks to current research concerns and aims, particularly in the context of South Africa's National School Nutrition Programme (NSNP) and the persistent micronutrient deficiencies among school-age children (Munje & Jita, 2019; Shisana et al., 2020). Through this detailed examination, the chapter paves the way for a deeper understanding of how the UNICEF conceptual frameworks can be utilized to enhance the effectiveness of nutrition programmes and improve developmental outcomes for children in South Africa and beyond.

3.1 Historical Context and Development of the UNICEF Conceptual Frameworks

The development of the UNICEF conceptual frameworks was driven by the urgent need to address the complex and multifaceted issue of malnutrition, which was a significant global health crisis in the late 20th century. These frameworks emerged from a confluence of theoretical insights, contextual realities, and political commitments, each playing a crucial role in shaping their structure and application.

3.1.1 Theoretical Underpinnings and Contextual Realities

The theoretical foundations of the UNICEF conceptual frameworks are deeply rooted in the fields of nutrition, public health, and social sciences. One of the key influences was Urie Bronfenbrenner's ecological systems theory, which emphasized the importance of understanding individuals within their broader environmental contexts (Bronfenbrenner, 1979). This theory highlighted the need to consider multiple layers of influence, from immediate dietary intake to broader socio-economic conditions, in addressing child health and nutrition.

Additionally, the frameworks were influenced by the social determinants of health, which recognize that health outcomes are shaped by a range of social, economic, and environmental factors. This perspective underscored the importance of a holistic approach to health and nutrition, one that goes beyond individual behaviour and considers the broader context in which people live (Black et al., 2008). This understanding is reflected in the shift from food security to nutrition security and the multifactorial nature of malnutrition.

3.1.1.1 Shift from Food Security to Nutrition Security

The concept of food security traditionally focused on the availability and accessibility of sufficient food to meet the dietary needs of a population. However, by the 1980s, it became evident that food security alone was not sufficient to address malnutrition. The concept of nutrition security, which encompasses not only the availability of food but also its quality, utilization, and the health environment, began to gain prominence.

The 1990 UNICEF Conceptual Framework for Malnutrition addressed this shift by emphasizing the importance of dietary intake and disease as immediate causes of malnutrition. It recognized that simply having access to food was not enough; the nutritional quality of the food and the health status of individuals were also critical. The framework highlighted the need for adequate care practices and health services to ensure that food intake translated into improved nutritional status. This broader perspective on food security laid the groundwork for a more comprehensive approach to tackling malnutrition (UNICEF, 1990).

The 2020 UNICEF Conceptual Framework further expanded on this concept by explicitly incorporating the idea of nutrition security. It addressed the triple burden of malnutrition: undernutrition, micronutrient deficiencies, and overweight/obesity. This framework emphasized the quality of diets and the role of care practices in determining nutritional outcomes. It recognized that achieving nutrition security required not only sufficient food but also diverse and nutrient-rich diets, appropriate feeding practices, and a supportive health environment. This comprehensive approach was designed to address the evolving nutritional challenges of the 21st century (UNICEF, 2020).

3.1.1.2 Multifactorial Understanding of Malnutrition

Malnutrition is a complex issue influenced by a variety of factors beyond just food intake. Theoretical advancements in nutrition science and public health have emphasized the multifactorial nature of malnutrition, recognizing the interplay of dietary, health, socioeconomic, and environmental factors.

The 1990 UNICEF Conceptual Framework acknowledged this complexity by identifying three levels of causation: immediate, underlying, and basic causes. Immediate causes included inadequate dietary intake and disease, while underlying causes encompassed household food security, inadequate care, and insufficient health services. Basic causes were rooted in socio-economic and political contexts. This framework provided a structured approach to understanding the diverse determinants of malnutrition and emphasized the need for multi-sectoral interventions to address these factors comprehensively (UNICEF, 1990).

Building on the 1990 framework, the 2020 UNICEF Conceptual Framework offered an even more nuanced understanding of malnutrition. It highlighted the critical role of diet quality and care practices as immediate determinants and expanded the analysis of underlying and basic causes. The framework recognized that malnutrition was influenced by a complex interplay of factors, including socio-economic status, education, and environmental conditions. By incorporating these diverse determinants, the 2020 framework provided a more holistic and detailed approach to addressing malnutrition, reflecting the latest theoretical advancements in the field (UNICEF, 2020).

3.1.1.2.1 Global and Political Context

The late 20th century was marked by significant global challenges, including widespread poverty, food insecurity, and high rates of child mortality. These issues were particularly acute in developing countries, where millions of children suffered from malnutrition and its devastating consequences. The international community recognized that traditional approaches, which often focused solely on food aid, were insufficient to address these complex problems (Statistics South Africa, 2019).

The 1990 UNICEF Conceptual Framework was developed in response to this urgent need for a more comprehensive approach. It aimed to provide a structured method for analyzing and addressing the root causes of child malnutrition and mortality. This period also saw a growing emphasis on human rights, with the United Nations Convention on the Rights of the Child (1989) underscoring the importance of ensuring children's well-being (United Nations, 1989).

As the global landscape evolved, new nutritional challenges emerged, necessitating an updated framework. By 2020, the world faced a triple burden of malnutrition: undernutrition, micronutrient deficiencies, and the rising prevalence of overweight and obesity. This shift was driven by changes in dietary patterns, urbanization, and economic transitions, which led to poor diet quality and inadequate care practices. The 2020 UNICEF Conceptual Framework was developed to address these complex and interconnected issues, recognizing the critical role of diet quality and care practices in influencing maternal and child nutrition. It aimed to provide a more comprehensive understanding of the determinants of nutrition, incorporating the broader socio-economic, educational, and environmental factors that contribute to malnutrition (UNICEF, 2020).

The development of the UNICEF frameworks was also supported by significant political commitments and collaborative efforts. International organizations, governments, and non-governmental organizations (NGOs) played crucial roles in advocating for and implementing strategies to combat malnutrition. The frameworks were designed to guide global efforts, providing a structured approach to identify and address the root causes of malnutrition. These political commitments underscored the importance of integrated and multisectoral strategies, emphasizing the need for continuous adaptation and innovation in public health interventions to effectively combat malnutrition in all its forms (UNICEF, 2020).

3.1.1.2.2 Addressing Global Challenges

The primary problem addressed by the UNICEF conceptual frameworks was the high prevalence of child malnutrition and mortality. At the time, it was recognized that traditional approaches, which often focused solely on food aid, were insufficient. The frameworks introduced a more comprehensive approach, considering immediate, underlying, and basic causes of malnutrition. This included factors such as inadequate dietary intake, poor health services, and socio-economic conditions (Black et al., 2008). By addressing these interconnected factors, the frameworks aimed to create sustainable solutions to improve child health outcomes. This holistic approach was essential in ensuring that interventions were not only effective in the short term but also sustainable in the long term (UNICEF, 1990).

The 2020 UNICEF Conceptual Framework built on this foundation by addressing the evolving nutritional challenges of the 21st century. It recognized the need to tackle the triple burden of malnutrition and emphasized the importance of diet quality, care practices, and the broader socio-economic and environmental determinants of nutrition. This framework aimed to provide a more nuanced and comprehensive understanding of malnutrition, guiding efforts to develop integrated and multi-sectoral interventions that are sustainable and effective in the long term (UNICEF, 2020).

3.1.1.2.3 Program Design and Implementation

Practitioners and policymakers needed a practical tool to design and implement effective nutrition programmes. The existing approaches were often fragmented and failed to address the root causes of malnutrition. The 1990 UNICEF Conceptual Framework provided a comprehensive guide for developing integrated and multi-sectoral interventions (UNICEF, 1990).

Building on this, the 2020 UNICEF Conceptual Framework emphasized the importance of addressing the triple burden of malnutrition through program design. It highlighted the need for interventions that not only address undernutrition but also tackle micronutrient deficiencies and the rising prevalence of overweight and obesity. This framework guided the development of programmes that focus on improving diet quality, promoting healthy eating practices, and ensuring access to diverse and nutrient-rich foods (UNICEF, 2020).

3.1.1.2.4 Policy Development

There was a need for evidence-based policies that could create an enabling environment for improved nutritional outcomes. Policymakers required a framework that could inform the development of comprehensive nutrition policies, considering the diverse factors influencing malnutrition (Black et al., 2008).

The 1990 UNICEF Conceptual Framework provided a foundation for developing such policies by highlighting the immediate, underlying, and basic causes of malnutrition (UNICEF,

1990). The 2020 UNICEF Conceptual Framework further enhanced policy development by incorporating the latest understanding of the triple burden of malnutrition. It emphasized the need for policies that promote nutrition security, support healthy diets, and address the socioeconomic and environmental determinants of nutrition. This framework guided policymakers in creating comprehensive and integrated nutrition policies that are responsive to the evolving nutritional challenges (UNICEF, 2020).

3.1.1.2.5 Monitoring and Evaluation

Effective monitoring and evaluation of nutrition programmes were essential to assess their impact and identify areas for improvement. A structured framework was needed to systematically analyze the causes of malnutrition and evaluate the effectiveness of interventions (UNICEF, 1990).

The 1990 UNICEF Conceptual Framework provided a basis for monitoring and evaluation by identifying key indicators and determinants of malnutrition (UNICEF, 1990). The 2020 UNICEF Conceptual Framework built on this by incorporating a more comprehensive set of indicators that reflect the triple burden of malnutrition. It emphasized the importance of monitoring diet quality, care practices, and the broader socio-economic and environmental factors influencing nutrition. This framework guided the development of robust monitoring and evaluation systems that can effectively track progress and inform continuous improvement of nutrition programmes (UNICEF, 2020).

3.1.1.2.6 Recent Statistics on Malnutrition

Recent statistics highlight the ongoing challenges of malnutrition globally. According to the 2023 UNICEF-WHO-World Bank Group Joint Malnutrition Estimates, stunting prevalence has declined from 33.0% in 2000 to 22.3% in 2022, with the number of children affected falling from 204.2 million to 148.1 million. However, wasting persists at alarming rates, with 45.0 million children under five affected in 2022. Additionally, the number of children under five affected by overweight has increased from 33.0 million in 2000 to 37.0 million in 2022 (UNICEF, 2023).

These statistics underscore the need for continued efforts to address malnutrition in all its forms. The UNICEF frameworks provide valuable insights and guidance for developing effective strategies to combat malnutrition and improve health outcomes for children and women worldwide.

3.1.1.2.7 Relevance to South Africa

Hunger and poverty remain significant issues in South Africa, with 6.8 million South Africans experiencing hunger daily, including 4.7 million individuals in households with young children (Statistics South Africa, 2019). These figures are alarming, especially given the negative correlation between poverty and poor developmental outcomes (Lu et al., 2016). To address this, the South African government introduced the National School Nutrition Programme (NSNP), aimed at improving the developmental outcomes of underprivileged children (Munje & Jita, 2019; World Food Programme, 2019).

Despite the implementation of the NSNP, micronutrient deficiencies persist among school-age children, particularly in low-income communities. Research conducted by the Medical Research Council (Shisana et al., 2020) and a survey by Stevens et al. (2015) indicate that these programmes may not always provide the necessary nutrient intake in accordance with dietary guidelines. This issue is compounded by the reliance on staple foods that lack essential micronutrients, leading to hidden hunger and its associated health and cognitive impacts.

The persistence of these deficiencies raises critical questions about the effectiveness of current school-feeding programmes in enhancing children's health and academic performance. International research initially viewed school feeding programmes (SFPs) as anti-hunger initiatives designed to enhance the nutritional status of underprivileged children (Watson et al., 2020). However, studies by Bundy et al. (2009), Finan (2009), and Metwally et al. (2020) revealed that these programmes had minimal impact on children's nutritional status. This prompted new theories to reconsider the influence of SFPs on other developmental outcomes.

Research has since examined the effects of SFPs on health and education outcomes (Drake et al., 2017; Pac et al., 2017; Aurino et al., 2018; Gelli et al., 2019), but gaps remain,

particularly regarding the concurrent effects on parents' health spending and children's education and health outcomes. In South Africa, the NSNP has shown positive impacts on educational outcomes, such as increased school enrollment and attendance (de la Monalis & Mothe, 2010; Graham et al., 2015). Schools with breakfast programmes reported higher rates of zero absenteeism compared to those without (Devereux et al., 2018). Despite these successes, research by Shisana et al. (2020) indicates that micronutrient deficiencies persist in some South African schools.

In the context of South Africa, where hunger and poverty remain pressing concerns, the UNICEF conceptual framework can provide a robust tool for analyzing and addressing the persistent micronutrient deficiencies among school-age children. By applying this framework, researchers and policymakers can develop more effective interventions to improve the health and developmental outcomes of children in South Africa and beyond.

3.2 Overview of the UNICEF Conceptual Frameworks

The evolution of the UNICEF conceptual frameworks for understanding malnutrition from 1990 to 2020 reflects significant advancements in the field of nutrition. Each framework builds on its predecessor, incorporating new insights and addressing emerging challenges.

3.2.1 The UNICEF 1990 First Printing framework & the UNICEF 1992 Second Printing framework

Figure 3.1 illustrates the two figures representing the different versions of the UNICEF conceptual framework for understanding the causes of malnutrition. The first version, printed in 1990, and the second version, printed in 1992, both aim to elucidate the multifaceted nature of malnutrition, but they do so with some notable differences.

The **UNICEF 1990 First Printing** framework for Malnutrition is comprehensive, offering a foundational perspective, detailing three levels of causes: ***immediate***, ***underlying***, and ***basic***. In this original framework, the basic causes are primarily focused on "resources" (human, financial, and organizational) as the key determinants of reaching adequacy in the

underlying determinants. Basic causes are depicted as potential resources transformed through various institutions and structures, highlighting the complexity of malnutrition's root causes. Immediate causes focus on inadequate dietary intake and disease, while underlying causes include household food security, care for women and children, and health services and environment.

The framework is structured to explain how "potential resources" are transformed into an "entitlement framework" called "formal and non-formal institutions," which determine how individual families and communities can access the critical resources needed to fulfil their food, health, and care needs. The "economic structure" and the "political and ideological superstructures" represent the key determinants governing this transformation. This detailed depiction underscores the complexity of malnutrition's root causes and the various institutional and structural influences at play (UNICEF, 1990).

In contrast, the **UNICEF 1992 Second Printing** framework for Malnutrition simplifies the representation of basic causes. While it retains the immediate and underlying causes from the 1990 framework, it reduces the basic causes to resources and control, omitting the detailed depiction of institutions and structures. In other words, the 1992 framework removed the formal and informal institutions, and the economic, political, and ideological superstructures, thereby leaving a critical gap between the basic and underlying causes with no explanation as to how these were linked. This revision aimed to streamline the understanding of how resources impact malnutrition, making it easier to identify and address key factors. However, this simplification has been noted by Young (2020) to leave out important contextual details that were present in the 1990 framework.

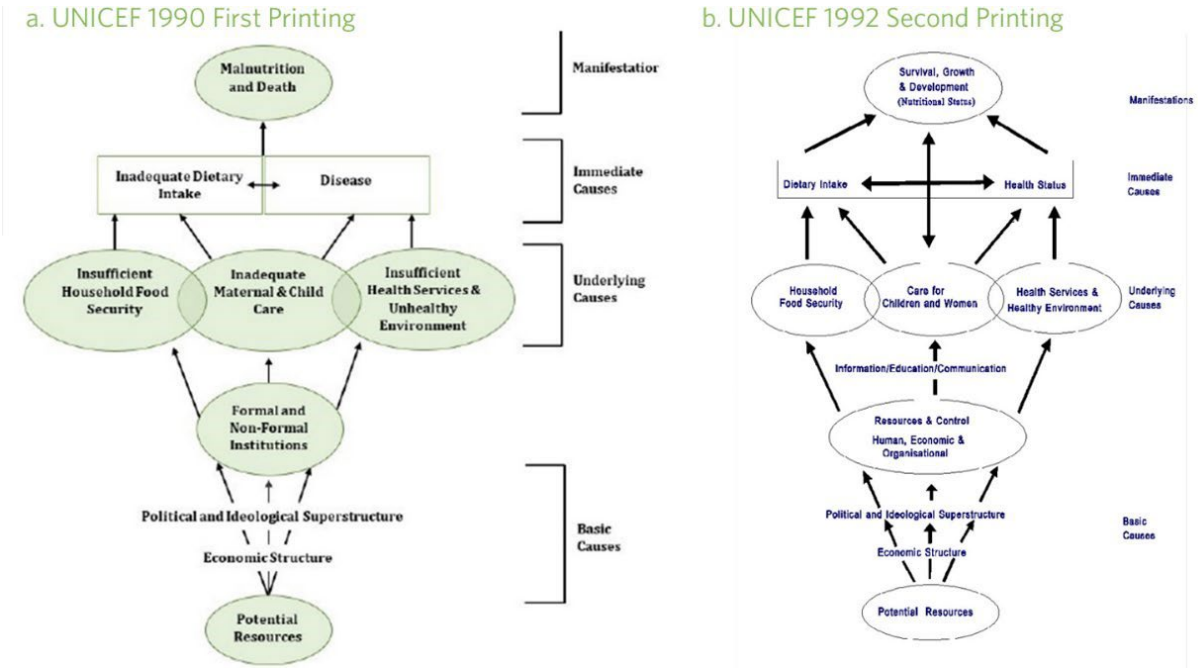


Fig. 3.1: The different versions of the UNICEF conceptual framework for understanding the causes of malnutrition.

(Source: Young, 2020, p. 9)

The primary difference between the two frameworks lies in their representation of basic causes. The 1990 framework provides a detailed and structured explanation of how resources are transformed into entitlements through various institutions and structures. This detailed depiction underscores the complexity of malnutrition's root causes and the various institutional and structural influences at play. In contrast, the 1992 framework simplifies the representation of basic causes, focusing more on resources and control. This streamlined approach aims to provide a clearer understanding of how resources impact malnutrition, making it easier to identify and address key factors without the detailed institutional and structural context.

The differences between the 1990 and 1992 frameworks have significant implications for policy and practice. The 1990 framework, with its detailed depiction of basic causes, highlights the importance of addressing the broader socio-economic and political contexts that influence malnutrition. This comprehensive approach suggests that effective interventions must consider the complex interplay of various factors and the role of institutions and structures

in transforming resources into entitlements. On the other hand, the 1992 framework offers a more streamlined and focused approach, emphasizing the control and availability of resources.

This simplification can make it easier for policymakers and practitioners to identify and address key factors impacting malnutrition. By focusing on resources and control, interventions can be more targeted and potentially more manageable, especially in contexts where detailed institutional analysis may be challenging.

However, the simplified approach of the 1992 framework may also risk overlooking the broader socio-economic and political contexts that are crucial for understanding and addressing the root causes of malnutrition. Therefore, while the 1992 framework provides clarity and focus, it is essential to balance this with the comprehensive perspective offered by the 1990 framework to ensure that interventions are both targeted and holistic.

3.2.2 UNICEF Conceptual Framework on the Determinants of Maternal and Child Nutrition (2020)

The **UNICEF 2020 Framework** marks a significant shift by expanding the analysis to include broader socio-economic, educational, and environmental factors. It introduces the concept of the triple burden of malnutrition, addressing undernutrition, micronutrient deficiencies, and overweight/obesity. The 2020 framework places greater emphasis on diet quality and care practices, recognizing their critical role in nutritional outcomes. This holistic approach reflects a deeper understanding of the multifaceted nature of malnutrition and the need for integrated interventions.

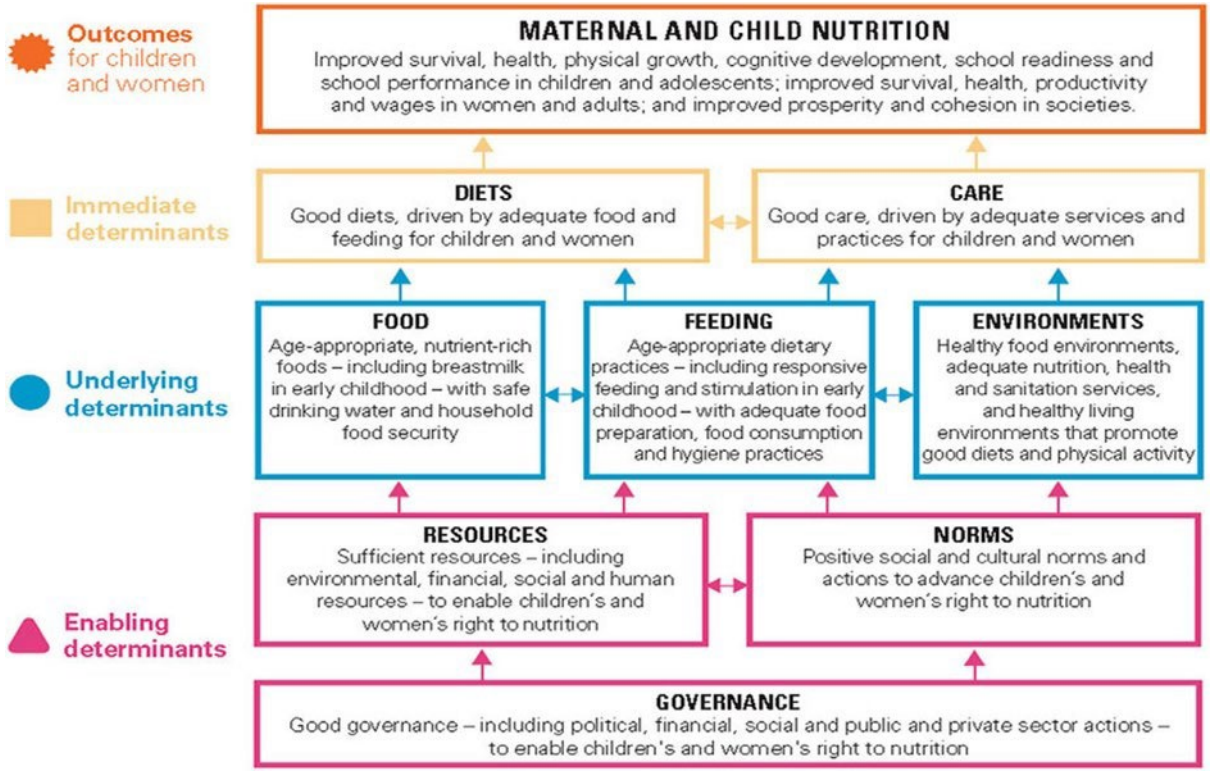


Fig 3.2: UNICEF Conceptual Framework on the Determinants of Maternal and Child Nutrition (Source: UNICEF, 2020, p. 3)

As illustrated by Figure 3.2, the framework identifies several key components. Firstly, the enabling determinants include governance, resources, and norms. Governance encompasses political, financial, social, and public/private sector actions that enable children's and women's right to nutrition. Resources refer to the environmental, financial, social, and human resources necessary for good nutrition. Norms involve positive gender, cultural, and social norms that support nutrition.

Secondly, the underlying determinants focus on food, practices, and services. Food includes age-appropriate, nutrient-rich foods, safe drinking water, and household food security. Practices involve age-appropriate feeding and dietary practices, including breastfeeding and hygiene. Services encompass adequate nutrition, health, sanitation, education, and social protection services. Thirdly, the immediate determinants are diets and care. Adequate foods and dietary practices, along with adequate services and practices supporting nutrition, are crucial for improving maternal and child nutrition outcomes.

The framework also outlines the outcomes of improved maternal and child nutrition. For children and adolescents, these outcomes include improved survival, health, physical

growth, cognitive development, school readiness, and performance. For adults and societies, the outcomes are improved survival, health, productivity, wages, prosperity, and social cohesion. The UNICEF Conceptual Framework on Maternal and Child Nutrition (2020) emphasizes the interconnectedness of these determinants and the positive outcomes resulting from improved maternal and child nutrition. It provides a comprehensive approach to preventing malnutrition in all its forms, highlighting the importance of integrated and multisectoral interventions to address the multifaceted nature of malnutrition (UNICEF, 2020).

The progression from the 1990 to the 2020 framework illustrates a shift from a detailed, institution-focused analysis to a broader, more holistic understanding of malnutrition. The 1990 framework provides a comprehensive view of the transformation of resources, while the 1992 framework simplifies this to focus on resource control. The 2020 framework builds on these foundations, addressing the triple burden of malnutrition and emphasizing the importance of diet quality and care practices. This evolution highlights the ongoing efforts to refine and improve the conceptual understanding of malnutrition to develop more effective interventions. Furthermore, it underscores the importance of adapting frameworks to incorporate new knowledge and address emerging challenges in the fight against malnutrition.

3.3. Application of the Frameworks to the Study

The three UNICEF conceptual frameworks utilized in this study - the 1990 UNICEF conceptual framework for malnutrition, the 1992 UNICEF conceptual framework for malnutrition, and the 2020 UNICEF conceptual framework on the determinants of maternal and child nutrition - provided a comprehensive foundation for investigating the prevalence of micronutrient deficiencies in foundation phase learners in the Driefontein and Kleinfontein area of Ladysmith. Specifically, the frameworks guided the examination of three key aspects: firstly, the state of micronutrient deficiencies in foundation phase learners; secondly, whether the food provided by the National School Nutrition Program in the schools aligned with the recommended dietary guidelines for children aged 5-8; and lastly, the value and quality of the food provided.

The 2020 UNICEF conceptual framework's three components - access, delivery, and outcomes - provided a structured approach to analyzing the National School Nutrition Program.

The access component helped identify factors influencing the availability and accessibility of nutritious food in schools. The delivery component examined the provision of nutrition services, including the quality of food provided and the effectiveness of the program's implementation. Finally, the outcomes component assessed the program's impact on learner nutrition and well-being, including the prevalence of micronutrient deficiencies.

The application of the three UNICEF conceptual frameworks in this study has significant implications for research, policy, and practice. By utilizing these frameworks, the study's findings on micronutrient deficiencies in foundation phase learners and the nutritional value of school meals can inform targeted interventions to address these issues. For research, the frameworks' emphasis on the interconnected factors influencing maternal and child nutrition highlights the need for interdisciplinary research approaches. Future studies can build upon this research by exploring the complex relationships between access, delivery, and outcomes in different contexts.

In terms of policy, the study's findings can inform the development of policies aimed at improving the nutritional quality of school meals. Policymakers can use the frameworks to identify areas for improvement in the delivery of nutrition services and develop targeted interventions to address micronutrient deficiencies. At the practice level, the study's results can inform the design and implementation of school-based nutrition programs. Practitioners can use the frameworks to assess the nutritional quality of school meals and develop strategies to improve the delivery of nutrition services. Additionally, the frameworks can be used to educate caregivers and parents about the importance of nutrition for child development and provide them with practical strategies for improving their children's nutritional intake.

Overall, the application of the three UNICEF conceptual frameworks in this study highlights the need for a comprehensive and multifaceted approach to addressing micronutrient deficiencies in foundation phase learners. By considering the interconnected factors influencing maternal and child nutrition, researchers, policymakers, and practitioners can work together to develop effective solutions to this complex problem.

3.4. Conclusion

This chapter unpacked the three UNICEF conceptual frameworks that underpinned the study. It began with a detailed explanation of the UNICEF Conceptual Framework for Malnutrition (1990), focusing on its identification of the immediate, underlying, and basic causes of malnutrition. The chapter then delved into the UNICEF Conceptual Framework for Malnutrition (1992), examining its simplified approach to basic causes. This section highlighted how the streamlined focus on resources and control provided clarity in understanding the impact of resources on malnutrition. Finally, the chapter explored the UNICEF Conceptual Framework on the Determinants of Maternal and Child Nutrition (2020), examining its expanded scope to include the triple burden of malnutrition. Additionally, the chapter addressed the specific issues faced in South Africa, where hunger and poverty remained pressing concerns. Through these frameworks, the chapter provided a comprehensive lens for understanding the multifaceted nature of malnutrition and its determinants, setting the stage for the subsequent analysis in the study.

Chapter 4 will describe the methodology and research design employed in the study. It will provide a detailed description of the research design, data collection methods, and analysis techniques used, along with a justification for the chosen methodology.

CHAPTER 4

Methodology Used in the Study

4.0 Introduction

As pointed out in previous chapters, despite South Africa's status as an upper-middle-income country, high rates of stunting, micronutrient deficiencies, and overnutrition persist among school-age children. These nutritional issues can lead to severe health problems, including impaired cognitive development, weakened immune systems, and increased susceptibility to infections (WHO, 2022). Furthermore, they contribute to an intergenerational cycle of poverty, malnutrition, and ill health, profoundly impacting children's physical health, cognitive development, and future economic prospects (May et al., 2020).

This research aims to investigate the current state of micronutrient deficiencies among Foundation Phase school children in the Driefontein and Kleinfontein areas, Ladysmith, KwaZulu-Natal. It seeks to answer two critical questions: ***What is the current state of micronutrient deficiencies among these children***, and ***what factors influence their nutritional micronutrient status***? The study focuses on identifying specific micronutrient deficiencies, comparing the nutritional values of school-provided meals to recommended dietary guidelines, and examining the socioeconomic, educational, and environmental factors contributing to these deficiencies. Additionally, it evaluates the effectiveness of the current school-feeding program in addressing these issues.

To achieve these objectives, the study employed a cross-sectional case study design using mixed methods. This approach was chosen to provide a comprehensive snapshot of the current state of micronutrient deficiencies and the effectiveness of the school-feeding program at a specific point in time (Zheng, 2015). The cross-sectional design allows for the simultaneous collection of data from multiple sources, facilitating a thorough analysis of the research problem (Hassan et. Al., 2014). Data were collected through dietary surveys, nutritional assessments, and qualitative interviews with various stakeholders, including cooks, suppliers, principals, and foundation phase teachers. This methodology ensured a holistic understanding

of the nutritional challenges faced by Foundation Phase school children in Driefontein and Kleinfontein and the factors influencing their micronutrient status.

The scope of this chapter includes a detailed description of the research design, data collection methods, and analysis techniques used in the study. It also provides a justification for the chosen methodology, highlighting its suitability for addressing the research questions and achieving the study's objectives. The chapter concludes with a discussion on the limitations of the study and the measures taken to mitigate potential biases and ensure the reliability and validity of the findings.

4.1 Research Design

As pointed out earlier, a cross-sectional mixed methods design is a research approach that combines both quantitative and qualitative data collection and analysis to provide a comprehensive understanding of a research problem at a single point in time. This design is particularly useful for capturing a snapshot of the current state of a phenomenon and understanding the relationships between different variables.

Cross-sectional studies are observational in nature and are known as descriptive research, not causal or relational, meaning that you can't use them to determine the cause of something. In research, establishing causality requires demonstrating that changes in one variable directly cause changes in another variable. This typically involves experimental or longitudinal study designs where variables can be manipulated, and temporal sequences can be established. In contrast, the cross-sectional design used in this study captures data at a single point in time, which is more suited to identifying correlations and associations rather than causation (Thomas, 2020). The study observes the state of micronutrient deficiencies among a specific population (Foundation Phase school children aged 5-9 years in Driefontein, Ladysmith, uThukela District) at a single point in time. This type of study is often used in medical research to assess the prevalence of a disease in a particular population.

According to Hassan et al. (2014), cross-sectional mixed methods designs are advantageous for examining health-related matters across different populations. These designs integrate quantitative and qualitative approaches to infer details about a population at a specific

moment, allowing for simultaneous data collection from multiple sources. Zheng (2015) emphasizes that cross-sectional mixed methods designs are frequently employed in health sciences to tackle intricate research questions that necessitate both numerical data and contextual insights. Zheng outlines three primary designs within this framework: convergent design, explanatory sequential design, and exploratory sequential design. Each of these designs combines quantitative and qualitative data in unique ways to offer a comprehensive perspective on the research problem.

Building on the insights from Hassan et al. (2014) and Zheng (2015), Thomas (2022) elaborates that mixed methods research leverages the advantages of both quantitative and qualitative approaches, offering a more comprehensive understanding than either method alone. In the context of cross-sectional studies, this involves gathering quantitative data to assess the prevalence and intensity of a phenomenon, while qualitative data sheds light on the underlying reasons and contextual elements.

In this study, the cross-sectional case study design using mixed methods was instrumental in examining micronutrient deficiencies among Foundation Phase school children in Driefontein and Kleinfontein. Quantitative data was gathered through dietary surveys and nutritional assessments to determine the prevalence and severity of deficiencies in key micronutrients such as iron, zinc, and vitamin A. Concurrently, qualitative data was collected through in-depth focus group interviews with various stakeholders, including cooks, suppliers, principals, and foundation phase teachers. These interviews provided valuable insights into the dietary habits, environmental factors, and the effectiveness of the school-feeding program. This comprehensive approach allowed for a detailed analysis, combining statistical data with contextual insights to offer a holistic understanding of the nutritional challenges faced by the children in these communities.

4.1.1 Data Collection Methods used in the Study

Data collection for both critical questions involved administering surveys to gather quantitative data and conducting in-depth focus groups interviews to collect qualitative data. The data was collected to answer the following two critical questions:

(i) What is the current state of micronutrient deficiencies among Foundation Phase school children in Driefontein?

- What specific micronutrient deficiencies are prevalent among these children?
- How do the nutritional values of the meals provided by the school compare to the recommended dietary guidelines for children?

(ii) What are the factors influencing the nutritional micronutrient status of these children?

- What socioeconomic, educational, and environmental factors contribute to these deficiencies?
- How effective is the current school-feeding program in addressing these micronutrient deficiencies?

The first research question in the context of a cross-sectional mixed methods study implies a thorough and multifaceted assessment of the current state of micronutrient deficiencies among Foundation Phase school children in Driefontein and Kleinfontein. The cross-sectional design provides a snapshot of the issue, while the mixed methods approach ensures a comprehensive analysis that combines objective measurements with contextual insights. This approach not only identifies the prevalence and types of deficiencies but also informs practical interventions to improve the nutritional status of the children.

The second research question, "What are the factors influencing the nutritional micronutrient status of these children?" does not inherently imply a causal relationship. Instead, it seeks to identify and understand the various factors that are associated with or contribute to the nutritional micronutrient status of the children.

4.1.1.1 Quantitative Data Collection

According to the Department of Health's (2016, p. ix) document ***Nutrition Guidelines for Early Childhood Development Centres***, the nutritional status of a person is described by using anthropometric measures, biochemical measures, a clinical examination and / or a dietary

assessment and analysis. This will show if the person has undernutrition and / or overnutrition or if they are well nourished.

In this study, nutrition focused physical examination and dietary intake data were analyzed to identify specific micronutrient deficiencies prevalent among the children. According to Ashley (2017), a nutrition-focused physical examination (NFPE) is a systematic approach used by healthcare providers, especially dietitians, to assess a patient's nutritional status by examining physical signs. This includes:

- ***Visual Inspection:*** Observing the patient's overall appearance, including muscle and fat stores.
- ***Palpation***: Feeling for muscle wasting, fat loss, and fluid accumulation (edema).
- ***Examination of Specific Areas***: Checking for signs of nutrient deficiencies in the skin, hair, nails, eyes, mouth, and other body parts.

Due to ethical considerations of working with foundation phase learners, Biochemical Analysis and the prevalence of diseases that could affect nutrient absorption and utilization were not done. In other words, no laboratory tests were done to identify specific deficiencies prevalent among the children based on Biochemical analysis.

Regarding dietary intake, School Meal Analysis in which both the selected schools' as well as the NSNP menus were reviewed and analysed for their nutritional content. This meant to compare the actual meals provided by the selected schools versus the intended meals, as provided by the NSNP menu. Detailed information on type and quantities of food consumed by the children during school hours we also gathered and compared to the NSNP. The school menus were then compared to the recommended dietary guidelines for children at Foundation Phase level.

4.1.1.1.1 Physical Examination of Foundation Phase children for micronutrient deficiencies

In the context of this study, the physical examination of Foundation Phase children for micronutrient deficiencies was categorized into five main areas: ***general appearance***, ***head and face***, ***scalp***, ***eyes***, and ***skin condition***. These categories provided a comprehensive

assessment of the children's nutritional status. General appearance was assessed to determine the overall health and nutritional status of the children. Indicators such as being well-nourished or undernourished were noted, along with signs of general health or illness. A well-nourished child typically appeared healthy, while an undernourished child showed signs of poor nutrition and health (American Society for Parenteral and Enteral Nutrition [ASPEN], 2016, p. 45).

The head and face category focused on the condition of the children's hair. Hair that was sparse, thin, discoloured, or dry indicated potential nutrient deficiencies. In contrast, hair that was thick, full, soft, manageable, and growing at a normal rate suggested good nutritional health. The presence of lustrous hair was also a positive indicator of adequate nutrition (Today's Dietitian, 2018, p. 10). The scalp was examined for cleanliness and the presence of conditions such as dandruff or ringworms. A clean scalp was a sign of good hygiene, while a dirty or injured scalp could indicate poor hygiene or underlying health issues (Freeman et al., 2019, p. 30). Eyes were assessed by examining the eyebrows, eyelids, and eyeballs. Normal eyebrows and eyelids were indicators of good health, whereas absent eyebrows or sunken eyeballs could suggest malnutrition or other health problems (Freeman et al., 2019, p. 30). Finally, the skin condition was evaluated for colour, texture, and hydration. Normal skin colour and smooth texture were signs of good health. In contrast, yellow-orange discoloration, hypopigmentation, dry skin, excessive moisture, rashes, acne, wounds, or roughness indicated potential nutritional deficiencies or skin conditions (Today's Dietitian, 2018, p. 12).

The rationale, for the physical examination of Foundation Phase children for micronutrient deficiencies in this study, was informed by several key references, each providing detailed guidelines and visual tools for assessing nutritional status through physical examinations. The "Micronutrient Exam: Clinical Interpretation of Nutrition Focused Physical Exam Findings" by Today's Dietitian (2018) provides a comprehensive overview of signs and possible nutrition-related causes for various physical conditions. For instance, it details how hair that is thin, sparse, or discoloured can indicate deficiencies in iron, zinc, or protein (p. 10). This reference was particularly useful for the head and face category in the study, where hair condition was assessed for signs of nutrient deficiencies.

The "Nutrition-Focused Physical Exam: An Illustrated Handbook" by the American Society for Parenteral and Enteral Nutrition (ASPEN) offers practical techniques and tips for conducting thorough nutrition-focused physical exams. It includes pictorial representations of muscle and fat depletion, vitamin and mineral losses, and fluid balance (p. 45). This handbook

informed the general appearance and skin condition categories, providing criteria for assessing overall health, skin texture, and hydration.

The “Practitioner’s Guide to Nutrition-Focused Physical Exam of Infants, Children, and Adolescents” by Freeman et al. (2019), focuses on the early identification and prevention of paediatric malnutrition. It provides detailed explanations of head-to-toe physical exams, including muscle wasting, fat stores, and potential signs of micronutrient deficiencies (p. 30). This guide was instrumental in shaping the scalp and eyes categories, offering insights into assessing scalp cleanliness and eye conditions as indicators of nutritional status.

By integrating these references, the study was able to systematically categorize and document signs of micronutrient deficiencies among the children, ensuring a comprehensive assessment of their nutritional status.

4.1.1.1.2 Analysis of Meals by selected schools and the NSNP Menu

This process began with obtaining the weekly menus from the two schools involved in the study. These menus provided detailed information on the meals served each day, including the ingredients and portion sizes used. Once the menus were collected, the next step involved conducting a nutritional content assessment. Nutritional analysis software, such as *Fatsecret.co.za*; *Nutritionix.com* and *Eatthismuch.com*, were used to calculate the nutritional content of each meal. This analysis included macronutrients like carbohydrates, proteins, and fats, as well as micronutrients such as vitamins and minerals.

4.1.1.1.3 Comparative Analysis of Schools A & B’s Menu against NSNP Menu

With the nutritional content data in hand, the next phase involved comparing these values to the standards set by the NSNP. The NSNP guidelines specifies the required nutrient levels and portion sizes for school meals. By comparing the nutritional content of the school-provided meals to these standards, any discrepancies or areas where the meals met or fell short of the guidelines were identified. In addition to the NSNP comparison, it was crucial to compare the nutritional content of the school meals to the recommended dietary guidelines for children.

These guidelines outlined the daily nutrient requirements for different age groups. By assessing whether the school meals provided adequate nutrients to meet these daily requirements, the study determined if the meals were nutritionally sufficient for the children.

4.1.1.1.4 Comparative Analysis of Schools A & B's Menu as well as NSNP Menu against the South African Food-Based Dietary Guidelines (FBDGs)

The process began with obtaining the weekly menus from the two schools involved in the study. These menus provided detailed information on the meals served each day, including the ingredients and portion sizes. Once the menus were collected, a nutritional content assessment was conducted using nutritional analysis software, such as *Fatsecret.co.za*; *Nutritionix.com* and *Eatthismuch.com*, to calculate the nutritional content of each meal. This analysis included macronutrients like carbohydrates, proteins, and fats, as well as micronutrients such as vitamins and minerals.

With the nutritional content data in hand, the next phase involved comparing these values to the standards set by the NSNP. The NSNP guidelines specify the required nutrient levels and portion sizes for school meals. By comparing the nutritional content of the school-provided meals to these standards, any discrepancies or areas where the meals met or fell short of the guidelines were identified. Additionally, it was crucial to compare the nutritional content of the school meals to the recommended dietary guidelines for children. These guidelines outline the daily nutrient requirements for different age groups. By assessing whether the school meals provided adequate nutrients to meet these daily requirements, the study determined if the meals were nutritionally sufficient for the children.

4.1.1.2 Qualitative Data Collection

The qualitative data set consisted of largely focus group discussions (FGDs) complemented by observations. FGDs were conducted with foundation phase teachers, principals, cooks and food suppliers to gather in-depth information on micronutrient deficiencies in school feeding programmes. In this regard, the stakeholders were asked questions that aimed to explore the multifaceted issue of malnutrition among school children, particularly focusing on its causes,

impacts, and potential solutions within the school environment. Nutrient deficiencies directly contribute to undernutrition and micronutrient-related malnutrition. To comprehensively explore these issues, several key questions were posed to gather relevant data and insights, and these formed the basis of the focus group protocol (see Appendix 9).

- *What do you understand by the term malnutrition or lack of nutritious food?*
- *Based on your knowledge, what causes malnutrition in school children? In other words, what causes them not to get nutritious food?*
- *What can the school do to prevent malnutrition?*
- *Is there a garden at the school?*
- *Do the children get fruits?*
- *How do you think malnutrition affects the learning process and growth of a student?*
- *What do you think about the current feeding scheme? Is it a good initiative or not?*
- *Have you ever had a problem with a malnourished student?*
    - *If, so, expand.*
    - *If not, what would you do if it happened, how would you help that student?*
- *If you had the opportunity to speak to the gov, founders or managers of the feeding scheme what would you like them to improve?*
- *Do you ever attend workshops? If so, what are they about?*

4.1.1.2.1 Rationale behind Key Issues Addressed by the Focus Group Protocol Questions

4.1.1.2.1.1 Understanding Malnutrition

The term malnutrition, or lack of nutritious food, is central to this study. It encompasses both undernutrition, where children do not receive enough essential nutrients, and overnutrition, where they consume excessive unhealthy foods. Understanding this concept is crucial for identifying the specific micronutrient deficiencies prevalent among the children in Driefontein and Kleinfontein.

4.1.1.2.1.2 Causes of Malnutrition in School Children

To determine the causes of malnutrition, questions were asked about the factors that prevent children from getting nutritious food. These include:

- **Socioeconomic Factors**: Poverty and limited access to nutritious food are significant contributors.
- **Educational Factors**: Lack of knowledge about proper nutrition among parents and caregivers can lead to poor dietary choices.
- **Environmental Factors**: The availability of fresh produce and healthy food options in the community plays a vital role.

These were in line with the UNICEF conceptual framework for malnutrition (UNICEF, 1990, 1992).

4.1.1.2.1.3 Preventing Malnutrition in Schools

Schools have a pivotal role in preventing malnutrition. Questions about what schools can do to address this issue were aimed at identifying effective strategies, such as:

- Implementing comprehensive school-feeding programmes that provide balanced and nutritious meals.
- Educating children and parents about healthy eating habits.
- Establishing school gardens to grow fresh fruits and vegetables, enhancing the availability of nutritious food.

4.1.1.2.1.4 School Garden and Fruit Availability

The presence of a school garden and the regular provision of fruits were explored to understand their impact on the children's nutritional status. These initiatives can significantly contribute to meeting the children's dietary needs and promoting healthy eating habits.

4.1.1.2.1.5 Impact of Malnutrition on Learning and Growth

As discussed in the literature review, malnutrition has profound effects on both the learning process and physical growth of students. Questions about how malnutrition affects students aimed to highlight its impact on cognitive development, concentration, academic performance, and physical health, including stunted growth and weakened immune systems.

4.1.1.2.1.6 Current Feeding Scheme

Evaluating the current feeding scheme was essential to understand its effectiveness in addressing micronutrient deficiencies. Questions about the feeding scheme sought to gather opinions on its nutritional quality, variety, and overall impact on the children's health.

4.1.1.2.1.7 Dealing with Malnourished Students

Teachers and school staff may encounter malnourished students. Questions about their experiences and responses to such situations aimed to identify immediate and long-term strategies for providing nutritional support and ensuring consistent access to nutritious food.

4.1.1.2.1.8 Suggestions for Improvement

If given the opportunity to speak to the government or managers of the feeding scheme, respondents were asked what improvements they would suggest. This aimed to gather practical recommendations for enhancing the nutritional quality and effectiveness of the feeding program.

4.1.1.2.1.9 Workshops and Training

Attending workshops on nutrition, health, and child development can equip school staff with the knowledge and skills needed to effectively address malnutrition. Questions about workshop attendance aimed to understand the availability and content of such training programmes.

By addressing these key issues, the study seeks to provide a comprehensive understanding of the current state of micronutrient deficiencies among Foundation Phase school children in Driefontein and Kleinfontein as well as the factors influencing their nutritional status. This narrative approach ensures that the data collected is relevant and directly contributes to answering the critical questions of the study.

4.1.1.3 Sampling

The sampling process began with defining the target population, which included Foundation Phase school children in Driefontein, and school staff. The sample consisted of two schools from the Driefontein and Kleinfontein areas in Ladysmith, uThukela District in KwaZulu-Natal: School A and School B, which are quintile 1 and 2 schools, respectively. Most of the children (90%) were from low-income households, and 100% were enrolled in the school feeding program.

A stratified sampling method was used to ensure that the sample was representative of the diverse stakeholder groups involved in the school-feeding program. Stratified sampling involves dividing the population into distinct subgroups (strata) and then randomly selecting samples from each stratum (Thomas, 2020). This method was chosen for several reasons. Firstly, it ensured the representation of diverse stakeholders, including cooks, suppliers, principals, foundation teachers, and students, providing a comprehensive view of the research problem (McBride et al., 2019). Secondly, it enhanced the accuracy and precision of the findings by reducing sampling bias and ensuring that the results were reflective of the entire population (Pluye, 2013). Lastly, it facilitated comparative analysis by allowing for the comparison of responses across different stakeholder groups, contributing to a more nuanced understanding of the factors influencing micronutrient deficiencies and the effectiveness of the school-feeding program.

As illustrated in Fig. 4.1, in School A, the sample consisted of one male principal, four female Foundation Phase educators (inclusive of one female Nutrition advisor or coordinator), two female cooks (food handlers), one male food supplier, and fifteen Foundation Phase school children. In School B, the sample consisted of one male principal, one female Nutrition advisor or coordinator, three female Foundation Phase educators, two female cooks (food handlers), one male food supplier, and fifteen Foundation Phase school children. The children were aged

between 6 and 9 years, with a mean age of 7.5 years. The sample included five boys (33%) and ten girls (67%) in School A, and seven boys (47%) and eight girls (53%) in School B.

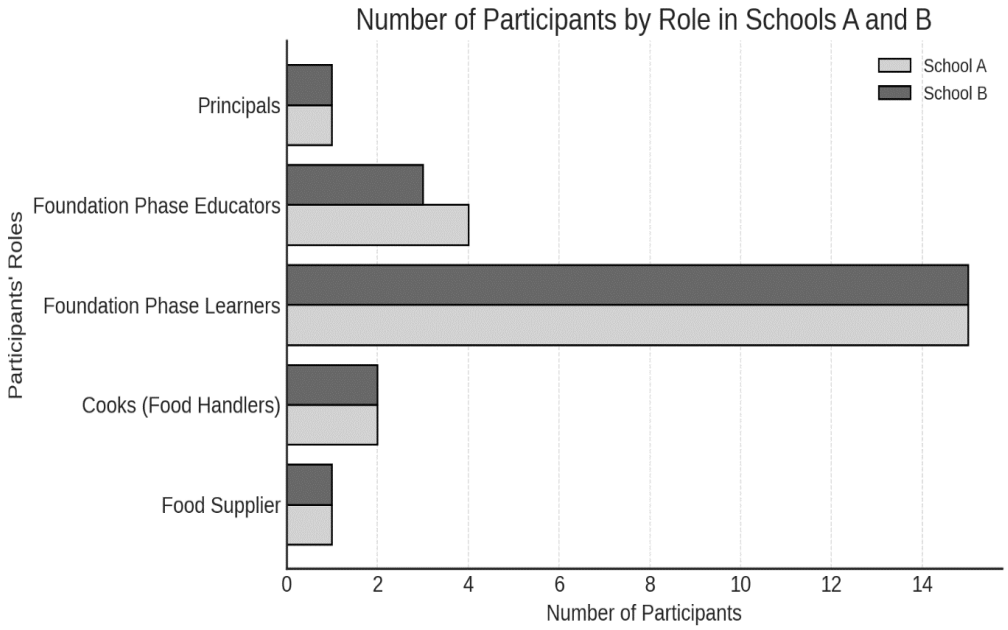


Figure 4.1: Participants demographic by Stakeholders Group

By employing a stratified sampling method, the study ensured that the sample was representative, the findings were accurate and precise, and the data collected allowed for meaningful comparisons across different stakeholder groups. This approach was instrumental in addressing the critical questions of the study and providing actionable insights into improving the nutritional status of school children in Driefontein and Kleinfontein.

4.1.1.3.1 Impacts of Sampling Method

The use of stratified sampling in this study has several important impacts on the results:

(i) Representation of Diverse Stakeholders:

By ensuring that various stakeholder groups, such as principals, teachers, nutrition advisors, cooks, food suppliers, and students, are adequately represented, the study captures a comprehensive view of the research problem. This diversity in the sample allows for a more

holistic understanding of the current state of micronutrient deficiencies and the factors influencing them.

(ii) Enhanced Accuracy and Precision:

Stratified sampling increases the accuracy and precision of the findings by reducing sampling bias. Each subgroup within the population is proportionately represented, ensuring that the results are reflective of the entire population. This is particularly important in identifying specific micronutrient deficiencies and evaluating the nutritional values of school meals.

(iii)Facilitation of Comparative Analysis:

The ability to compare responses across different stakeholder groups is a significant advantage of stratified sampling. This facilitates the identification of common trends, patterns, and differences in perspectives, contributing to a more nuanced understanding of the factors influencing micronutrient deficiencies and the effectiveness of the school-feeding program. For example, comparing the views across different stakeholder groups on the nutritional status of children provides insights into both the school environment and community practices.

(iv) Depth and Richness of Data:

The inclusion of both quantitative and qualitative data collection methods ensures that the study captures both the breadth and depth of the research problem. Quantitative data provide measurable evidence of micronutrient deficiencies, while qualitative data offer detailed insights into the experiences and perspectives of different stakeholders.

4.1.1.3.2 Analysis techniques used in the study

The analytical methods and tools used for both the quantitative and qualitative aspects of the research were carefully selected to ensure a comprehensive understanding of the nutritional status and influencing factors.

4.1.1.3.2.1 Quantitative Analysis

The quantitative analysis aimed to identify specific micronutrient deficiencies and compare the nutritional values of school-provided meals to the National School Nutrition Programme (NSNP) and recommended dietary guidelines. The following analytical tools and methods were employed:

- ***Anthropometric Measurements:***

The physical examination of Foundation Phase children was conducted to assess their nutritional status. This provided an overview of the general nutritional status of the children, highlighting any signs of undernutrition or malnutrition.

- ***Nutritional Content Analysis:***

The nutritional content of the school-provided meals was analyzed using nutritional analysis software (*Fatsecret.co.za*; *Nutritionix.com* and *Eatthismuch.com*). This software calculated the macronutrient and micronutrient content of each meal. The results were then compared to the NSNP standards and recommended dietary guidelines to identify any discrepancies.

4.1.1.3.2.2 Qualitative Analysis

The qualitative analysis aimed to explore the factors influencing the nutritional micronutrient status of the children and the effectiveness of the school-feeding program. The analysis was guided by the UNICEF conceptual frameworks of 1990, 1992, and 2020, which provided a structured approach to understanding the underlying causes of malnutrition. The following methods were used:

- ***Thematic Analysis:***

The qualitative data from focus group discussions (FGDs) and interviews were transcribed and coded to identify recurring themes and patterns. The UNICEF conceptual frameworks guided the coding process, focusing on immediate, underlying, and basic causes of malnutrition. Themes related to dietary intake, health status, and the effectiveness of the school-feeding program were identified and analyzed.

- ***Triangulation:***

To enhance the validity and reliability of the findings, triangulation was employed. This involved cross verifying the data from different sources, such as comparing the themes identified in the FGDs with the observations made during school visits. Triangulation ensured that the findings were consistent and robust.

- ***Narrative Analysis:***

Narrative analysis was used to construct detailed accounts of individual experiences and perspectives. This method provided a deeper understanding of the personal and contextual factors influencing the children's nutritional status. Narratives from parents and teachers highlighted the challenges and successes of the school-feeding program.

4.1.1.3.2.3 Integration of Quantitative and Qualitative Data

The final step in the analysis involved integrating the quantitative and qualitative data to provide a comprehensive understanding of the research questions. This mixed methods approach allowed for the identification of patterns and relationships in the quantitative data, while the qualitative data provided context and depth to these findings. For example, the quantitative analysis might reveal a significant association between low socioeconomic status

and micronutrient deficiencies, while the qualitative data could explain the underlying reasons for this association, such as limited access to nutritious food.

By employing these analysis methods, the study was able to provide a detailed and nuanced understanding of the current state of micronutrient deficiencies among Foundation Phase school children in Driefontein and Kleinfontein, and the factors influencing their nutritional status. This comprehensive approach ensured that the findings were both reliable and actionable, contributing to the development of effective interventions and policies to improve child nutrition.

4.1.1.4 Data editing and coding procedures

During the data editing process, I carefully reviewed my transcripts for errors, ensuring that all data was accounted for and properly labelled. Each recording was named according to the specific participant or group being interviewed, allowing for easy identification and organization. I also removed any unnecessary or redundant data to maintain the integrity of my findings. In the data coding phase, I identified patterns and themes within my data, grouping related information into distinct categories. Although I didn't employ a specific coding framework, I utilized the UNICEF conceptual framework as the foundation for my analysis and interpretation. This framework provided a structured approach to understanding my data and drawing meaningful conclusions.

To minimize errors and ensure the accuracy of my findings, I employed several strategies. Firstly, I ensured transcription accuracy by having multiple individuals transcribe the same data. Although I initially attempted to use transcription software, I found that the results were inaccurate, particularly for recordings in Zulu. Therefore, I relied on manual transcription to ensure the highest level of accuracy. In addition to transcription accuracy, I conducted data validation by reviewing my field notes, recordings, and supporting materials to ensure consistency and accuracy. Furthermore, I engaged in member checking, returning to participants to verify the accuracy of my findings and ensure that their voices were represented. This step was crucial in maintaining the trust and integrity of my research.

I also participated in peer debriefing, discussing my findings with my supervisor and fellow peers to gain new insights and ensure that my conclusions were grounded in the data.

This collaborative approach allowed me to refine my analysis and increase the validity of my results. Throughout the research process, I maintained a detailed record of all data collection, editing, and coding procedures, ensuring transparency and accountability. Finally, to countercheck my findings, guided by my supervisor, I employed triangulation, using multiple data sources and methods to verify the accuracy of my results. This approach increased my confidence in the findings and provided a more comprehensive understanding of the research topic. By incorporating these various strategies, I was able to ensure the reliability and validity of my research findings.

4.1.1.5 Ethical Considerations

Ethical considerations were crucial in conducting this study. To ensure ethical and responsible research, I applied for ethical clearance from the University of KwaZulu-Natal (UKZN) Ethics Committee, with protocol reference number **HSSREC/00007016/2024** (see Appendix 1). This process involved submitting my research proposal and protocols for review and approval. The ethical clearance ensured that my research met the required standards and protected the rights and dignity of participants.

Following UKZN's approval, I requested permission from the Department of Education, KwaZulu-Natal (KZN), to conduct the study in their schools. Upon receiving permission (see Appendix 2), I proceeded with the next steps. To maintain participant anonymity, pseudonyms were used for all stakeholders, including school principals, Foundation Phase teachers, cooks, food suppliers, and nutrition educators.

At the school level, I obtained permission from the principals of both School A and School B. This involved providing detailed information about the research, including its purpose, methods, and potential benefits. The principals signed consent letters (see appendix 3), indicating their agreement to participate. I also ensured that parents or guardians signed consent letters (see Appendix 4), granting permission for their children to participate. Other participants signed consent letters (see Appendix 5) to indicate their agreement. Additionally, I obtained assent from the learners themselves (see Appendix 6) by explaining the research in an understandable way and obtaining their signatures on a child assent form.

Throughout the data collection process, I respected the rights and dignity of participants. This included maintaining confidentiality, ensuring voluntary participation, and being sensitive to their needs and concerns.

4.1.1.6 Limitations of the Study

Overall, the stratified sampling method used in this study ensures that the results are comprehensive, accurate, and reflective of the diverse factors influencing micronutrient deficiencies among Foundation Phase school children in Driefontein. This approach provides actionable insights that can inform interventions and policies aimed at improving the nutritional status of school children. While the study employed a stratified sampling method to ensure representation of diverse stakeholder groups, the relatively small sample size does pose some limitations regarding the generalizability of the findings. Here are a few considerations:

- ***Sample Size and Representation:***

Although the sample included a diverse range of participants from different roles within the school system, the small numbers may limit the extent to which the findings can be generalized to a broader population. The study's results are more reflective of the specific context of the two schools in Driefontein and Kleinfontein.

- ***Context-Specific Insights:***

The findings provide valuable insights into the micronutrient deficiencies and influencing factors within the specific context of these schools. However, variations in socioeconomic, educational, and environmental factors across different regions may affect the applicability of these results to other settings.

- ***Qualitative Depth:***

The qualitative data collected through interviews and focus groups offer in-depth understanding and rich contextual information. While these insights are valuable, they are inherently context-specific and may not be easily generalizable.

- ***Quantitative Data Limitations:***

The quantitative data, while providing measurable evidence of micronutrient deficiencies, is based on a small sample size. This limits the statistical power and the ability to generalize the findings to a larger population.

Despite these limitations, the study's methodology and findings can still inform similar research in other contexts. The identified trends, patterns, and factors influencing micronutrient deficiencies can serve as a basis for further studies with larger sample sizes and different settings. While the small sample size limits the generalizability of the findings, the study provides valuable context-specific insights that can inform future research and interventions aimed at improving the nutritional status of school children in similar environments.

4.2 Conclusion

This chapter has detailed the research design, data collection methods, and analysis techniques used in this cross-sectional mixed-method study. The chosen methodology was justified as suitable for addressing the research questions and achieving the study's objectives. The chapter also acknowledged the study's limitations and outlined measures to mitigate potential biases, ensuring the reliability and validity of the findings.

The methods of data collection within the cross-sectional mixed-method design elicited several key themes related to micronutrient deficiencies among Foundation Phase school children in Driefontein and Kleinfontein. This approach provided a comprehensive understanding of the nutritional status and the factors influencing it within the specific context

of this study. The insights gained are crucial for developing effective interventions and policies to improve child nutrition within the context of the study.

In the following chapter, we will present the main trends, patterns, and connections that emerged from these themes, providing a deeper understanding of the study's findings within the context of the cross-sectional data collected.

CHAPTER 5

Data Presentation, Analysis, and Interpretation

5.0 Introduction

The purpose of this chapter is to present the findings of the study, which aimed to assess the current state of micronutrient deficiencies among Foundation Phase school children in the Driefontein and Kleinfontein areas in Ladysmith, KwaZulu-Natal. Additionally, the chapter identifies the factors influencing their nutritional micronutrient status. The study was guided by the following two critical questions.

(i) What is the current state of micronutrient deficiencies among Foundation Phase school children in Driefontein?

- What specific micronutrient deficiencies are prevalent among these children?
- What is the nutritional value of the meals provided by the schools?
- How do these nutritional values compare to the recommended dietary guidelines for children?

(i) What are the factors influencing the nutritional micronutrient status of these children?

- What socioeconomic, educational, and environmental factors contribute to these deficiencies?
- How effective is the current school-feeding program in addressing these micronutrient deficiencies?

This chapter is organized into four main sections. The first section describes the actual sample and its characteristics, providing a detailed overview of the participants involved in the study. The second section summarizes the main results, highlighting the key findings related to micronutrient deficiencies and the nutritional content of the school meals. The third section discusses the main trends, patterns, and connections that emerged from the data, offering insights into the broader implications of the results. Finally, the chapter concludes with a

summary of the main results, addressing the specific research questions posed at the outset of the study. By systematically presenting the findings, this chapter aims to provide a comprehensive understanding of the nutritional challenges faced by young children in the Driefontein area and to inform potential interventions to improve their dietary intake and overall health.

5.1. Demographic Information

As discussed in Chapter 4, in School A, the sample consisted of two schools from the Driefontein and Kleinfontein areas in Ladysmith, uThukela District in KwaZulu-Natal: School A and School B of which are quintile 1 and 2 schools, respectively. As illustrated in Figure 5.1, in School A, the sample consisted of one male principal, four female Foundation Phase educators (inclusive of one female Nutrition advisor or coordinator), two female cooks (food handlers), one male food supplier, and fifteen Foundation Phase school children. In School B, the sample consisted of one male principal, one female Nutrition advisor or coordinator, three female Foundation Phase educators, two female cooks (food handlers), one male food supplier, and fifteen Foundation Phase school children. The children were aged between 6 and 9 years, with a mean age of 7.5 years. The sample included five boys (33%) and ten girls (67%) in School A, and seven boys (47%) and eight girls (53%) in School B.

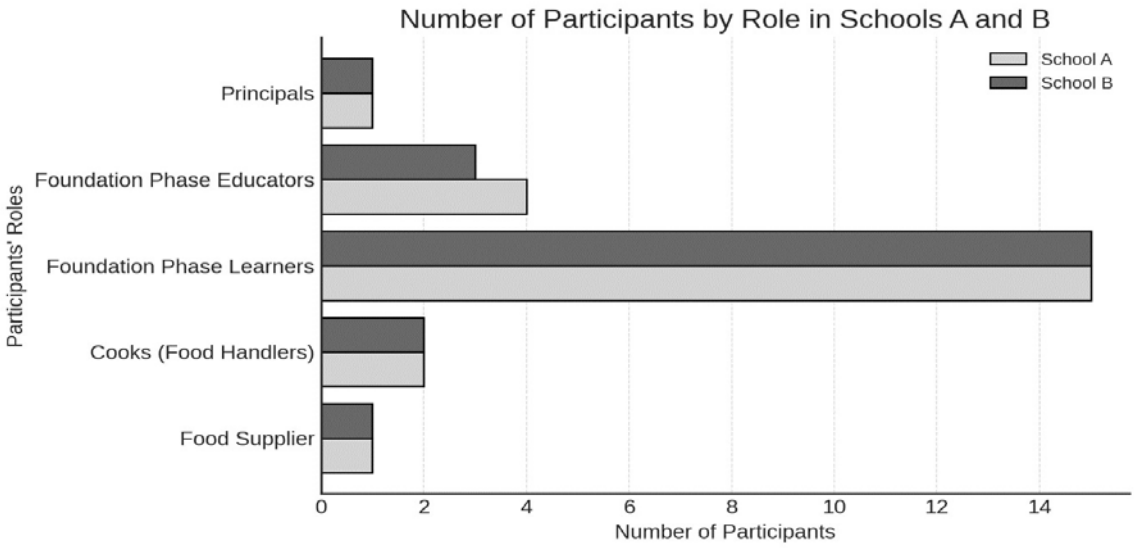


Fig. 5.1: Participants' demographic by Stakeholders Group

To evaluate the specific micronutrient deficiencies prevalent, physical examination of Foundation Phase children for micronutrient deficiencies were conducted. The examination focused on these five main areas: general appearance, head and face, scalp, eyes, and skin condition. and how do the nutritional values of the meals provided by the schools compare to the recommended dietary guidelines for children?

To assess the nutritional value of meals provided by the school feeding program, weekly menus from the two schools involved in the study were accessed. In addition, observations of meal provisions and nutrient intake were conducted. This involved observing meal serving sizes, food variety, and learner consumption patterns throughout the week. Again, FGDs were conducted to explore stakeholders' perceptions and experiences related to school nutrition programmes.

To compare meals the meals provided by the school to recommended dietary guidelines for children, the provincial menu and Schools Meal Plan were examined. The dietary guidelines of the Public Health England - Government Dietary Recommendations, The South African Food-Based Dietary Guidelines (FBDGs) and UNICEF served as benchmarks for assessing nutritional quality. Key considerations for the quantitative analysis included vitamins, macro and micro-nutrient balance and food variety. Data analysis for the qualitative analysis employed thematic analysis and content analysis. The analysis was guided by the UNICEF conceptual frameworks of 1990, 1992, and 2020, which provided a structured approach to understanding the underlying causes of malnutrition.

To evaluate the effectiveness of the current school-feeding program in addressing these micronutrient deficiencies focus group interviews were held with the various stakeholders. Through the FGDs, stakeholders shared their views on micronutrient deficiencies, meal planning and preparation, supplying of food, and barriers to providing nutritious meals. Their input highlighted the complexities surrounding school meal provision and the need for integrated solutions.

5.2 Description & Summary of Research Questions

As mentioned earlier, this research study is about the assessment of micronutrient deficiencies and the evaluation of the nutritional value of school meals in comparison to dietary guidelines.

5.2.1 Micronutrient Deficiencies as Determined by Physical Examination of Foundation Phase Children

The sample of Foundation Phase school children in the Driefontein and Kleinfontein areas reveal that in School A, approximately all of learners appeared well-nourished and healthy, with all having thick, full, and lustrous hair. Scalp health was generally good, with 87% (26/30) of learners having clean scalps, although learners like L1 from Grade 1, L2 from Grade 1, L7 from Grade 1 and L10 from Grade 2 (13%) had dandruff and ringworms. Eye health was normal in approximately all the learners, and skin condition was normal in 92% (27/30), with learners like L1 from Grade 1, L10 from Grade 2 and L15 from Grade 3(8%) showing signs of dry skin and roughness.

In contrast, School B had a slightly higher percentage of well-nourished learners. Approximately 97% (29/30) of learners had thick and lustrous hair, while learners like L20 from Grade 3 (3%) showed signs of sparse, thin, and discoloured hair, indicating a higher prevalence of micronutrient deficiencies. Scalp health was generally good, with 97% (29/30) of learners having clean scalps, although learners like L20 from Grade 3 had dandruff and ringworms. Eye health was normal in 97% (29/30) of learners, and skin condition was also normal in 97% (29/30), with learners like L20 from Grade 3 showing signs of hypopigmentation and discoloured eyes. These findings suggest that while the health and wellbeing of the learners in both schools are generally good, there are areas that need attention to ensure that all learners receive the necessary nutrients and care to support their growth and development.

Micronutrient deficiencies can often be hidden or silent, not manifesting in overt physical symptoms until they reach advanced stages (Mlambo et al., 2017). The normal appearance of learners does not necessarily reflect their true micronutrient status. Research has shown that deficiencies in essential nutrients such as vitamin A, iron, and zinc can exist without

obvious clinical signs (WHO, 2018, p.12). Therefore, relying solely on physical examinations to establish micronutrient deficiencies might not be sufficient. This underscores the importance of evaluating the meal plans of schools and the NSNP to ensure that children receive adequate nutrition and to identify potential gaps in their diets.

5.2.1.1 Nutritional Value of Meals

For assessing the nutritional value of the school meals, Nutritional analysis software, such as *Fatsecret.co.za*; *Nutritionix.com* and *Eatthismuch.com*, were used to calculate the nutritional content of each meal based on ingredient lists and portion sizes. The dietary assessments revealed that most meals provided to learners were high in starch and low in essential micronutrients. Specifically, meals lacked adequate amounts of vitamin A, iron, and zinc, crucial for cognitive development and immune function (see Tables 5.3 and 5.4). Observations of school meal provision confirmed these findings, highlighting inadequate food variety. Meals often consisted of refined grains, such as rice, with limited inclusion of fruits, vegetables, and lean protein sources.

5.2.1.2 Comparison to Dietary Guidelines

Results revealed that the provincial menu aligned more closely with dietary guidelines, incorporating essential food groups and nutrients. In contrast, the Schools Meal Plan showed significant gaps. Notably, the Schools Meal Plan lacked adequate servings of fruits, vegetables, and whole grains, potentially contributing to micronutrient deficiencies among learners.

5.2.2 Factors Contributing to Dietary Deficiencies

5.2.2.1 Socioeconomic, educational, and environmental factors

The study analyzed stakeholder responses to identify the causes of malnutrition among school children in Driefontein and Kleinfontein. Four key themes emerged: Socioeconomic

Constraints, Lack of Nutritional Balance, Parental and Caregiver Influence, and Nutritional Education and Awareness.

Socioeconomic Constraints was the most prominent theme, with 33% (5 out of 15) of participants citing poverty, limited access to nutritious food, and unstable employment as major contributors to malnutrition. Lack of Nutritional Balance was also significant, with 27% (4 out of 15) of participants highlighting the importance of a balanced diet and the need for essential nutrients. Parental and Caregiver Influence and Nutritional Education and Awareness were also identified as critical factors, with 20% (3 out of 15) and 13% (2 out of 15) of participants contributing to these themes, respectively. The findings underscore the need for a multifaceted approach to address malnutrition, involving proper food provision, balanced diets, and comprehensive nutritional education.

5.2.2.2. Effectiveness of Current School-feeding Program in Addressing Micronutrient Deficiencies

The current school feeding scheme is widely supported by participants, who recognize its importance in providing at least one meal a day to children, particularly those from low socioeconomic backgrounds. The scheme is seen to have a positive impact on concentration and learning. However, concerns were raised about the adequacy and balance of the meals provided. Some participants suggested that the portion sizes are too small, and the meals lack variety and nutritional value. The need for improvement was highlighted by several participants. Key themes that emerged from the analysis include support for the feeding scheme, its impact on concentration and learning, the need for improvement, and nutritional value.

5.3 Presentation of the Results to Research Question 1:

- *What is the current state of micronutrient deficiencies among the Foundation Phase school children in the Driefontein and Kleinfontein areas, Ladysmith KwaZulu-Natal?*

In other words, we ask the questions:

- What specific micronutrient deficiencies are prevalent among these children?
    - As per the physical examinations.
    - As per the School Menus.
- How do the nutritional values of the meals provided by the selected schools compare to the NSNP Menu and the recommended dietary guidelines for children?

5.3.1 Results to Research Question 1(a)

5.3.1.1 School A Results

Table 5.1: Physical Assessment of Foundation Phase Learners (Grades 1 to 3)

Category	Grade 1 School A		Grade 2 School A		Grade 3 School A		
	Boys	Girls	Boys	Girls	Boys	Girls	Total
	2	3	2	3	1	4	15
General							
Appearance							
Well Nourished	L1, L2	L3, L11	L6, L7, L8	L9, L10, L15	L5 L4	L12, L13, L14,	
Under Nourished							
	L3,				L12, L13,14,		

Healthy	L1, L2	L6, L7, L8		L9,10, L11	L5	
			L4			L15
Unhealthy						

Head & Face						
Hair						
Sparse and thin						
			L3, L4	L9, L10, L11		L12, L13, L14,
Thick and Full	L1, L2	L6, L7, L8			L5	
						L15
Discoloured						
Dry hair						
Soft and manageable			L3, L4	L9, L10, L11		L12, L13,14,
	L1, L2	L6, L7, L8			L5	
						L15
Growing at a normal			L3, L4	L9, L10, L11		L12, L13,14,
rate	L1, L2	L6, L7, L8			L5	
						L15
			L3, L4	L9, L10, L11		L12, L13,14,
Lustrous	L1, L2	L6, L7, L8			L5	
						L15

Scalp						
Dandruff	L1					
Ringworms	L2	L7		L10		
			L3, L4			L12, L13, L14,
Clean		L6, L8		L9, L11	L5	
						L15
Dirty	L1	L7		L10		
Injured						

Eyes						
Normal Eyebrows	L1, L2	L6, L7, L8	L3, L4	L9, L10, L11	L5	L12, L13, L14, L15
Absent Eyebrows						
Normal Eyelids	L1, L2	L6, L7, L8	L3, L4	L9, L10, L11	L5	L12, L13, L14, L15
Sunken eyeballs						
Normal Eyeballs	L1, L2	L6, L7, L8	L3, L4	L9, L10, L11	L5	L12, L13, L14, L15
Skin Condition						
Yellow- Orange (Discolouration)						
Hypopigmentation						
Normal skin colour	L1, L2	L6, L7, L8	L3, L4	L9, L10, L11	L5	L12, L13, L14, L15
Texture						
Smooth	L2	L6, L7, L8	L3	L9	L5	L12, L13,14
Dry						
Excessive moisture						
Hydration	L1, L2	L6, L7, L8	L3, L4	L9, L10, L11	L5	L12, L13, L14, L15
Rash/ Acne			L4	L11		
Wounds/ Roughness	L1			L10		L15

In School A, the general appearance of the learners from Grades 1 to 3 indicates that the majority are well-nourished and healthy. This suggests that their nutritional needs are largely being met, which is a positive sign for their overall well-being. The condition of their hair further supports this observation, as most learners have thick, full, soft, manageable, and lustrous hair. These characteristics are indicative of good nutrition and overall health. However, there are isolated cases of sparse and thin hair, such as in Learner L2 from Grade 1, which may point to mild micronutrient deficiencies that need to be addressed.

The scalp health of the learners in School A is predominantly good, with clean scalps being the norm. Nonetheless, there are occasional instances of dandruff and ringworms, particularly in Learner L1 from Grade 1 and Learner L7 from Grade 2. These issues highlight the need for improved hygiene practices to prevent and manage such conditions. The eye health of the learners is generally good, with normal eyebrows, eyelids, and eyeballs being common across all grades.

When it comes to skin condition, most learners in School A have normal skin colour and smooth texture, indicating good hydration and nutrition. However, there are a few cases of dry skin and roughness, such as in Learner L1 from Grade 1 and Learner L10 from Grade 2, suggesting that some learners might benefit from better hydration and possibly an improved diet to ensure they receive all necessary micronutrients.

5.3.1.2 School B Results

Table 5.2: Physical Assessment of Foundation Phase Learners (Grades 1 to 3)

Category	Grade 1 School B		Grade 2 School B		Grade 3 School B		
	Boys	Girls	Boys	Girls	Boys	Girls	Total
	2	2	2	3	3	3	15

General Appearance						
Well Nourished	L16, L17	L23, L24	L18, L19	L25, L26, L27	L21, L22	L28, L29, L30
Under Nourished					L20	
Healthy	L16, L17	L23, L24	L18, L19	L25, L26, L27	L21, L22	L28, L29, L30
Unhealthy					L20	
Head & Face Hair						
Sparse and thin					L20	
Thick and Full	L16, L7	L23, L24	L18, L19	L25, L26, L27	L21, L22	L28, L29, L30
Discoloured					L20	
Dry hair					L20	
Soft and manageable	L16, L17	L23, L24	L18, L19	L25, L26, L27	L21, L22	L28, L29, L30
Growing at a normal rate	L16, L17	L23, L24	L18, L19	L25, L26, L27	L21, L22	L28, L29, L30
Lustrous	L16, L17	L23, L24	L18, L19	L25, L26, L27	L21, L22	L28, L29, L30
Scalp						
Dandruff						
Ringworms					L20	
Clean	L16, L17	L23, L24	L18, L19	L25, L26, L27	L21, L22	L28, L29, L30
Dirty					L20	
Injured						
Eyes						
Normal Eyebrows	L16, L17	L23, L24	L18, L19	L25, L26, L27	L21, L22	L28, L29, L30
Absent Eyebrows					L20	
Normal Eyelids	L16, L17	L23, L24	L18, L19	L25, L26, L27	L21, L22	L28, L29, L30
Sunken eyeballs						

Normal Eyeballs	L16, L17	L23, L24	L18, L19	L25, L26, L27	L21, L22	L28, L29, L30
Skin Condition						
Yellow- Orange (Discolouration)					L20	
Hypopigmentation					L20	
Normal skin colour	L16, L17	L23, L24	L18, L19	L25, L26, L27	L21, L22	L28, L29, L30
Texture						
Smooth	L16, L17	L23, L24	L18	L25, L26, L27	L21, L22	L28, L29, L30
Dry					L20	
Excessive moisture						
Hydration	L16, L17	L23, L24	L18, L19	L25, L26, L27	L21, L22	L28, L29, L30
Rash/ Acne			L18			
Wounds/ Roughness						

In School B, the general appearance of the learners also shows that the majority are well nourished and healthy, like School A. However, there are more frequent signs of micronutrient deficiencies in School B, particularly in the condition of the learners' hair. While many learners have thick, full, soft, manageable, and lustrous hair, there are more instances of sparse, thin, discoloured, and dry hair compared to School A. For example, Learner L20 from Grade 3 exhibits these signs, suggesting that micronutrient deficiencies are more pronounced in School B and need to be addressed more urgently.

The scalp health in School B is generally good, with clean scalps being common. However, there are more frequent cases of dandruff and ringworms, especially in Learner L10 from Grade 2 and Learner L20 from Grade 3. This indicates a need for better hygiene practices

to prevent and treat these conditions. The eye health of the learners is like that in School A, with normal eyebrows, eyelids, and eyeballs being the norm.

The skin condition of learners in School B shows more frequent signs of micronutrient deficiencies compared to School A. While most learners have normal skin colour and smooth texture, there are more cases of hypopigmentation and dry skin. For instance, Learner L20 from Grade 3 exhibits these signs, indicating a higher prevalence of micronutrient deficiencies. Additionally, there are more frequent cases of dry skin, such as in Learner L20 from Grade 3, suggesting the need for better hydration and improved dietary intake.

5.3.1.3 Overall analysis of RQ 1(a)

The analysis reveals that while both schools have a majority of well-nourished and healthy learners, School B shows more frequent signs of micronutrient deficiencies, particularly in hair and skin health. These findings highlight the need for targeted nutritional interventions in School B to address these deficiencies and improve the overall well-being of the learners. Improved hygiene practices are also necessary in both schools to prevent and treat conditions like dandruff and ringworms. Addressing these issues will help ensure that all learners receive the necessary support and resources for optimal health and development.

5.3.2 Presentation of the Results to Research Question 1(b):

- *What is the nutritional value of the meals provided by the schools?*

A nutrient is a substance providing nourishment to the body and is necessary for both growth and maintenance. Nutrients can fall into seven groups that include carbohydrate, protein, fat, fibre, mineral, vitamin, and water. All groups are essential for the adequate functioning of the body. Macronutrients serve as a source of energy, while micronutrients play a crucial role in biochemical reactions.

In this study the analysis was organised around the following 5 groups:

1. ***Macro nutrients:*** Macro-nutrients are the primary nutrients required in large amounts to provide energy and support bodily functions.

2. ***Vitamins:*** Vitamins are organic compounds required in small amounts for various metabolic processes.
3. ***Minerals:*** Minerals are inorganic elements required for various bodily functions. They are categorized into:
    - Macro-Minerals: Needed in larger amounts. o Micro-Minerals: Needed in smaller amounts.
4. ***Phytochemicals*** are bioactive compounds found in plants that have health benefits. They include:
    - Flavonoids: A group of antioxidants that protect against inflammation and chronic diseases.
    - Xanthophylls (Carotenoids): Pigments that support eye health and act as antioxidants.
5. ***Other:*** These essential nutrients that are neither a vitamin nor a mineral, which play a critical role in various bodily functions.

Categorizing dietary intake into these groups helps in understanding the diverse roles of nutrients in maintaining health. It ensures a comprehensive analysis of dietary intake, highlighting the importance of both macro and micronutrients, as well as the beneficial compounds found in plants. This approach aids in identifying potential deficiencies and guiding dietary recommendations for optimal health.

5.3.2.1 School A's Results of the Nutritional value of the meals provided

Let's take a closer look at the nutritional intake for School A's menu from Monday to Friday and discuss the implications of these nutrients on health and well-being. As illustrated in Table 5.3, School A's menu for the week provides a variety of meals aimed at meeting the nutritional needs of children. However, a closer examination reveals some areas where the diet excels and others where improvements are necessary.

Table 5.3: School A’s Menu for the Week

SCHOOL A Weekly Menu	MACRO-NUTRIENTS													VITAMINS											MINERALS										PHYTOCHEMICALS						OTHER	AMINO ACIDS																					
																									MACRO-MINERALS						MICRO-MINERALS							FLAVANOIDS			XANTHOPHYLLS (Carotenoids)				ESSENTIAL AMINO ACIDS									NON-ESSENTIAL AMINO ACIDS					CONDITIONALLY ESSENTIAL AMINO ACIDS		
Monday	Energy (kJ)	Cal (kcal)	Carbohydrates (g)	Protein (g)	Sugar (g)	Fat (g)	Saturated Fat (g)	Monounsaturated Fat (g)	Polyunsaturated Fat (g)	Omega 3 Fatty Acids (mg)	Trans Fat (mg)	Cholesterol (mg)	Fibre (g)	Vit A (Retinyl Palmitate) µg / kg	Vit C (mg)	Vit D (µg)	Vit E (mg)	Vitamin B1 (Thiamin) (mg)	Vit B2 (Riboflavin) mg / kg	Vit B3 (Niacin) mg / kg	Vitamin B6 (mg)	Vit B12	Vitamin B9 (Folate) (µg)	Vitamin K (µg)	Calcium (mg)	Magnesium (mg)	Potassium (mg)	Phosphorus (mg)	Sodium (mg)	Copper (mg)	Iron (mg)	Zinc (mg)	Iodine (µg)	Manganese (mg)	Selenium (µg)	Kaempferol (mg)	Quercetin (mg)	Apigenin (mg)	Lutein (mg)	Zeaxanthin (mg)	Betacarotene (mg)	Choline (mg)	Histidine (mg)	Isoleucine (mg)	Leucine (mg)	Lysine (mg)	Methionine (mg)	Phenylalanine (mg)	Threonine (mg)	Tryptophan (mg)	Valine (mg)	Glutamic Acid (mg)	Glycine (mg)	Proline (mg)	Serine (mg)	Cystine (mg)	Tyrosine (mg)
Breakfast - My Life Instant Porridge (250g)	4005	956	143	22 5	22 5	13	2 5						20																1290																																		
Fortified Maize Meal (250g)	3337 5	797 5	182 5	18 5	1 5	2 5	2	2			4			788									0 125						164		9																														
Sugar Beans (Kidney Beans) (125g)	665 25 6	159	29	11			0 1		0 3				9		2			0 2	0 07	0 7	0 15		163	11		56	504	178	298	0 3	3 7	1 3		0 6	2							303	479	866	744	163	586	456	129	568	1,654	424	460	590	118	305
Total	**8007.756**	**1912.5**	**354.5**	**52**	**24**	**15.5**	**4.6**	**2**	**0.3**	**0**	**4**	**0**	**29**	**788**	**2**	**0**	**0**	**0.2**	**0.07**	**0.7**	**0.15**	**0**	**163.125**	**11**	**0**	**56**	**504**	**178**	**1752**	**0.3**	**12.7**	**1.3**	**0**	**0.6**	**2**																								
Tuesday																																																																	
Breakfast - My Life Instant Porridge (250g)	4005	956	143	22 5	22 5	13	2 5						20																1290																																		
Fortified Maize Meal (250g)	3337 5	797 5	182 5	18 5	1 5	2 5	2	2			4			788									0 125						164		9																														
Maas UHT) Milk (250ml)	672 5	160 73	8 25	9 2		9 15	5 875	2 725	0 2					93 75					0 375			1			405	35 75	475	230 5	141 75																																
Total	**8015**	**1914.23**	**333.75**	**50.2**	**24**	**24.65**	**10.375**	**4.725**	**0.2**	**0**	**4**	**0**	**20**	**881.75**	**0**	**0**	**0**	**0**	**0.375**	**0**	**0**	**1**	**0.125**	**0**	**405**	**35.75**	**475**	**230.5**	**1595.75**	**0**	**9**	**0**	**0**	**0**	**0**																								

Wednesday																																																									
Breakfast - My Life Instant Porridge (250g)	4005	956	143	22 5	22 5	13	2 5						20																1290																												
Rice (cooked) 250g	1412 5	337 5	69 1	6 6	0 125	2 675	0 56	1 1525	0 7675				1													87 5		920																													
Cabbage (250g)	237 11	56 67	13 33	3 33	6 67	6 97	1 243	2 881	2 216				4 5	78	48 5			0 17			0 33		73 33	271 67	120	36 67	566 67		690		0 4 3					1 67	1 67	1 67	100	100	166 67	35 67															
Total	**5654.61**	**1350.17**	**225.43**	**32.43**	**29.295**	**22.645**	**4.303**	**4.0335**	**2.9835**	**0**		**0**	**25.5**	**78**	**48.5**	**0**	**0**	**0.17**	**0**	**0**	**0.33**	**0**	**73.33**	**271.67**	**120**	**36.67**	**654.17**	**0**	**2900**	**0**	**0.43**	**0**	**0**	**0**	**0**	**1.67**	**1.67**	**1.67**	**100**	**100**	**166.67**	**35.67**															
Thursday																																																									
Breakfast - My Life Instant Porridge (250g)	4005	956	143	22 5	22 5	13	2 5						20																1290																												
Sugar Beans (Kidney Beans) (125g)	665 25 6	159	29	11			0 1		0 3				9		2			0 2	0 07	0 7	0 15		163	11		56	504	178	298	0 3	3 7	1 3		0 6	2								303	479	866	744	163	586	456	129	568	1,654	424	460	590	118	305
Iwisa Samp (125g)	1701 2 5	406 2 5	90	8 875		0 5	0 125	0 125	0 25				6 25																13																												
Total	**6371.506**	**1521.25**	**262**	**42.375**	**22.5**	**13.5**	**2.725**	**0.125**	**0.55**	**0**		**0**	**35.25**	**0**	**2**	**0**	**0**	**0.2**	**0.07**	**0.7**	**0.15**	**0**	**163**	**11**	**0**	**56**	**504**	**178**	**1601**	**0.3**	**3.7**	**1.3**	**0**	**0.6**	**2**																						
Friday																																																									
Breakfast - My Life Instant Porridge (250g)	4005	956	143	22 5	22 5	13	2 5						20																1290																												
Rice (cooked) 250g	1412 5	337 5	69 1	6 6	0 125	2 675	0 56	1 1525	0 7675				1													87 5		920																													
Pilchards (250g)	1095	330 6 5	7 5	42 5	2 5	12 75	5	3	4 5	4062 5	0 1	170	5 75			0 03 5						0 032 5			667 5			41 94	675				0 16		0 0875																						
Apples / Oranges (medium)	300	72	19 06	0 36		0 23	0 039	0 01	0 07				3 3		4 6												148		1																												

Butternut (80g)	133 6	32	8 59	0 78	1 576	0 072	0 0152	0 0056	0 0304				2 73	1605.07	18 2 6		0 7 6	0 05	0 08	0 62	0 07		15 61			24 59	311 8		192					0 16																							
Total	**6946.1**	**1728. 15**	**247.25**	**72.74**	**26.70 1**	**28.72 7**	**8.1142**	**4.1681**	**5.3679**	**4062.5**		**170**	**32.7 8**	**1605.07**	**22.8 6**	**0.03 5**	**0.7 6**	**0.05**	**0.08**	**0.62**	**0.07**	**0.032 5**	**15.61**	**0**	**667.5**	**24.59**	**547.3**	**41.94**	**3078**	**0**	**0**	**0**	**0.16**	**0.16**	**0.0875**																						

- ***Monday***

On Monday, the combination of fortified maize meal and sugar beans offers a good start, with the maize meal providing essential vitamins and minerals such as iron, zinc, and vitamin A, while the sugar beans contribute protein, fibre, and iron. This combination supports both energy needs and overall health.

On Monday, the total energy intake is **8007.756 kJ** (***1912.5 kcal***), which is a substantial amount of energy to start the week. The high **carbohydrates at 354.5 grams** provides a quick source of energy, essential for maintaining concentration and stamina throughout the day. The **protein intake at 52 grams**, supports muscle repair and growth, which is particularly important for active children. The **fat at 15.5 grams** is moderate, with a low amount of saturated fat (4.6 g), which is beneficial for heart health. However, the **sodium content at 1752 mg** is quite high, which could be a concern for long-term cardiovascular health if consistently consumed at this level. Additionally, the menu provides 24 g of sugar, which is within a reasonable range.

The diet also includes significant amounts of Vitamin A, Vitamin B1, B2, B3, and B6, but lacks Vitamin C, D, E, B12, and K. The mineral intake is good, with calcium, magnesium, potassium, phosphorus, and sodium being well-represented. Iron intake is also beneficial. The amino acid profile includes essential amino acids like histidine, isoleucine, leucine, lysine, methionine, phenylalanine, threonine, tryptophan, and valine, along with non-essential amino acids such as glutamic acid, glycine, proline, and serine.

- ***Tuesday***

Tuesday's menu continues with fortified maize meal paired with maas (UH milk). Maas is rich in calcium, vitamin D, and protein, which are crucial for bone health and growth. However, the lack of vegetables on this day means that some micronutrients, particularly those found in green leafy vegetables, might be missing.

Tuesday's menu provides **8015 kJ (*1914.23 kcal*)**, slightly less energy than Monday. The with carbohydrate intake (333.75 g) remains high, ensuring sustained energy level. Protein

at 50.2 grams is adequate for growth and repair. The fat content at 24.65 grams is higher than Monday. The fibre intake (20 g) is lower than Monday, but still beneficial for digestion. The menu also includes 24 g of sugar, which is acceptable. The diet includes Vitamin A and a small amount of Vitamin B1, but lacks Vitamin C, D, E, B2, B3, B6, B12, and K. The mineral intake is notable for calcium, magnesium, potassium, phosphorus, and sodium (at 1595.75 mg, which is lower than Monday), with iron intake being 9 milligrams.

- ***Wednesday***

Wednesday's meal of rice and cabbage introduces some variety. While rice is a good source of carbohydrates, it lacks significant micronutrients. Cabbage, on the other hand, provides vitamins C and K, as well as fibre, which are beneficial for immune function and digestion.

Wednesday's menu offers **5910.82 kJ (*1398.5 kcal*)**, which is lower than the previous days. The carbohydrate intake (223 g) is also lower, which might result in reduced energy levels for some students. Protein intake (31.57 g) is sufficient, while the fat content (22.645 g) is moderate with a low amount of saturated fat (4.303 g). The fibre intake (25.5 g) supports digestive health. However, the sodium content (2900 mg) is extremely high, which could pose a risk for developing hypertension if consumed regularly. The menu provides 29.645 g of sugar, which is slightly higher but still within a reasonable range.

The diet includes Vitamin A, Vitamin B1, and B3, but lacks Vitamin C, D, E, B2, B6, B12, and K. The mineral intake includes calcium, magnesium, potassium, phosphorus, and sodium, with an unusually high iron intake that might need verification. The amino acid profile remains at 0.

- ***Thursday***

On Thursday, the menu includes sugar beans and samp. Sugar beans continue to provide protein and iron, while samp offers carbohydrates and some fibre. However, the absence of vegetables or fruits on this day means that certain vitamins and minerals might be lacking.

On Thursday, the total energy intake is **6371.506 kJ (1521.25 kcal)**, with carbohydrates at 262 grams. Protein intake (42.215 g) is adequate, supporting muscle maintenance and growth. The fat content (13.5 g) is lower than previous days, with a moderate amount of saturated fat (2.969 g). The diet includes Vitamin B1, B2, B3, and B6, but lacks Vitamin A, C, D, E, B12, and K. The mineral intake is good for calcium, magnesium, potassium, phosphorus, and sodium at 1600.5 mg which is still high but lower than Wednesday with iron intake being

3.7 milligrams. The amino acid profile includes essential and non-essential amino acids.

- ***Friday***

Friday's meal plan includes rice, pilchards, and apples or oranges. Pilchards are an excellent source of omega-3 fatty acids, calcium, vitamin D, and protein, making this meal nutritionally rich. The inclusion of apples or oranges adds vitamin C and fibre, rounding out the week with a well-balanced meal.

Finally, on Friday, the total energy intake is **6946.1 kJ (1728.15 kcal)**, with carbohydrates at 247.25 grams. Protein intake (72.74 g) is the highest of the week, likely due to the inclusion of pilchards, which are rich in protein and omega-3 fatty acids, beneficial for brain health. The fat content (28.727 g) is also the highest, with a moderate amount of saturated fat (8.1142 g). The fibre intake (32.78 g) supports digestive health. However, the sodium content (3078 mg) is very high, which could contribute to long-term health issues if not balanced with lower sodium intake on other days. The menu provides 26.701 g of sugar, which is acceptable. The diet includes Vitamin A, Vitamin B1, and B3, but lacks Vitamin C, D, E, B2, B6, B12, and K. The mineral intake is notable for calcium, magnesium, potassium, phosphorus, and sodium, with iron intake not recorded. The amino acid profile remains at zero.

Overall, the diet at School A provides a mix of essential nutrients, but there are gaps in the intake of macronutrients, vitamins, minerals, and other components. Calcium intake is low, particularly on days without Maas or pilchards. Iron intake is also insufficient, which is crucial for preventing anaemia. Healthy fats, especially omega-3 fatty acids, are limited to pilchards on Friday.

5.3.2.2 School B' s Results of the Nutritional value of the meals provided

Table 5.4 below presents School B's menu for the week as well as the nutrient intake for each day.

- ***Monday***

In School B, the meal plan also starts with fortified maize meal on Monday, paired with maas and apples or oranges. This combination provides a good mix of essential vitamins and minerals, calcium, vitamin D, protein, and vitamin C, supporting overall health and immune function.

On Monday, the total energy intake was **4310 kJ (1030.23 kcal)**, providing a substantial amount of energy to start the week. The high carbohydrate intake of 209.81 g offers a quick source of energy, essential for maintaining concentration and stamina throughout the day. The protein intake of is at 28.06 grams, and fat at 11.88 grams. The diet included significant amounts of Vitamin A, Vitamin C, and Vitamin B1, with vitamin A intake at 405 µg, and vitamin C intake at 35.75 mg, both of which support immune function. However, the diet lacked Vitamin D, E, B2, B3, B6, B12, and K. The mineral intake was good, with calcium, magnesium, potassium, phosphorus, and sodium being well-represented. Iron intake was also beneficial. The amino acid profile included essential amino acids like histidine, isoleucine, leucine, lysine, methionine, phenylalanine, threonine, tryptophan, and valine, along with nonessential amino acids such as glutamic acid, glycine, proline, and serine.

- ***Tuesday***

Tuesday's menu includes cabbage, pilchards, and rice. Cabbage offers vitamins C and K, while pilchards provide omega-3 fatty acids, calcium, vitamin D, and protein. Rice adds carbohydrates to the meal, making it energy dense. This day is well-balanced in terms of micronutrient diversity.

On Tuesday, the total energy intake was **2744.61 kJ (724.82 kcal)**, slightly less energy than Monday. The carbohydrate intake is 89.93 grams, ensuring sustained energy levels. Protein intake is at 52.43 grams, and fat at 22.395 grams. The diet included Vitamin A, Vitamin C, and Vitamin B1, with vitamin A intake at 198 μg, and vitamin C intake at 742.5 mg, both supporting immune function. However, the diet lacked Vitamin D, E, B2, B3, B6, B12, and K. The mineral intake was notable for calcium, magnesium, potassium, phosphorus, and sodium. The amino acid profile was like Monday, with a good mix of essential and non-essential amino acids.

Table 5.4: School B's Daily Dietary Intake - Menu for the Week

SCHOOL B Weekly Menu	MACRO-NUTRIENTS													VITAMINS										
Monday	Energy (kJ)	Cal (kcal)	Carbohydrat es (g)	Protein (g)	Sugar	Fat (g)	Saturated Fat (g)	Monounsaturated Fat (g)	Polyunsaturated Fat (g)	Omega 3 Fatty Acids (mg)	Trans Fat	Cholesterol (mg)	Fibre (g)	Vit A (Retinyl Palmitate) µg / kg	Vit C (mg)	Vit D (mg)	Vit E (mg)	Vitamin B1 (Thiamine) (mg)	Vit B2 (Riboflavin) mg / kg	Vit B3 (Niacin) mg / kg	Vitamin B6 (mg)	Vit B12	Vitamin B9 (Folate) (µg)	Vitamin K (µg)
Fortified Maize Meal (250g)	3337 5	797 5	182 5	18 5	1 5	2 5	2	2			4			788									0 125	
Maas UHT) Milk (250ml)	672 5	160 73	8 25	9 2		9 15	5 875	2 725	0 2					93 75					0 375			1		
Apples / Oranges (medium)	300	72	19 06	0 36		0 23	0 039	0 01	0 07				3 3		4 6									
Total	**4310**	**1030.23**	**209.81**	**28.06**	**1.5**	**11.88**	**7.914**	**4.735**	**0.27**	**0**	**4**	**0**	**3.3**	**881.75**	**4.6**	**0**	**0**	**0**	**0.375**	**0**	**0**	**1**	**0.125**	**0**
Tuesday																								
Cabbage (250g)	237 11	56 67	13 33	3 33	6 67	6 97	1 243	2 881	2 216				4 5	78	48 5			0 17			0 33		73 33	271 67
Pilchards (250g)	1095	330 65	7 5	42 5	2 5	12 75	5	3	4 5	4062 5	0 1	170	5 75			0 035						0 0325		
Rice (cooked) 250g	1412 5	337 5	69 1	6 6	0 125	2 675	0 56	1 1525	0 7675				1											
Total	**2744.61**	**724.82**	**89.93**	**52.43**	**9.295**	**22.395**	**6.803**	**7.0335**	**7.4835**	**4062.5**	**0.1**	**170**	**11.25**	**78**	**48.5**	**0.035**	**0**	**0.17**	**0**	**0**	**0.33**	**0.0325**	**73.33**	**271.67**

SCHOOL B Weekly Menu	MINERALS: MACRO-MINERALS					MINERALS: MICRO-MINERALS						PHYTOCHEMICALS: FLAVANOIDS			PHYTOCHEMICALS: XANTHOPHYLLS (Carotenoids)			OTHER
Monday	Calcium (mg)	Magnesium (mg)	Potassium (mg)	Phosphorus (mg)	Sodium (mg)	Copper (mg)	Iron	Zinc (mg)	Iodine (µg)	Manganese (mg)	Selenium (µg)	Kaempferol (mg)	Quercetin (mg)	Apigenin (mg)	Lutein (mg)	Zeaxanthin (mg)	Betacarotene (mg)	Choline (mg)
Fortified Maize Meal (250g)					164		9											
Maas UHT) Milk (250ml)	405	35 75	475	230 5	141 75													
Apples / Oranges (medium)			148		1													
Total	**405**	**35.75**	**623**	**230.5**	**306.75**	**0**	**9**	**0**	**0**	**0**	**0**							
Tuesday																		
Cabbage (250g)	120	36 67	566 67		690		0 43					1 67	1 67	1 67	100	100	166 67	35 67
Pilchards (250g)	667 5			41 94	675				0 16		0 0875							
Rice (cooked) 250g			87 5		920													
Total	**787.5**	**36.67**	**654.17**	**41.94**	**2285**	**0**	**0.43**	**0**	**0.16**	**0**	**0.0875**	**1.67**	**1.67**	**1.67**	**100**	**100**	**166.67**	**35.67**

SCHOOL B Weekly Menu	AMINO ACIDS: ESSENTIAL AMINO ACIDS									NON-ESSENTIAL AMINO ACIDS				CONDITIONALLY ESSENTIAL AMINO ACIDS	
Monday	Histidine (mg)	Isoleucine (mg)	Leucine (mg)	Lysine (mg)	Methionine (mg)	Phenylalanine (mg)	Threonine (mg)	Tryptophan (mg)	Valine (mg)	Glutamic Acid (mg)	Glycine (mg)	Proline (mg)	Serine (mg)	Cystine (mg)	Tyrosine (mg)
Fortified Maize Meal (250g)															
Maas UHT) Milk (250ml)															
Apples / Oranges (medium)															
Total															
Tuesday															
Cabbage (250g)															
Pilchards (250g)															
Rice (cooked) 250g															
Total															

Wednesday																																																									
Sugar Beans (Kidney Beans) (125g)	665 256	159	29	11			0 1		0 3				9		2			0 2	0 07	0 7	0 15		163	11		56	504	178	298	0 3	3 7	1 3		0 6	2								303	479	866	744	163	586	456	129	568	1,654	424	460	590	118	305
Iwisa Samp (125g)	1701 25	406 25	90	8 875		0 5	0 125	0 125	0 25				6 25																13																											
Total	**2366.506**	**565.25**	**119**	**19.875**	**0**	**0.5**	**0.225**	**0.125**	**0.55**	**0**	**0**	**0**	**15.25**	**0**	**2**	**0**	**0**	**0.2**	**0.07**	**0.7**	**0.15**	**0**	**163**	**11**	**0**	**56**	**504**	**178**	**311**	**0.3**	**3.7**	**1.3**	**0**	**0.6**	**2**																						
Thursday																																																									
NSNP Soya Mince (125g)	1522 5	369 89	2 5	83 13	1 88	3 75							23 75																31 25																											
Butternut (80g)	133 6	32	8 59	0 78	1 576	0 072	0 0152	0 0056	0 0304				2 73	1605.07	18 26		0 76	0 05	0 08	0 62	0 07		15 61			24 59	311 8		192					0 16																							
Cabbage (250g)	237 11	56 67	13 33	3 33	6 67	6 97	1 243	2 881	2 216				4 5	78	48 5			0 17			0 33		73 33	271 67	120	36 67	566 67		690		0 43					1 67	1 67	1 67	100	100	166 67	35 67															
Rice (cooked) 250g	1412 5	337 5	69 1	6 6	0 125	2 675	0 56	1 1525	0 7675				1														87 5		920																											
Total	**3305.71**	**796.06**	**93.52**	**93.84**	**10.251**	**13.467**	**1.8182**	**4.0391**	**3.0139**	**0**	**0**	**0**	**31.98**	**1683.07**	**66.76**	**0**	**0.76**	**0.22**	**0.08**	**0.62**	**0.4**	**0**	**88.94**	**271.67**	**120**	**61.26**	**965.97**	**0**	**1833.25**	**0**	**0.43**	**0**	**0**	**0.16**	**0**																						
Friday																																																									
Sugar Beans (Kidney Beans) (125g)	665 256	159	29	11			0 1		0 3				9		2			0 2	0 07	0 7	0 15		163	11		56	504	178	298	0 3	3 7	1 3		0 6	2								303	479	866	744	163	586	456	129	568	1,654	424	460	590	118	305
Fortified Maize Meal (250g)	3337 5	797 5	182 5	18 5	1 5	2 5	2	2			4			788									0 125						164		9											38															
Total	**4002.756**	**956.5**	**211.5**	**29.5**	**1.5**	**2.5**	**2.1**	**2**	**0.3**	**0**	**4**	**0**	**9**	**788**	**2**	**0**	**0**	**0.2**	**0.07**	**0.7**	**0.15**	**0**	**163.125**	**11**	**0**	**56**	**504**	**178**	**462**	**0.3**	**12.7**	**1.3**	**0**	**0.6**	**2**	**0**	**0**	**0**	**0**	**0**	**0**	**38**	**0**	**479**	**0**	**0**	**0**	**0**	**0**	**0**	**568**	**0**	**0**	**0**	**590**	**118**	**305**

- ***Wednesday***

On Wednesday, the meal plan features sugar beans and samp. Sugar beans provide protein, fibre, and iron, while samp offers carbohydrates and some fibre. Like School A, this day could benefit from the inclusion of vegetables to provide additional vitamins and minerals.

On Wednesday, the total energy intake is **2366.506 kJ (565.25 kcal)**, which is lower than the previous days. The carbohydrate intake is 119 g, which might result in reduced energy levels for some students. Protein intake is at 19.875 grams, and fat at 0.5 grams. The fibre intake is at 11.25 g. The diet included Vitamin B1, B2, B3, and B6, but lacked Vitamin A, C, D, E, B12, and K. The mineral intake included calcium, magnesium, potassium, phosphorus, and sodium, with iron intake being 3.7 milligrams. The amino acid profile remained consistent with previous days.

- ***Thursday***

Thursday's menu is more varied, with NSNP soya mince, butternut, cabbage, and rice. Soya mince is a good source of protein and iron, while butternut is rich in vitamin A, vitamin C, and fibre. Cabbage adds vitamins C and K, and rice provides carbohydrates. This day offers a good mix of nutrients, addressing potential micronutrient deficiencies more effectively.

On Thursday, the total energy intake was **3305.71 kJ (796.06 kcal)**, offering a good amount of energy. The carbohydrate intake is 93.52 grams, ensuring sustained energy levels. Protein intake is at 93.84 grams, and fat at 13.467 grams. the fat content is 92.98 g, significantly higher, which should be balanced with other nutrients. The fibre intake is 10.601 g, beneficial for digestion. The diet included Vitamin A, Vitamin C, and Vitamin B1, with vitamin A intake is 634.3 µg, and vitamin C intake is 1833.25 mg, both supporting immune function. However, the diet lacked Vitamin D, E, B2, B3, B6, B12, and K. The mineral intake was good for calcium, magnesium, potassium, phosphorus, and sodium, with iron intake being 0.16 milligrams. The amino acid profile included essential and non-essential amino acids.

- ***Friday***

Friday's meal plan includes sugar beans and samp, like Wednesday. While this combination provides protein, fibre, and carbohydrates, the lack of vegetables or fruits on this day means that certain vitamins and minerals might be missing.

Finally, on Friday, the total energy intake was **4002.756 kJ (956.5 kcal)**, providing a substantial amount of energy. The carbohydrate intake is at 211.5 grams, protein at 29.5 grams, and fat at 2.5 grams. The fibre intake is 1.9 g, which could be improved. The calcium intake is 788 mg, supporting bone health. The diet included Vitamin A, Vitamin B1, and B3, but lacked Vitamin C, D, E, B2, B6, B12, and K. The mineral intake was notable for calcium, magnesium, potassium, phosphorus, and sodium. The iron intake is 0 mg, indicating a gap in iron sources.

The amino acid profile included essential and non-essential amino acids.

5.3.2.3 Overall analysis of RQ 1(b)

Research Question 1(b) focused on the nutritional value of the meals provided by the schools. The analysis highlighted areas of strength and concern in the dietary intake of the learners. Both schools provided meals that met some nutritional needs, but there were significant gaps, particularly in vitamin and mineral intake. High sodium levels in School A's menu and the lack of vegetables and fruits in both schools' menus were identified as areas needing improvement. Ensuring a variety of nutrients is crucial for preventing deficiencies and supporting overall health.

5.3.3 Presentation of the Results to Research Question 1(c):

- *How does the nutritional value of these meals compare to the NSPN and the recommended dietary guidelines for children?*

5.3.3. NSNP Menu Plan

The relationship between diet and education is the main emphasis of the NSNP. It is premised on evidence that poor school performance, attendance, and punctuality, along with reduced concentration, attention, and intellectual capacity are strongly related to poor short and long term nutrition (Singh et al., 2013).

According to the Department of Basic Education, (DoE, 2014, p. 15) a key output of the NSNP is to provide nutritious meals to learners in quintile 1 to 3 primary and secondary schools, as well as identified special schools nationally. The NSNP covers 2.4 million learners in 5 436 participating schools across 12 education districts in KZN, with a total value of approximately R2.1 billion. The National School Nutrition Programme (NSNP) guidelines, which aim to provide at least 30% of the daily nutritional needs of learners per meal. The NSNP emphasizes the importance of balanced meals that include carbohydrates, proteins, and fats, along with essential vitamins and minerals.

The Department of Education (2021) stipulates that the meals should consists of Protein (Soya, Fish, Eggs, Milk, Sour Milk, Beans and Lentils), fresh fruits and vegetables, Carbohydrate/starch. Soya should not be served more than twice a week and variety of protein should be served in a week. Fats/Oil, salt and flavourants are added to make meals tasty and Fresh vegetable or Fruit should be served daily. The NSNP menu is presented in Table 5.5 below highlighting the raw quantity and portion sizes.

Table 5.5: The NSNP Menu April 2024 – March 2025 for Primary Schools

NSNP MENU APRIL 2024- MARCH 2025 FOR PRIMARY SCHOOLS			
Day	**Food Item**	**Raw Quantity**	**Portion size Served**
Monday	Breakfast	20g	**1/4 cup**
	Phuthu	40g	**4/5cup**
	UHT Milk/ Pasteurized Milk or Amasi	200ml	**1 cup**
	Fruit in season	Medium	

Tuesday	Breakfast	20g	**1/4cup**
	Sugar beans	30g	**1/2cup**
	Samp	40g	**1 cup**
	Yellow vegetables in season	60g	**1/2cup**
Wednesday	Breakfast	20g	**1/4cup**
	Soya Mince Relish	25g	**1/2cups**
	Boiled Rice	40g	**1 cup**
	Green vegetables in season	60g	**1/2cup**
Thursday	Breakfast	20g	**1/4cup**
	Sugar beans		**1/2cup**
	Phuthu	40g	**1cup**
	Yellow vegetables in season	60g	**1/2cup**
	or Veg Breyani & Dhall	10g lentils	
		20gDhall	
Friday	Breakfast	20g	**1/4cup**
	Canned Pilchards	40g	**1/2cup**
	Rice	40g	**1cup**
	Green vegetables in season	60g	**1/2cup**
	Tomatoes	10g	

5.3.3.1.1 Analysis of NSNP Menu for Primary Schools

The analysis of the NSNP menu in terms of caloric, macro and micronutrients are provided in Table 5.6 below.

- ***Monday***

On Monday, the meal plan includes breakfast, Phuthu, UHT Milk or Amasi, and a fruit in season. The energy provided ranges from 334.72 to 669.44 kJ (80-160 kcal), with carbohydrates being the primary macronutrient, contributing 18-35 grams. The main sources of carbohydrates are Phuthu, a traditional maize meal, and the fruit in season. Among these, Phuthu contributes the most carbohydrates, providing 30-35 grams. Protein intake is moderate, ranging from 1.5 to 12 grams, primarily from UHT Milk or Amasi. Fat content varies between 0.3 to 10 grams, with UHT Milk or Amasi contributing to the fat intake. The meals are rich in vitamins, particularly Vitamin A (5-10 µg) from the fruit and Vitamin C (515 mg) from the fruit as well. UHT Milk or Amasi provides essential minerals like calcium (200-250 mg) and magnesium (5-10 mg). Phytochemicals such as flavonoids and carotenoids are present in the fruit, contributing to the antioxidant intake. Additionally, the fibre content from Phuthu and the fruit ranges from 1 to 6 grams, supporting digestive health. Iron content is modest, with Phuthu and the fruit contributing around 0.5-1 mg.

- ***Tuesday***

Tuesday's menu includes breakfast, sugar beans, samp, and yellow vegetables in season. The energy content ranges from **334.72 to 711.28 kJ (80-170 kcal)**, with carbohydrates contributing 18-35 grams. The primary sources of carbohydrates are samp, a staple made from crushed maize, and yellow vegetables. Among these, samp contributes the most carbohydrates, providing 30-35 grams. Protein intake is higher, ranging from 1.5 to 25 grams, primarily from sugar beans. Fat content remains low at 0.3 to 6 grams. The meals are rich in Vitamin A (2030 µg) from the yellow vegetables and Vitamin C (5-10 mg) from the vegetables as well. Significant amounts of calcium (10-20 mg) and iron (0.5-1 mg) are provided by sugar beans and yellow vegetables. The yellow vegetables also provide carotenoids, enhancing the antioxidant profile of the meal. The fibre content from sugar beans, samp, and vegetables ranges from 8 to 12 grams, promoting digestive health and satiety.

Table 5.6 NSNP's Daily Dietary Intake - Menu for the Week

NSNP Weekly Menu	MACRO-NUTRIENTS													VITAMINS										
Monday	Energy (kJ)	Cal (kcal)	Carbohydrat es (g)	Protein (g)	Sugar	Fat (g)	Saturated Fat (g)	Monounsaturated Fat (g)	Polyunsaturated Fat (g)	Omega 3 Fatty Acids (mg)	Trans Fat	Cholesterol (mg)	Fibre (g)	Vit A (Retinyl Palmitate) µg / kg	Vit C (mg)	Vit D (mg)	Vit E (mg)	Vitamin B1 (Thiamine) (mg)	Vit B2 (Riboflavin) mg / kg	Vit B3 (Niacin) mg / kg	Vitamin B6 (mg)	Vit B12	Vitamin B9 (Folate) (µg)	Vitamin K (µg)
NSNP Weekly Menu																								
Monday																								
Breakfast (20g)	334 7 2 - 418 4 0	80-100	18-22	1 5-2		0 3-0 5							0.3-0.5	5 0-10 0	0-0 5		0 2 5-0 5		0 03-0 05	0 6-1			5 0-10 0	
Phuthu (40g)	585 7 6 - 669 4 4	140-160	30-35	02-Mar		0 5-1							2.0-3.0	0-10	0-1		0 5-1		0 01-0 02	1 0-2 0			10 0-20 0	
UHT Milk/ Pasteurized Milk or Amasi (200ml)	585 7 6 - 669 4 4	140-160	12- 0/15 0	10 0-12 0		8 0 - 10 0							0-1	100-150	1 0-2 0	0 5-1	0 5-1		0 2-0 3	1 0-3 0			20 0-30 0	
Fruit in season(medium apple)	397 4 8	95	25	0 3		0 2							4	100-150	10 0 - 15 0		0 2-0 3		0 02-0 03	0 1-0 2			10 0-15 0	
Tuesday																								
Breakfast (20g)	334 7 2 - 418 4 0	80-100	18-22	1 5-2		0 3-0 5							0.3-0.5	5 0-10 0	0-0 5		0 2 5-0 5		0 03-0 05	0 6-1			5 0-10 0	
Sugar beans (30g)	418 4 0 - 502 0 8	100-120	20-25	5 0-6 0		0 5-1							5.0-6.0	0-10	0-1		0 5-1		0 02-0 03	0 5-1			50-70	
Samp (40g)	627 6 0 - 711 2 8	150-170	30-35	2 0-3 0		0 5-1							2.0-3.0	0-10	0-1		0 5-1		0 01-0 02	1 0-2 0			10 0-20 0	

NSNP Weekly Menu	MINERALS											PHYTOCHEMICALS						OTHER	AMINO ACIDS														
	MACRO-MINERALS					MICRO-MINERALS						FLAVANOIDS			XANTHOPHYLLS (Carotenoids)				ESSENTIAL AMINO ACIDS									NON-ESSENTIAL AMINO ACIDS				CONDITIONALLY ESSENTIAL AMINO ACIDS	
Monday	Calcium (mg)	Magnesium (mg)	Potassium (mg)	Phosphorus (mg)	Sodium (mg)	Copper (mg)	Iron	Zinc (mg)	Iodine (µg)	Manganese (mg)	Selenium (µg)	Kaempferol (mg)	Quercetin (mg)	Apigenin (mg)	Lutein (mg)	Zeaxanthin (mg)	Betacarotene (mg)	Choline (mg)	Histidine (mg)	Isoleucine (mg)	Leucine (mg)	Lysine (mg)	Methionine (mg)	Phenylalanine (mg)	Threonine (mg)	Tryptophan (mg)	Valine (mg)	Glutamic Acid (mg)	Glycine (mg)	Proline (mg)	Serine (mg)	Cystine (mg)	Tyrosine (mg)
NSNP Weekly Menu																																	
Monday																																	
Breakfast (20g)	5 0-10 0						0 3-0 5	0 1-0 2																									
Phuthu (40g)	10 0-20 0						0 5-1	0 2-0 3																									
UHT Milk/ Pasteurized Milk or Amasi (200ml)	200-250						0-5-1	1 0-2 0																									
Fruit in season(medium apple)	10 0-15 0						0 2-0 3	0 1-0 2																									
Tuesday																																	
Breakfast (20g)	5 0-10 0						0 3-0 5	0 1-0 2																									
Sugar beans (30g)	50-60						1 5-2 5	0 5-1																									
Samp (40g)	10 0-20 0						0 5-1	0 5-1																									

Yellow vegetables in season (Butternut)(60g)	188 2 8 - 230 1 2	45-55	11 0-12 0	1 0- 2 0		0-1							2.0- 3.0	10000- 12000	20- 30		1 0- 2 0		0 02-0 03	0 5-1			20-30		50-60						0 5- 1	0 2- 0 3
Wednesday																																
Breakfast (20g)	334 7 2 - 418 4 0	80- 100	18-22	1 5-2		0 3- 0 5							0.3- 0.5g	5 0-10 0	0- 0 5		0 2 5- 0 5		0 03-0 05	0 6-1			5 0- 10 0		5 0- 10 0						0 3- 0 5	0 1- 0 2
Soya Mince Relish (Beef Flavour) (25g)	334 7 2 - 418 4 0	80- 100	10 0-11 0	5 0- 6 0		2 0- 3 0							2.0- 3.0	0-10	0-1		0 5-1		0 01-0 02	1 0-2 0			10 0- 20 0		20-30						1 0- 2 0	0 5- 1
Boiled Rice (40g)	460 2 4 - 543 9 2	110- 130	25-30	2 0- 3 0		0 5- 1							0.5- 1g	0-10	0- 1mg		0 5-1		0 01-0 02	1 0-2 0			5 0- 10 0		10 0- 20 0						0 5- 1	0 2- 0 3
Green vegetables in season (Cabbage) (60g)	83 68 - 104 6 0	20-25	5 0-6 0	1 0- 2 0		0-1							2.0- 3.0	50-70	30- 50mg		0 5-1		0 02-0 03	0 2-0 3			20-30		20-30						0 2- 0 3	0 2- 0 3
Thursday																																
Breakfast (20g)	334 7 2 - 418 4 0	80- 100	18-22	1 5-2g		0 3- 0 5							0.3- 0.5g	5 0-10 0	0- 0 5		0 2 5- 0 5		0 03-0 05	0 6-1			5 0- 10 0		5 0- 10 0						0 3- 0 5	0 1- 0 2
Sugar beans (30g)	418 4 0 - 502 0 8	100- 120	20-25	5-6g		0 5- 1							5-6g	0-10	0-1		0 5-1		0 02-0 03	0 5-1			50-70		50-60						1 5- 2 5	0 5- 1
Phuthu (40g)	585 7 6 - 669 4 4	140- 160	30-35	2-3g		0 5- 1							2.0- 3.0	0-10	0-1		0 5-1		0 01-0 02	1 0-2 0			10 0- 20 0		10 0- 20 0						0 5- 1	0 2- 0 3
Yellow vegetables in season (Butternut) (60g)	188 2 8 - 230 1 2	45-55	11 0-12 0	1 0- 2 0		0-1							2.0- 3.0	10000- 12000	20- 30		1 0- 2 0		0 02-0 03	0 5-1			20-30		50-60						0 5- 1	0 2- 0 3
or Veg Breyani (10g lentils) & Dhall (20g)	146 4 4 - 167 3 6 (418 4 0 - 502 0 8)	3 5- 4 0 100- 120	6 0-7 0 20-25	2 0- 3 0 5 0- 6 0		0 5 - 1g 0 5- 1							1. 0- 2. 0 2.0- 3.0	10-20 0- 10	1 0- 2 0 0- 1		0 5 -1 0 5-1		0 02-0 03 0 02-0 03	1 0-2 0			20-30 50- 70		10-20 20- 30						1 0 - 2 0 2 0- 3 0	0 5- 1 1 0- 2 0

Friday																																																										
Breakfast (20g)	334 7 2 - 418 4 0	80- 100	18-22	1 5-2		0 3- 0 5							0.3- 0.5g	5 0-10 0	0- 0 5		0 2 5- 0 5		0 03-0 05	0 6-1			5 0- 10 0		5 0- 10 0						0 3- 0 5	0 1- 0 2																										
Canned Pilchards (40g)	543 9 2 - 627 6 0	130- 150	0-1	15-20	500- 700	8 0 - 10 0								50-100	0-1	10 0 - 20 0	1 0- 2 0		0 1-0 2	5 0- 10 0			10 0- 20 0		200- 300						2 0- 3 0	1 0- 2 0																										
Rice (40g)	460 2 4 - 543 9 2	110- 130	25-30	2 0- 3 0		0 5- 1							0.5- 1g	0-10	0-1		0 5-1		0 01-0 02	1 0-2 0			5 0- 10 0		10 0- 20 0						0 5- 1	0 2- 0 3																										
Green vegetables in season (Cabbage) (60g)	83 68 - 104 6 0	20-25	5 0-6 0	1 0- 2 0		0-1							2.0- 3.0	50-70	30- 50		0 5-1		0 02-0 03	0 2-0 3			20-30		20-30						0 2- 0 3	0 2- 0 3																										
Tomatoes (10g)	20 92 - 25 10	5 0- 6 0	1 0-2 0	0 2- 0 3		0- 0 1							0.2- 0.3g	10 0-20 0	2 0- 3 0		0 1- 0 2		0 01-0 02	0 2-0 3			5 0- 10 0		2 0-3 0						0 2- 0 3	0 1- 0 2																										

Wednesday

Wednesday's meal plan features breakfast, soya mince relish, boiled rice, and green vegetables in season. The energy content ranges from **334.72 to 543.92 kJ (80-130 kcal)**, with carbohydrates contributing 18-30 grams. The main sources of carbohydrates are boiled rice and green vegetables. Among these, boiled rice contributes the most carbohydrates, providing 2530 grams. Protein intake is moderate, ranging from 1.5 to 11 grams, primarily from soya mince. Fat content is low at 0.3 to 3 grams. The meals are rich in Vitamin A (5-10 µg) from green vegetables and Vitamin C (5-10 mg) from the vegetables as well. Essential minerals like calcium (5-10 mg) and magnesium (5-10 mg) are provided by green vegetables. Phytochemicals such as flavonoids and carotenoids are present in green vegetables, contributing to the antioxidant intake. The fibre content from soya mince, rice, and vegetables ranges from 4 to 7 grams, aiding in digestion and overall health. Iron content is around 1-2 mg, primarily from soya mince and green vegetables.

- ***Thursday***

Thursday's menu includes breakfast, sugar beans, Phuthu, yellow vegetables in season, and Veg Breyani with Dhall. The energy content ranges from **334.72 to 669.44 kJ (80-160 kcal)**, with carbohydrates contributing 18-35 grams. The primary sources of carbohydrates are Phuthu, yellow vegetables, and Veg Breyani with Dhall. Among these, Phuthu contributes the most carbohydrates, providing 30-35 grams. Protein intake is higher, ranging from 1.5 to 25 grams, primarily from sugar beans and Veg Breyani. Fat content remains low at 0.3 to 6 grams. The meals are rich in Vitamin A (20-30 µg) from yellow vegetables and Vitamin C (5-10 mg) from the vegetables as well. Significant amounts of calcium (10-20 mg) and iron (0.5-1 mg) are provided by sugar beans and yellow vegetables. The yellow vegetables and Veg Breyani provide carotenoids, enhancing the antioxidant profile of the meal. The fibre content from beans, Phuthu, and vegetables ranges from 8 to 12 grams, supporting digestive health and maintaining a healthy weight.

- ***Friday***

Friday's meal plan features breakfast, canned pilchards, rice, green vegetables in season, and tomatoes. The energy content ranges from **334.72 to 627.60 kJ (80-150 kcal)**, with carbohydrates contributing 18-30 grams. The main sources of carbohydrates are rice, green vegetables, and tomatoes. Among these, rice contributes the most carbohydrates, providing 2530 grams. Protein intake is higher, ranging from 1.5 to 20 grams, primarily from canned pilchards. Fat content varies between 0.3 to 10 grams, with pilchards providing healthy fats. The meals are rich in Vitamin A (5-10 µg) from green vegetables and tomatoes, and Vitamin C (5-10 mg) from tomatoes. Essential minerals like calcium (10-20 mg) and magnesium (5-10 mg) are provided by green vegetables. Phytochemicals such as flavonoids and carotenoids are present in green vegetables and tomatoes, contributing to the antioxidant intake. The fibre content from rice, vegetables, and tomatoes ranges from 3 to 5 grams, aiding in digestion and overall health. Iron content is around 1-2 mg, primarily from canned pilchards and green vegetables.

5.3.4 Comparative Analysis of Schools A & B, NSNP against the FBDGs Guidelines

5.3.4.1 The South African Food-Based Dietary Guidelines (FBDGs)

According to Vorster et al, (2013, p. 6), the Department of Health formally adopted the set of FBDGs in 2003 to form the basis of nutrition communication to the public, with the addition of a guideline on sugar intake (which was based on the relationship between sugar consumption and dental caries). The final set of 11 guidelines of which 10 apply to the age group of our study is listed in Table 5.7.

Table 5.7: First set of South African food-based dietary guidelines, 2003

Guideline	Reason
Variety is Essential	Consuming a wide range of foods ensures that you get all the necessary nutrients for optimal health.
Regular Physical Activity	Being active is a crucial part of maintaining a healthy lifestyle.
Starchy Foods	These should be a staple in most meals, providing essential energy and carbohydrates.
Vegetables and Fruits:	Aim for at least 400 grams (5 portions) daily to get vital vitamins, minerals, and fibre.
Legumes and Soya	Regular consumption of dry beans, split peas, lentils, and soya is recommended for their protein and fibre content.
Dairy Products	Include milk, maas, or yoghurt daily to meet calcium and vitamin D needs.
Protein Sources:	Fish, chicken, lean meat, or eggs should be part of the daily diet to provide essential amino acids and other nutrients.
Hydration:	Drink plenty of clean, safe water to stay hydrated.
Healthy Fats	Use fats sparingly, focusing on healthier options like vegetable oils.
Limit Sugar and Salt	Reduce the intake of sugary foods and drinks and use salt sparingly to maintain healthy blood pressure levels.

The guidelines in Table 5.7 were translated into the following graphic by the DoE (2020).

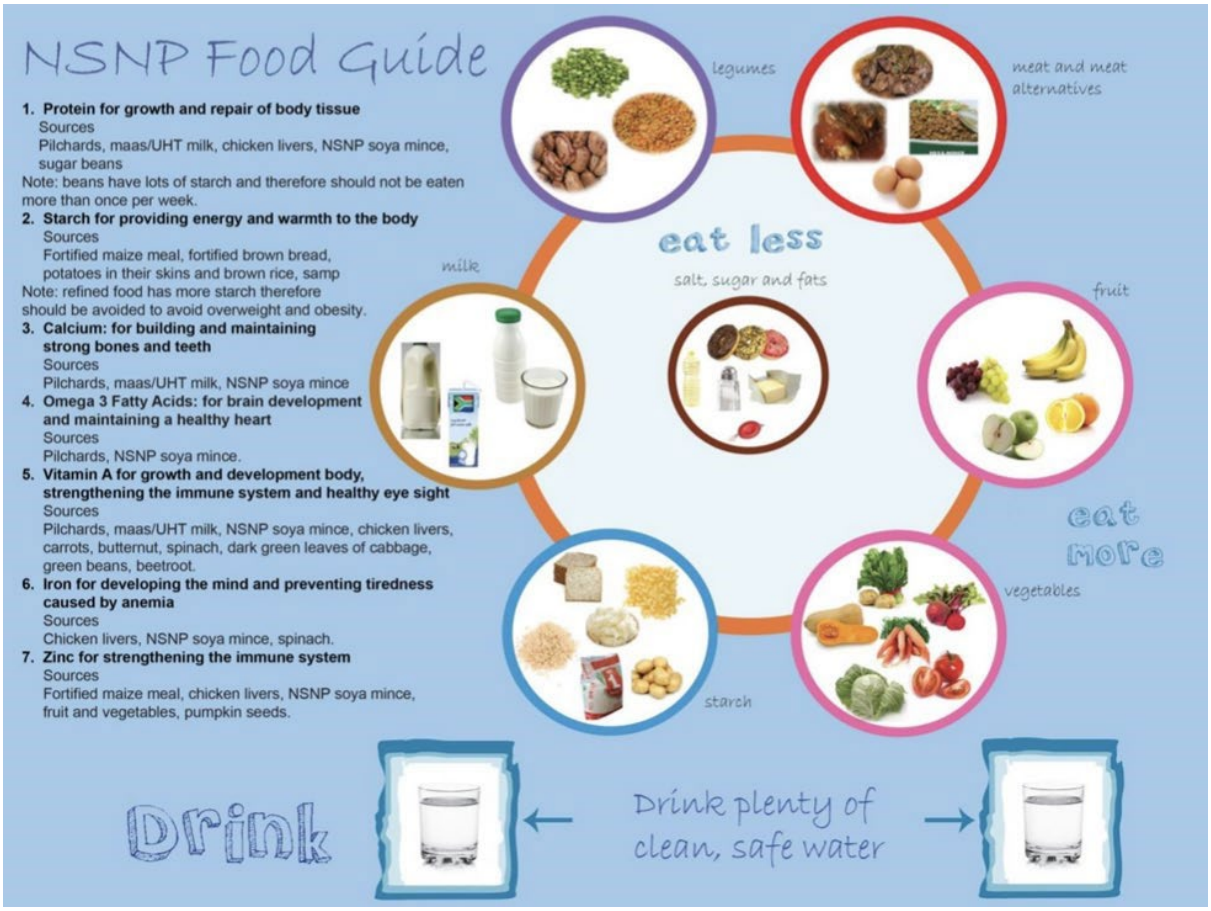


Fig 5.3: NSNP Food Guide

The South African Food-Based Dietary Guidelines (FBDGs) offer a comprehensive framework aimed at promoting healthy eating habits and preventing malnutrition and non-communicable diseases. These guidelines emphasize the importance of consuming a variety of foods to ensure a balanced intake of essential nutrients. Regular physical activity is also highlighted as a crucial component of a healthy lifestyle.

Starchy foods, such as bread, rice, maize, and potatoes, are recommended as staples in most meals to provide necessary energy and carbohydrates. The recommended daily energy intake for children aged 7-8 years is **5857.6 - 6694.4 kJ (1400-1800 kcal)**, with carbohydrates making up **184-198 grams** of this intake.

Vegetables and fruits are crucial components of the diet, with at least 400 grams (5 portions) recommended daily. These foods provide essential **fibre (25-30 grams)**, vitamins, and minerals, including **Vitamin A (500 µg)**, **Vitamin C (25-30 mg)**, **Vitamin K (85-100 µg)**, and **potassium (2000-2300 mg)**.

Legumes and soya are encouraged for their protein and fibre content, while dairy products are recommended to meet calcium and vitamin D needs. Protein sources like fish, chicken, lean meat, and eggs are advised to be part of the daily diet to provide essential amino acids and other nutrients. Dry beans, split peas, lentils, and soya should be consumed regularly as they are excellent sources of **protein (15-19 grams)**, **iron (6.1 mg)**, **zinc (5 mg)**, and **Vitamin B9 (folate) (200 µg)**. Dairy products, such as milk, maas, or yoghurt, should be included daily to meet **calcium needs (800-1200 mg)** and provide **Vitamin D (10-15 µg)** and **Vitamin B2** (**riboflavin) (0.8 mg)**.

Protein from fish, chicken, lean meat, or eggs is also essential, with 1-2 servings recommended daily. These foods provide important nutrients like **Vitamin B12 (1.0-1.2 µg)**, **Vitamin B3 (niacin) (8-9 mg)**, **Vitamin B6 (0.6 mg)**, and **phosphorus (800-1200 mg)**.

Hydration is vital, and the guidelines stress the importance of drinking lots of clean, safe water, aiming for at least 6-8 glasses daily. Fats should be used sparingly, with a daily **intake of 48 grams**, focusing on healthier fats like vegetable oils. **Vitamin E (7 mg)** and **omega-3 fatty acids** should be included in the diet through polyunsaturated fats.

Sugar and foods and drinks high in sugar should be limited to **less than 10% of total daily energy intake**, while salt intake should be reduced to l**ess than 5 grams** (about one teaspoon) per day. This helps maintain healthy blood pressure levels. Additionally, **iodine (90 µg)**, **manganese (1.5-2.0 mg)**, and **selenium (30 µg)** are important minerals that should be included in the diet.

- ***School A***

School A's meal plan is the most closely aligned with the South African Food-Based Dietary Guidelines (FBDGs). It provides a daily energy intake of **8007.756 kJ (1912.5 kcal)**, which exceeds the recommended range of **5857.6 - 6694.4 kJ (1400-1800 kcal)**. This ensures that

children receive sufficient energy for their daily activities and growth. In terms of protein, School A offers **52 grams per day**, significantly exceeding the daily requirement of 1**5-19 grams.** This high protein intake supports muscle development and overall growth. The carbohydrate content is also high at **354.5 grams per day**, well above the recommended **184198 grams**, providing ample energy for active children.

However, the **fat content is 15.5 grams per day**, which is below the recommended 48 grams. While this may help in managing weight, it is essential to ensure that children receive enough healthy fats for brain development and hormone production. The fibre content is **29 grams per day**, meeting the daily requirement of 25-30 grams, which is beneficial for digestive health. School A excels in providing vitamins and minerals, with Vitamin A at 788 µg (requirement: 500 µg) and iron at 12.7 mg (requirement: 6.1 mg). However, Vitamin C is only 2 mg, falling short of the 25-30 mg requirement, and calcium is 163.125 mg, below the 8001200 mg requirement. The high sugar content in some meals, particularly those with instant porridge, and the fat content need to be managed to align better with the FBDGs.

The insufficient intake of Vitamin C (2 mg vs. 25-30 mg required) and calcium (163.125 mg vs. 800-1200 mg required) highlights the lack of essential micronutrients, which are crucial for immune function and bone health.

- ***School B***

In School B the daily energy intake is **4310 kJ (1030.23 kcal)**, which is below the recommended range of **5857.6 - 6694.4 kJ (1400-1800 kcal)**. This could lead to insufficient energy levels for children, affecting their overall activity and growth. The protein content is 28.06 grams per day, meeting the daily requirement of 1**5-19 grams**, and the carbohydrate content is 209.81 grams per day, which is within the recommended range of **184-198 grams**.

However, the fat content is **11.88 grams per day**, significantly below the recommended **48 grams**, which may impact the intake of essential fatty acids necessary for brain development. Fibre intake is only **3.3 grams per day**, far below the recommended **25-30 grams**, which could affect digestive health. While School B provides moderate amounts of vitamins and minerals, it falls short in some areas. Vitamin A is **881.75 µg** (requirement: 500 µg), iron is **9 mg**

(requirement: 6.1 mg), but Vitamin C is only **4.6 mg** (requirement: 25-30 mg), and calcium is **405 mg** (requirement: 800-1200 mg).

The low energy intake (4310 kJ vs. 5857.6 - 6694.4 kJ required) indicates food insecurity, while the inadequate fat (11.88 grams vs. 48 grams required) and fibre intake (3.3 grams vs. 25-30 grams required) reflect poor dietary diversity and inadequate dietary intake. The shortfall in Vitamin C (4.6 mg vs. 25-30 mg required) and calcium (405 mg vs. 800-1200 mg required) further underscores the risk of hidden hunger and its associated health impacts.

- ***NSNP (National School Nutrition Programme)***

The NSNP provides essential nutrients but generally falls short in meeting the daily requirements. The energy provided per meal ranges from 334.72 to 669.44 kJ (80-160 kcal), which is **significantly lower than the daily requirement** of **5857.6 - 6694.4 kJ (1400-1800 kcal)**. This could lead to energy deficiencies in children. Protein intake ranges from **1.5 to 12 grams** per meal, which may not meet the daily requirement of **15-19 grams**. Carbohydrate intake is **18-35 grams** per meal, potentially insufficient to meet the daily requirement of **184198 grams**. Fat intake is **0.3 to 10 grams** per meal, below the recommended **48 grams**, and fibre intake is **1 to 6 grams** per meal, which may not meet the daily requirement of **25-30**

grams.

The NSNP provides essential vitamins and minerals but in lower amounts. **Vitamin A is 5-10 µg** (requirement: 500 µg), **Vitamin C is 5-15 mg** (requirement: 25-30 mg), **calcium is 200-250 mg** (requirement: 800-1200 mg), and **iron is 0.5-1 mg** (requirement: 6.1 mg). The insufficient intake of Vitamin A (5-10 µg vs. 500 µg required), Vitamin C (5-15 mg vs. 25-30 mg required), calcium (200-250 mg vs. 800-1200 mg required), and iron (0.5-1 mg vs. 6.1 mg required) highlights the risk of hidden hunger and its severe consequences on children's health and development.

The data from School A, School B, and NSNP menus reveal the hidden potential of malnutrition in different forms. School A's menu, while providing sufficient energy and protein, has a high sugar content and low-fat intake, which could lead to potential obesity and deficiencies in essential fatty acids. The low intake of Vitamin C and calcium also poses a risk

for deficiencies. School B's menu falls short in providing adequate energy, fat, and fibre, which may lead to undernutrition and related health issues. The NSNP's menu reflects significant food insecurity and inadequate dietary intake, which could result in potential deficiencies in essential nutrients.

5.3.4 Overall Analysis of Research Question 1

The results from Research Questions 1(a) and 1(b) indicate that physical examinations alone cannot assess the micronutrient deficiencies among Foundation Phase school children in Driefontein and Kleinfontein, Ladysmith, KwaZulu-Natal. It is essential to evaluate school meal plans and the NSNP to determine if children receive adequate nutrition. Data from School A, School B, and NSNP menus reveal various forms of malnutrition. Inadequate dietary intake and poor dietary diversity are prevalent in these schools. Despite the NSNP, many children in these low-income communities still suffer from essential micronutrient deficiencies. This raises critical questions about the effectiveness of current school-feeding programmes in improving children's health and academic performance. The next section explores other contributing factors to micronutrient deficiencies from stakeholders' perspectives and examines the effectiveness of school-feeding programmes.

5.4 Presentation of the Results to Research Question 2

- *What factors influence the Foundation Phase school children in the Driefontein and Kleinfontein areas' nutritional micronutrient status?*

In other words, we ask the questions:

- What socioeconomic, educational, and environmental factors contribute to these deficiencies?
- How effective is the current school-feeding program in addressing these micronutrient deficiencies?

5.4.1 Presentation of the Results to Research Question 2(a)

- *What socioeconomic, educational, and environmental factors contribute to these deficiencies?*

The data set consisted of questionnaires, focus group discussions (FGDs) and observations which were conducted with the four stakeholder groups: cooks, principals, suppliers, and Foundation Phase teachers (FPTs) across two schools, School A and School B. The total response rate was 93.3%, with only one participant, a Foundation Phase teacher from School B, not responding. In total, 15 participants were involved: 8 from School A (1 principal, 4 teachers, 2 cooks, and 1 food supplier/handler) and 7 from School B (1 principal, 3 teachers, 2 cooks, and 1 food supplier).

The analysis of the FGD protocol in Chapter 4 focused on five key themes, primarily addressing the causes of malnutrition in school children. The argument presented here is that the factors influencing malnutrition are intricately linked to broader questions, such as understanding malnutrition, its impact on the learning and development of foundation phase learners and determining effective strategies to combat it. Therefore, the analysis of these questions is included in addition to the analysis of stakeholder perceptions of the causes of malnutrition. This comprehensive approach is essential for guiding the development of targeted and effective interventions to address the multifaceted issue of child malnutrition.

- Understanding Malnutrition
- School Garden and Fruit Availability
- Impact of Malnutrition on Learning and Growth
- Preventing Malnutrition in Schools & Strategies for Addressing (Potential) Malnutrition Cases
- Stakeholder Perceptions on Key Areas of Improvement

Through this analysis, we aim to uncover the multifaceted factors influencing malnutrition and propose actionable strategies to enhance the nutritional status and overall well-being of school children in these communities.

5.4.1.1 Analysis of Stakeholder Responses on Causes of Malnutrition

The following four themes were elicited:

- Socioeconomic Constraints
- Lack of Nutritional Balance
- Parental and Caregiver Influence
- Nutritional Education and Awareness

5.4.1.1.1 Socioeconomic Constraints

Firstly, the theme of ***Socioeconomic Constraints*** emerged prominently, with 33% of participants (5 out of 15) contributing to this theme. This included responses from two cooks (Mama Khumalo from School A and Mama Nxumalo from School B), two suppliers (Mr. Zulu from School A and Mr. Thabede from School B), and one principal (Mr. Khanyile from School B). For instance, Mr. Zulu from School A noted, "*What causes children's malnutrition is not getting nutritious food, that's why the Department of Education released this program so that children will get nutritious food because some families do not afford nutritious food*." Similarly, Khanyile from School B mentioned, "*We can say that not getting the right food that the child needs, maybe because they can't afford it at home, but it is not enough feeding*."

Socioeconomic constraints encompass various aspects. Many families in these areas struggle with poverty, which limits their ability to purchase nutritious food. As Mr. Zulu highlighted, financial hardship means that families often rely on cheaper, less nutritious options, such as porridge and potatoes, which are starchy and lack essential vitamins and minerals. The lack of stable employment further exacerbates the issue, as Mama Nxumalo from School B pointed out, "*It can happen that there is no one working at home*." Without a steady income, families cannot consistently afford a balanced diet, leading to nutritional deficiencies. Even when families have some financial resources, access to nutritious food can be limited. Rural areas often have fewer grocery stores and markets that offer fresh produce and healthy food options. This limited access forces families to rely on whatever is available, which may not be nutritionally adequate. Socioeconomic constraints also impact food security, meaning that

families may experience periods where they do not have enough food to meet their dietary needs, leading to malnutrition.

Educational opportunities are also affected by socioeconomic status, influencing nutritional knowledge and practices. Families with limited financial resources may not prioritize education, leading to a lack of awareness about proper nutrition. Miss Mazibuko from School A highlighted this issue, stating, "*Lack of nutrition education, kids even adults in general have limited understanding of healthy eating habits and the importance of essential nutrients.*" While programmes like the NSNP aim to address these issues, the effectiveness of such programmes can be hindered by socioeconomic constraints. For example, Mthembu from School A noted an imbalance in the nutrients provided by the school nutrition program, indicating that even with support, there are gaps that need to be addressed.

5.4.1.1.2 Lack of Nutritional Balance

The second theme, ***Lack of Nutritional Balance*** was evident in 27% of the responses (4 out of 15) discussing this aspect. This included two cooks (Mama Khumalo from School A and Mama Nxumalo from School B) and two principals (: Mr. Mthembu from School A and Mr. Khanyile from School B). Mama Khumalo from School A emphasized, "They do not get enough vitamins, especially in the rural areas where we often eat porridge and potatoes, which are starchy and show that the child's diet is not balanced properly." Mr. Mthembu from School A added, "*Yeah, it's because of failure to supply proteins, like meat, there is no meat. Instead of meat, they give us beans. Okay. But there is an imbalance in most nutrients in the school nutrition program*."

5.4.1.1.3 Parental and Caregiver Influence

20% of participants (3 out of 15) contributed to the third theme, ***Parental and Caregiver Influence.*** The theme was derived from the discussion by two Foundation Phase teachers (Ms Thabede and Ms Mazibuko both from School A) and Mama Nxumalo (the cook from School B), with. Mama Nxumalo highlighted, "*It can happen that there is no one working at home, or sometimes there is no caregiver even if there is food, there is no one to take care of the child*." Ms Thabede elaborated, "*Lack of parental guidance also can have an impact on what a child*

eats as I have mentioned earlier that some learners come from homes where no one would bother to check them before going to school."

5.4.1.1.4 Nutritional Education and Awareness

The theme of Nutritional Education and Awareness was highlighted by two Foundation Phase teachers (Ms Thabede and Miss Mazibuko both from School A), with 13% of participants (2 out of 15) contributing to this theme. Ms Mazibuko from School A stated, "Lack of nutrition education, kids even adults in general have limited understanding of healthy eating habits and the importance of essential nutrients. People especially from rural areas where these schools are in have limited access to healthy food."

These insights are crucial for understanding the factors influencing the nutritional status of Foundation Phase school children in Driefontein and Kleinfontein. The stakeholders' perspectives underscore the need for a multifaceted approach to address malnutrition, involving proper food provision, balanced diets, and comprehensive nutritional education. This understanding informs the development of effective strategies to improve the nutritional status and overall well-being of the children in these communities.

5.4.1.2 Analysis of Stakeholder Responses on Understanding Malnutrition

The analysis revealed the following three key themes:

- Nutritional Deficiency and Health Impact
- Diet Quality and Food Preparation
- Balanced Diet and Nutrient Sufficiency
- Comprehensive Understanding of Malnutrition

5.4.1.2.1 Nutritional Deficiency and Health Impact

Firstly, the theme of ***Nutritional Deficiency and Health Impact*** emerged prominently, with 27% of participants (4 out of 15) contributing to this theme. This included responses from two cooks (Mama Khumalo from School A and Mama Nxumalo from School B) and two suppliers (Mr. Zulu from School A and Mr. Thabede from School B). For instance, Mama Khumalo from School A noted, "*If children eat food that lacks nutrition, they can get diseases, fall ill, and their bodies will not develop as they should*." Similarly, Mr. Zulu from School A highlighted the importance of nutritious foods like vegetables, maas, and rice.

5.4.1.2.2 Diet Quality and Food Preparation

The second theme of ***Diet Quality and Food Preparation*** was evident in the responses from cooks in each school, with 13% of participants (2 out of 15) discussing this aspect. Mama Nxumalo from School B stressed, "*Malnutrition in a child is caused by not getting healthy food and often eating food that is high in fats and salt. A child should eat boiled food most of the time.*"

5.4.1.2.3 Balanced Diet and Nutrient Sufficiency

The third theme, ***Balanced Diet and Nutrient Sufficiency***, was discussed by principals from each school and two FPTs from School A (Ms Mazibuko and Ms Thabede) with 27% of participants (4 out of 15) contributing to this theme. Mthembu from School A defined malnutrition as "*incorrect feeding, encompassing both underfeeding and overfeeding*." Miss Mazibuko from School A stressed the importance of a balanced diet that provides sufficient nutrients, vitamins, and minerals.

5.4.1.2.4 Comprehensive Understanding of Malnutrition

Lastly, the theme of ***Comprehensive Understanding of Malnutrition*** was highlighted by Foundation Phase teachers from School A, with 13% of participants (2 out of 15) contributing

to this theme. Ms Mazibuko from School A stated, "*Malnutrition is a condition that occurs when an individual's diet does not provide enough nutrients, vitamins, or minerals for optimal health*."

The varied responses from the stakeholders highlight different aspects of malnutrition, reflecting their roles and perspectives. The cooks and suppliers focused on the practical aspects of food provision and preparation, emphasizing the immediate health impacts of poor nutrition. The principals provided a broader view, acknowledging both underfeeding and overfeeding as forms of malnutrition. The Foundation Phase teachers offered a detailed understanding, linking malnutrition to the lack of essential nutrients.

5.4.1.3 Analysis of Stakeholder Responses on Preventing Malnutrition in Schools The analysis yielded the following four key themes:

- Nutrition Education
- Provision of Balanced School Meals
- Promotion of Gardening
- Ensuring Balanced Diets
- Ensuring Access to Food and Clean Water

5.4.1.3.1 Nutrition Education

Nutrition Education is a prominent theme, highlighted by three participants, one cook and two teachers (20% of the total 15 participants), indicating a significant focus on education as a tool to combat malnutrition. Mama Mtambo (Cook, School A) believes that families should be informed about buying nutritious food. She stated, "*They should tell the families to buy nutritious food*." This highlights the importance of educating families on the benefits of a balanced diet and how to achieve it within their means. Similarly, Miss Mbhele (Teacher, School A) emphasizes integrating nutrition education into the curriculum. She suggested, "*The school can start by providing balanced school meals, promote nutrition education by integrating nutrition and health education into the curriculum*." By teaching students about healthy eating habits and the nutritional value of different foods, schools can empower children to make

informed choices. Ms Thabede (Teacher, School B) supports this by advocating for balanced diets according to department-issued menus, ensuring that children receive a variety of nutrients. She mentioned, "*Schools should balance the diet as the department sometimes issues a menu, so the cooks need to cook according to the menu they have been given because the menu has protein, vitamins, and starch*."

5.4.1.3.2 Provision of Balanced School Meals

The provision of School Meals is another significant theme. It was mentioned by three participants, one Cook and two FPTs (20% of the total 15 participants), showing a strong emphasis on the role of school-provided meals. Mama Mabaso (Cook, School A) points out that children can benefit from the food provided at school. She said, "*I think they can benefit from the food provided at school*," which is particularly important for those who may not have access to balanced meals at home. Mr. Thabede (Supplier, School B) stresses the importance of balancing the diet according to the department-issued menu, ensuring that meals are rich in essential nutrients. He argues, "*Well, in my opinion, schools should balance the diet as the department sometimes issues a menu, so the cooks need to cook according to the menu they have been given because the menu has protein, vitamins and starch, so let's balance these things so that the children will not get sick.*" Ms Thango (Teacher, School A) emphasizes the need to ensure all children get food, highlighting the fundamental role of schools in providing regular, nutritious meals to prevent malnutrition. She stated, "What we can do in this school is to make sure that the children get food and that no one ends up without it."

5.4.1.3.3 Promotion of School Garden and Fruit Availability

The promotion of food gardens in schools is a recurring theme among participants, with several advocating for their implementation as a sustainable solution to improve nutrition. However, the reality is that none of the schools currently have active food gardens. School A has no food garden, as confirmed by Mama Mtambo (Cook, School A), who stated, "No, we have never seen one (Laughing). There is no garden at this school." Similarly, Mr. Mthembu (Principal, School B) also confirmed the absence of a garden, stating, "We once had it, but we usually use

summertime because there is rainfall, but now there is no garden." Khanyile (Teacher, School B) confirmed this, stating, "No, we don't have a garden."

Despite the absence of food gardens, three participants (20% of the total 15 participants), indicated a strong interest in food gardening as a practical solution to malnutrition. Mr. Zulu (Supplier, School B) and Mama Khumalo (Cook, School A) both advocate for encouraging families and schools to grow vegetables. Mr. Zulu mentioned, "*The only thing they can do is encourage them to grow vegetables and everything that children need at home and at school so that children can eat food with proper nutrition.*" This approach not only provides fresh produce but also educates students about agriculture and the importance of fresh, home-grown food. Mama Khumalo added, "The school should have a small garden to grow vegetables instead of buying them. The children can take care of the garden." Mr. Mthembu (Principal, School B) suggests using the school garden to supplement food supplies, which can help fill gaps in the menu and enhance the nutritional value of meals. He stated, "We must use the school garden to supply the food, to supplement the food that is being supplied by the supplier. If there is a shortage of some vegetables to improve vitamin content in the ration of the learners, we should have a school garden."

While the promotion of food gardens is widely supported by participants, the current lack of active gardens in both School A and School B highlights a gap between advocacy and implementation. This gap suggests that while the idea of food gardens is recognized as beneficial, practical challenges or resource limitations may be preventing their establishment and maintenance. Establishing food gardens could provide fresh produce, enhance the nutritional value of school meals, and serve as an educational tool for students.

5.4.1.3.4 Ensuring Balanced Diets

This theme was mentioned by two participants (13% of the total 15 participants), showing a focus on the importance of balanced diets. Ensuring Balanced Diets is a theme highlighted by Ms Thabede (Teacher, School B) and Ms Mbhele (Teacher, School A). Ms Thabede emphasizes the importance of adhering to the department-issued menu, which includes a variety of nutrients. Miss Mbhele suggests providing balanced school meals and promoting healthy snacking, such as offering fruits. She stated, "Encourage healthy snacking by offering nutritious snacks such as

fruits since the suppliers don't supply fruits more often." This ensures that children receive a well-rounded diet that includes all necessary vitamins and minerals. This theme was mentioned by two participants (13% of the total 15 participants), showing a focus on the importance of balanced diets.

5.4.1.3.5 Ensuring Access to Food and Clean Water

Access to Food and Water is another critical theme. It was mentioned by two participants (13% of the total 15 participants), emphasizing the necessity of access to food and clean water. Ms Thango (Teacher, School A) stresses the importance of ensuring that no child goes without food. Schools need to have systems in place to identify and support children who may not have access to regular meals. She stated, "*What we can do in this school is to make sure that the children get food and that no one ends up without it*." Ms Thabede (Teacher, School A) highlights the need to provide access to clean drinking water, ensuring that students stay hydrated and healthy throughout the school day.

5.4.1.4 Analysis on the Impact of Malnutrition on Learning and Growth

In examining the responses from the various stakeholders across Schools A and B, several key themes emerge regarding the impact of malnutrition on the learning process and growth of students.

- Cognitive and Academic Performance
- Physical Growth and Health
- Absenteeism and Engagement
- Concentration and Focus
- Emotional and Mental Health

5.4.1.4.1 Cognitive and Academic Performance

Cognitive and Academic Performance is a prominent theme, highlighted by multiple participants. This theme was highlighted by three participants (20% of the total 15 participants), indicating a significant focus on the cognitive and academic impacts of malnutrition. Mama Khumalo (Cook, School A) believes that malnutrition affects a child's intelligence and their ability to understand lessons. She stated, "*A child's intelligence will be affected, they will not grow well because they eat food that lacks nutrition, and they may not understand their lessons well because they are hungry*." Similarly, Mama Nxumalo (Cook, School B) emphasized the hindrance to learning caused by hunger, saying, "*How can a child learn on an empty stomach? It really hinders the child. It will prevent the child from learning if they haven't eaten*." Ms Mbhele (Teacher, School A) also noted the academic consequences, stating, "*Poor academic achievement, micronutrient deficiencies can lead to low grades and poor attendance*."

5.4.1.4.2 Physical Growth and Health

Physical Growth and Health is another significant theme. It was mentioned by one participant (7% of the total 15 participants), showing a focus on the physical health impacts of malnutrition. Mr. Mthembu (Principal, School B) pointed out the physical consequences of nutrient deficiencies, stating, "*If the ration is running short of proteins, there is no growth physically to the learners. If there is a shortage of vitamins, the power to reason is hindered because we need vitamins to see properly just like vitamin A*." This highlights the importance of a balanced diet for physical growth and cognitive function.

5.4.1.4.3 Absenteeism and Engagement

Absenteeism and Engagement is a recurring theme, with several participants suggesting that malnutrition leads to increased absenteeism and reduced engagement in school. This theme was mentioned by two participants (13% of the total 15 participants), indicating a concern for the attendance and engagement of malnourished students. Mr Khanyile (Principal, School B) mentioned, "*It can increase absenteeism in school and the student falls behind others and finds*

out that he is failing in the end." Ms Thabede (Teacher, School A) added, "*Reduced engagement, malnutrition can cause learners to be less engaged in the learning process*."

5.4.1.4.4 Concentration and Focus

Concentration and Focus is another critical theme. It was mentioned by two participants (13% of the total 15 participants), emphasizing the necessity of proper nutrition for maintaining concentration and focus in class. Ms Mazibuko (Teacher, School A) highlighted the impact of micronutrient deficiencies on concentration, stating, "*Reduced concentration, micronutrient deficiency can lead to difficulty focusing in class*." Mama Mabaso (Cook, School B) also noted the effects on focus, saying, "*They can't focus, sometimes they fall asleep during lessons because they are trying to avoid the hunger pangs. Sometimes they might even feel sick. When they feel unwell, they can't learn*."

5.4.1.4.5 Emotional and Mental Health

Emotional and Mental Health is another theme that emerged from the responses. This theme was mentioned by one participant (7% of the total 15 participants), highlighting the impact of malnutrition on students' emotional and mental well-being. Ms Mazibuko (Teacher, School A) pointed out the emotional consequences of malnutrition, stating, "*Micronutrient deficit can lead to depression and low self-esteem to learners, and it can reduce their self-confidence*."

5.4.1.5 Analysis on Stakeholder Experiences and Perceptions Concerning Child Malnutrition and Strategies for Addressing Potential Malnutrition Cases

In the analysis of experiences and perceptions of various stakeholders concerning child malnutrition and their strategies for addressing potential malnutrition cases, a 100% prevalence rate was recorded among the 6 (40%) participants who responded. This ***proactive and supportive attitude towards combating malnutrition*** emerged as the sole theme.

5.4.1.5.1 Proactive and Supportive Attitude Towards Combating Malnutrition

From School A, Mama Khumalo (the cook), mentioned that if there is a malnourished student, they are instructed to give extra food to take home. Mama Khumalo stated, "*If there is a malnourished student, we are told that those who do not have proper meals at home should be given extra food to take home. We pack food for them in containers*." This proactive approach indicates an awareness of the issue and a willingness to support students beyond the school environment. From School B, Mama Nxumalo (the cook), noted that they have not encountered such a case but emphasized the importance of ensuring proper nutrition if it were to happen. Mama Nxumalo mentioned, "*It hasn't happened yet, but I think if it were to happen, that child should be taken care of to ensure they are getting proper nutrition. Perhaps we should also check if the food provided is enough*." This response suggests a readiness to address potential malnutrition cases, although it highlights a lack of direct experience with such situations.

The suppliers did not respond to this question at all. The principal from School A, Mr. Mthembu, reported no current cases of malnutrition but acknowledged the need to involve parents and seek advice from dieticians if such cases arise. Mr. Mthembu stated, "*No, we never experienced malnutrition in this school, well not now, when I became the principal, but we do have those learners that we help with food here and there. But if it happens in the future that there is such a problem, I think we must call the parents of the learners who are affected, so that they go to the dietician to get advice as to how they must feed their kids*." This response reflects a structured approach to handling potential malnutrition cases, emphasizing collaboration with parents and healthcare professionals. Similarly, the principal from School B, Mr. Khanyile, mentioned that they have not encountered malnutrition cases but would share their lunchboxes with struggling students before the nutrition program was implemented. Mr. Khanyile noted, "*No, we have never had one. We can improvise like before the nutrition program, when we see someone who is struggling, we would share our lunchboxes with him so that he will know that he will have the power to continue to study, but when the nutrition program came, we stopped*." This indicates a community-oriented approach to supporting students in need.

Foundation Phase teachers from School A provided additional insights. Miss Mazibuko from School A reported no recent cases of malnutrition, stating, "No, not recently." Meanwhile, Miss Mbhele from School A mentioned that they provide leftover food to a few learners to take home, which also benefits their families. Miss Mbhele explained, "*Even though I wouldn't call*

it a case, but we do have those few learners that we give the food that is left to after school, so they can eat at home. It even helps their family members. You know when school closes especially in June we take the stuff that is left and give it to them to eat at home because when we come back the food would have expired whereas there were learners who really needed that food." This practice highlights the teachers' awareness of the students' needs and their efforts to support them beyond the classroom.

5.4.1.6 Analysis of Stakeholder Perceptions on Key Areas of Improvement

The responses from various stakeholders highlighted several key areas for improvement in the feeding scheme, each reflecting the urgent need for better support and resources to combat child malnutrition effectively. The following five themes elicited were derived from an overall response rate of 8 out of 15 participants, resulting in a 53.3% overall response rate.

- Inclusion of Meat and Variety of Vegetables
- Budget and Timely Payments:
- Increase in Meal Frequency:
- Accurate Calculations and Resource Allocation:
- Funding and Policy Development:

These themes are elaborated upon below.

5.4.1.6.1 Inclusion of Meat and Variety of Vegetables

This theme was mentioned by 4 out of the 8 respondents (50%). Both cooks and principals emphasized the need to include meat in the meals to ensure children receive adequate proteins. For instance, Mama M from School A humorously suggested, "*They should include meat* (Laughing). *We already have starch from the porridge. They should include meat*." MN from School B added, "I *think maybe they should add more vegetables and fruits because the fruits they get are very few*." This sentiment was echoed by Mr Mthembu (Principal, School A), who stated, "*To the government, I recommend that there must be meat at school. Also, balance the*

ration of the learners." Mama Khumalo (Cook, School A), mentioned, "*We really request that they include meat, more fruits, and more vegetables, maybe even carrots.*"

Based on the results of Research Question 1, ensuring the inclusion of meat and a variety of vegetables in school meals is crucial for providing balanced nutrition to children. This would ensure they receive essential proteins and vitamins necessary for their growth and development. Without these improvements, children may continue to suffer from nutritional deficiencies, impacting their health and academic performance. The inclusion of diverse food options can help bridge nutritional gaps identified in Research Question1 and promote better health outcomes for children, ensuring they have the energy and nutrients needed for their daily activities.

5.4.1.6.2 Budget and Timely Payments

This theme was highlighted by 2 out of the 8 respondents (25%). The two suppliers from each school pointed out the critical issue of budget constraints and the need for timely payments. Mr Zulu, a supplier from School A, mentioned, "*Mostly the Department has a money problem. They should ensure that they increase the money given to us to improve the quality of nutritious food supplied*." Mr. Thabede, a supplier from School B, highlighted the impact of delayed payments, saying, "*First, they should raise the budget. Second, they must pay us on time. If the Department does not pay, some of us end up going to places that sell food that is not right*."

Ensuring timely payments and adequate budgets is essential for maintaining the quality and consistency of food supplies. In Driefontein, where the community has faced historical challenges, delays and budget constraints can lead to interruptions in food delivery, forcing suppliers to compromise on the quality of food. This can negatively affect the nutritional intake of children, exacerbating malnutrition issues. Timely payments and sufficient budgets are crucial, ensuring that children receive consistent and high-quality meals.

5.4.1.6.3 Increase in Meal Frequency

This theme was suggested by 1 out of the 8 respondents (12.5%). There was a suggestion to increase the number of meals provided per day. Currently, in School A, children receive two meals (breakfast and lunch), but an additional meal in the afternoon is recommended. Mr Mthembu, a principal from School A, explained, "if the government can add another meal, say "*If the government could increase the number of meals per day, provide a third meal at around two o'clock… because most of these learners have nothing to eat at home. They start eating here at school and end eating here at school.*"

Increasing the frequency of meals can significantly improve the nutritional status of children, especially those who do not have access to food at home. In Driefontein, where community support is vital, providing an additional meal can help bridge the gap and ensure children are not going hungry, which can improve their concentration and performance in school. Furthermore, increasing meal frequency can help address any hidden hunger issues as elaborated upon in Research Question 1, ensuring children have the energy and nutrients needed for their daily activities.

5.4.1.6.4 Accurate Calculations and Resource Allocation

This theme was mentioned by 1 out of the 8 respondents (12.5%). Mr Khanyile (Principal, School B) stressed the importance of accurate calculations for meal provisions to ensure that all children receive sufficient food. He suggested, "*They should use the right calculations, like those used by a caterer, to ensure no one goes without eating.*"

Accurate calculations and resource allocation are vital for ensuring that all children receive adequate portions of food. In Driefontein and Kleinfontein, where resources may be limited, precise calculations can prevent situations where some children go without eating, thereby reducing the risk of malnutrition and ensuring equitable distribution of resources.

5.4.1.6.5 Funding and Policy Development

This theme was highlighted by 1 out of the 8 respondents (12.5%). Ms Mbhele (FPT, School A) recommended increased funding for school meal programmes, the development and implementation of school nutrition policies, and the establishment of standards for healthy meals and snacks. She stated, "*I would ask the government to fund school meal programmes more, allocate sufficient resources for nutritious meal provision, develop and implement school nutrition policies, establish standards for healthy meals and snacks, provide nutrition education, and encourage public-private partnerships*."

Increased funding and robust policy development are essential for the long-term sustainability of school meal programmes. Establishing standards for healthy meals and snacks can ensure that children receive balanced nutrition. Additionally, providing nutrition education and fostering public-private partnerships can enhance the overall effectiveness of the NSNP program.

Overall, the analysis reveals a unanimous call for improvements in the quality, variety, and frequency of meals provided, as well as better financial management and policy support to ensure the sustainability and effectiveness of the feeding scheme. The stakeholders' responses underscore the critical need for a proactive and supportive approach to addressing child malnutrition.

5.4.2 Presentation of the Results to Research Question 2(b)

- *How effective is the current school-feeding program in addressing these micronutrient deficiencies?*

5.4.2.1 Analysis on the Current Feeding Scheme

Evaluating the current feeding scheme was essential to understand its effectiveness in addressing micronutrient deficiencies. Questions about the feeding scheme sought to gather opinions on its nutritional quality, variety, and overall impact on the children's health. In

examining the responses from various participants across Schools A and B, several key themes emerge regarding the perceptions of the current feeding scheme.

The fact that 53% of the participants responded to this question and expressed strong support for the feeding scheme has significant implications. It suggests that the feeding scheme is widely recognized as a crucial initiative that addresses the immediate nutritional needs of students, particularly those from food-insecure households in Driefontein and Kleinfontein.

5.4.2.1.1 Support for the Feeding Scheme in Low Socio-Economic Contexts

Support for the Feeding Scheme in Low Socio-Economic Contexts is a prominent theme, highlighted by multiple participants, indicates a significant level of support for the feeding scheme, particularly in the context of learners from Driefontein and Kleinfontein, which are low socio-economic areas. This theme was highlighted by three participants (20% of the total 15 participants). Mama Khumalo (Cook, School A) believes that the feeding scheme is beneficial because it ensures that children who come to school without having eaten anything receive food before starting their lessons. She stated, “It is a good initiative because families are different, some children come to school without having eaten anything, so they benefit a lot because they get food here before starting their lessons.” Similarly, Ms Nxumalo (Cook, School B emphasized the importance of the feeding scheme for children from homes with no food, saying, “Yes, it is a good idea because there are children who come from homes with no food.” Mr. Zulu (Supplier, School A) also supports the scheme, noting, “Yes, it is the right system because in these schools there are children who do not eat well at home and who do not have food, so some of them only eat at school.”

5.4.2.1.2 Impact on Concentration and Learning

Impact on Concentration and Learning is another significant theme. It was mentioned by two participants (13% of the total 15 participants), showing a focus on the impact of the feeding scheme on concentration and learning. Mr Thabede (Supplier, School B) pointed out that the feeding scheme makes a difference because it helps children who leave home without eating anything to concentrate better in class. He mentioned, “Well, I can say that it makes a difference

because there are children who leave home without eating anything and find out that even in class they can't even concentrate because they are hungry. So, if they have that one meal at school a day at least it can go a long way." Mr. Khanyile (Principal, School B) also noted the positive impact on students' ability to study, stating, "It helps those who are poor, who come to school with an empty stomach with an aim to study, but they won't be able to study when they are hungry, so at least they come to school hungry, eat and then study."

5.4.2.1.3 Need for Improvement

Need for Improvement is a recurring theme, with several participants suggesting that the feeding scheme needs to be enhanced. This theme was mentioned by two participants (13% of the total 15 participants), indicating a concern for the adequacy and balance of the meals provided. Mr. Thabede (Supplier, School B) highlighted the issue of insufficient food quantity, stating, "*If you look at the menu the quantity of food that they eat is too small. It's not designed to make you full just so you have something in your stomach. Like I said earlier that I'd ask the government to revise their budget*." Mr. Mthembu (Principal, School A) also emphasized the need for a balanced and improved meal, saying, "*I think it must be improved. Learners must get a full meal with sometimes a piece of meat, just a balanced ration, piece of meat, potatoes, rice. There is rice, but we eat rice sometimes together with cabbage, sometimes with beans. In other words, it must be improved and balanced*."

5.4.1.3.4 Nutritional Value

Nutritional Value is another critical theme. This theme was mentioned by one participant (7% of the total 15 participants), highlighting the importance of the nutritional content of the meals. Miss Mbhele (Teacher, School A) expressed satisfaction with the nutritional value of the meals, stating, "I feel good because this combination provides a nutritious meal covering essential macronutrients and micronutrients."

The current feeding scheme is widely supported by participants, who recognize its importance in ensuring that children receive at least one meal a day, which helps them concentrate and learn better. However, there are concerns about the adequacy and balance of

the meals provided, suggesting a need for improvement. The analysis shows that the themes of support for the feeding scheme, impact on concentration and learning, and the need for improvement are the most prevalent, each mentioned by multiple participants, indicating their importance in the overall perception of the feeding scheme.

5.5 Conclusion

This chapter sought to present the findings of the study, which aimed to assess the current state of micronutrient deficiencies among Foundation Phase school children in the Driefontein and Kleinfontein areas in Ladysmith, KwaZulu-Natal. Additionally, the chapter aimed to identify the factors influencing their nutritional micronutrient status.

The findings from this study provide a comprehensive understanding of the nutritional status and dietary intake of Foundation Phase learners in Schools A and B. The physical assessments revealed that while most learners appeared well-nourished, there were notable differences in the prevalence of micronutrient deficiencies between the two schools. School A's learners generally exhibited good nutrition and health, with isolated cases of mild deficiencies. In contrast, School B's learners showed more frequent signs of micronutrient deficiencies, particularly in hair and skin health, indicating a need for targeted nutritional interventions and improved hygiene practices.

The analysis of the nutritional value of the meals provided by the schools highlighted areas of strength and concern. Both schools provided meals that met some nutritional needs, but there were significant gaps, particularly in vitamin and mineral intake. High sodium levels in School A's menu and the lack of vegetables and fruits in both schools' menus were identified as areas needing improvement. Ensuring a variety of nutrients is crucial for preventing deficiencies and supporting overall health.

Comparing the nutritional value of the meals to the NSNP and recommended dietary guidelines revealed that while School A's meal plan closely aligned with the guidelines, it exceeded the recommended energy intake and fell short in providing adequate fat and certain vitamins. School B's meal plan provided insufficient energy and fat, reflecting poor dietary diversity and inadequate intake. The NSNP, although providing essential nutrients, generally

fell short in meeting daily requirements, highlighting the risk of hidden hunger and its severe consequences on children's health and development.

The causes of malnutrition in Driefontein and Kleinfontein were found to be multifaceted, with socioeconomic constraints, lack of nutritional balance, limited nutritional education, and the absence of food gardens being key factors. These findings underscore the need for targeted interventions to improve food security, dietary diversity, and nutritional education.

The evaluation of the current school-feeding program revealed strong support for the feeding scheme, particularly in low socio-economic contexts, where it plays a crucial role in ensuring that children receive at least one meal a day. However, concerns about the adequacy and balance of the meals provided suggest a need for improvement. Participants highlighted the positive impact of the feeding scheme on concentration and learning, but also emphasized the need for enhanced meal quality and quantity.

Chapter 6, the concluding chapter, discusses the study’s results and relates them to the broader literature review. It explores the implications of the findings for theoretical, methodological, policy, and practice levels, while also providing recommendations for future research endeavours.

CHAPTER 6

Discussion, Conclusions, and Recommendations

6.0 Introduction

Theoretically, this study aimed to explore and address two major gaps: the persistent micronutrient deficiencies among children despite the presence of the National School Nutrition Programme (NSNP), and the effectiveness of the NSNP in providing adequate nutrient intake according to dietary guidelines. Empirically, the study sought to assess the prevalence of micronutrient deficiencies among Foundation Phase school children in Driefontein and Kleinfontein areas, evaluate the nutritional value of meals provided by the selected schools, and compare these nutritional values to recommended dietary guidelines. Additionally, guided by the UNICEF Conceptual Frameworks for Malnutrition (1990, 1992, and 2020), the study aimed to identify the socioeconomic, educational, and environmental factors contributing to these deficiencies and evaluate the effectiveness of the current school feeding program in addressing them.

To achieve these objectives, the study employed a cross-sectional case study design using mixed methods. This approach was chosen to provide a comprehensive snapshot of the current state of micronutrient deficiencies and the effectiveness of the school-feeding program at a specific point in time (Zheng, 2015). The cross-sectional design allows for the simultaneous collection of data from multiple sources, facilitating a thorough analysis of the research problem (Hassan et al., 2014). Data were collected through dietary surveys, nutritional assessments, and qualitative interviews with various stakeholders, including cooks, suppliers, principals, and foundation phase teachers. This methodology ensured a holistic understanding of the nutritional challenges faced by Foundation Phase school children in Driefontein and Kleinfontein and the factors influencing their micronutrient status.

This comprehensive theoretical and methodological approach was designed to provide a thorough understanding of the nutritional challenges faced by school children in Driefontein and Kleinfontein areas and to inform effective interventions that can improve their health and educational outcomes.

This concluding chapter synthesizes the key findings from the research, presenting a comprehensive discussion of the findings from the research, drawing conclusions and making recommendations based on the analysis of the nutritional status and dietary intake of Foundation Phase learners in Schools A and B. The scope of this chapter includes a detailed examination of the physical assessments of the learners, the nutritional value of the meals provided by the schools, the causes of malnutrition in Driefontein and Kleinfontein, and the effectiveness of the current school-feeding program in addressing micronutrient deficiencies. The chapter will draw conclusions about the effectiveness of the current school-feeding programmes and make recommendations for targeted nutritional interventions, improved meal planning, enhanced hygiene practices, and comprehensive nutritional education. These strategies aim to address the identified gaps and improve the overall well-being and academic outcomes of the learners in Driefontein and Kleinfontein.

6.1 Summary and Discussion of the Main Results

Micronutrient deficiencies can often be hidden or silent, not manifesting in overt physical symptoms until they reach advanced stages. The normal appearance of learners does not necessarily reflect their true micronutrient status. Research has shown that deficiencies in essential nutrients such as vitamin A, iron, and zinc can exist without obvious clinical signs. Therefore, relying solely on physical examinations to establish micronutrient deficiencies might not be sufficient. This underscores the importance of evaluating the meal plans of schools and the NSNP to ensure that children receive adequate nutrition and to identify potential gaps in their diets.

One major gap in the existing literature is the persistent micronutrient deficiencies among children, despite the presence of the NSNP. Many children, especially those in low-income communities, continue to suffer from deficiencies in essential micronutrients such as iron, zinc, and vitamin A. This “hidden hunger” has significant health and cognitive impacts on children, affecting their overall well-being and development. Another critical gap is the effectiveness of the NSNP in providing adequate nutrient intake in accordance with dietary guidelines. Research suggests that the program may not always meet the nutritional needs of children, leading to ongoing deficiencies. This raises important questions about how well the program is functioning and whether it is truly addressing the nutritional needs of school-age

children. Addressing nutrient deficiencies among children, especially foundation phase learners, presents several challenges. Socio-economic barriers such as poverty and food insecurity make it difficult for many families to afford nutritious foods, leading to diets that lack essential nutrients.

6.1.1 Summary of Research Question 1

6.1.1.1 Summary of Research Question 1(a)

The findings from Research Question 1(a) revealed insights into the nutritional status and overall health of the learners. While the majority of learners in both schools appeared well-nourished and healthy, notable differences in the prevalence of micronutrient deficiencies were observed. School A's learners generally exhibited good nutrition and health, with isolated cases of mild deficiencies. In contrast, School B's learners showed more frequent signs of micronutrient deficiencies, particularly in hair and skin health, indicating a need for targeted nutritional interventions and improved hygiene practices. The findings from the physical assessments highlight several key points: While both schools had a majority of well-nourished and healthy learners, School B showed more frequent signs of micronutrient deficiencies, particularly in hair and skin health. This suggests that targeted nutritional interventions are needed in School B to address these deficiencies and improve the overall well-being of the learners. The differences in the nutritional status of learners between the two schools underscore the importance of ensuring that children receive a balanced diet rich in essential nutrients. This aligns with the broader theme of preventing malnutrition in schools through the provision of balanced school meals. The presence of dandruff and ringworms in both schools highlights the need for improved hygiene practices to prevent and treat these conditions. This is crucial for maintaining the overall health and well-being of the learners.

The findings from the physical assessments highlight several key points:

- **Prevalence of Micronutrient Deficiencies:** While both schools had a majority of well-nourished and healthy learners, School B showed more frequent signs of micronutrient deficiencies, particularly in hair and skin health. This suggests

that targeted nutritional interventions are needed in School B to address these deficiencies and improve the overall well-being of the learners.

- **Importance of Balanced Diets**: The differences in the nutritional status of learners between the two schools underscore the importance of ensuring that children receive a balanced diet rich in essential nutrients. This aligns with the broader theme of preventing malnutrition in schools through the provision of balanced school meals.
- **Need for Improved Hygiene Practices:** The presence of dandruff and ringworms in both schools highlights the need for improved hygiene practices to prevent and treat these conditions. This is crucial for maintaining the overall health and well-being of the learners.

6.1.1.2 Summary of Research Question 1(b)

Research Question 1(b) focused on the nutritional value of the meals provided by the schools. The analysis highlighted areas of strength and concern in the dietary intake of the learners. Both schools provided meals that met some nutritional needs, but there were significant gaps, particularly in vitamin and mineral intake. High sodium levels in School A's menu and the lack of vegetables and fruits in both schools' menus were identified as areas needing improvement. Ensuring a variety of nutrients is crucial for preventing deficiencies and supporting overall health.

Both schools have gaps in vitamin and mineral intake, particularly on days without vegetables or fruits. Ensuring a variety of nutrients is crucial for preventing deficiencies and supporting overall health. Consistently high sodium intake in School A's menu could pose long term health risks, emphasizing the need for balanced sodium levels. Including more vegetables and fruits can help fill micronutrient gaps, and the limited sources of omega-3 fatty acids, such as pilchards on Friday, highlight the need for more sources of healthy fats throughout the week.

While both schools provide meals that meet some nutritional needs, there are significant gaps that need to be addressed to ensure a balanced diet and optimal health for the learners. Addressing these gaps through targeted nutritional interventions and improved meal planning can contribute to better health and academic outcomes for the children.

The findings from the nutritional value of the meals provided by the schools highlight several key salient Points:

- **Nutrient Deficiencies:** Both schools have gaps in vitamin and mineral intake, particularly in Vitamin C and calcium.
- **Balanced Diets:** Ensuring a variety of nutrients is crucial for preventing deficiencies and supporting overall health.
- **High Sodium Levels:** Consistently high sodium intake in School A's menu could pose long-term health risks.
- **Importance of Vegetables and Fruits**: Including more vegetables and fruits can help fill micronutrient gaps.
- **Omega-3 Fatty Acids:** Limited sources of healthy fats highlight the need for more diverse protein sources.

While both schools provide meals that meet some nutritional needs, there are significant gaps that need to be addressed to ensure a balanced diet and optimal health for the learners.

Addressing these gaps through targeted nutritional interventions and improved meal planning can contribute to better health and academic outcomes for the children.

6.1.1.3 Summary of Research Question 1(c)

Research Question 1(c) compared the nutritional value of the meals provided by the schools to the NSNP and recommended dietary guidelines. The recommended guidelines were based on the South African Food-Based Dietary Guidelines' (FBDGs) comprehensive framework for promoting healthy eating habits and preventing malnutrition. For foundation phase learners, the daily dietary nutrient recommendations suggest a balanced intake of energy, protein, carbohydrates, and fats, along with essential vitamins and minerals. The menus of School A, School B, and the NSNP reveal significant discrepancies when compared to these guidelines. The analysis showed, among the three meal plans, School A's menu is the most closely aligned with the nutritional guidelines, providing adequate or exceeding amounts of energy, protein, carbohydrates, fibre, vitamins, and minerals. The NSNP meal plan, while balanced, falls short in meeting the daily energy, protein, carbohydrate, fat, and fibre requirements. School B's menu

meets the daily requirements for protein and carbohydrates but falls short in energy and fibre intake.

School A's menu provides sufficient energy and protein but falls short in dietary diversity and adequate intake of essential nutrients. The high sugar content and low-fat intake do not align with the FBDGs' recommendations for balanced macronutrient intake. The insufficient intake of Vitamin C (2 mg vs. 25-30 mg required) and calcium (163.125 mg vs. 800-1200 mg required) highlights the lack of essential micronutrients, which are crucial for immune function and bone health. School B's menu meets the protein and carbohydrate requirements but fails to provide adequate energy, fat, and fibre. The low energy intake (4310 kJ vs. 5857.6 - 6694.4 kJ required) indicates food insecurity, while the inadequate fat (11.88 grams vs. 48 grams required) and fibre intake (3.3 grams vs. 25-30 grams required) reflect poor dietary diversity and inadequate dietary intake. The shortfall in Vitamin C (4.6 mg vs. 25-30 mg required) and calcium (405 mg vs. 800-1200 mg required) further underscores the risk of hidden hunger and its associated health impacts. The NSNP's menu reflects significant food insecurity and inadequate dietary intake. The low energy (334.72 to 669.44 kJ per meal vs. 5857.6 - 6694.4 kJ required), protein (1.5 to 12 grams per meal vs. 15-19 grams required), fat (0.3 to 10 grams per meal vs. 48 grams required), and fibre intake (1 to 6 grams per meal vs. 25-30 grams required) do not meet the daily requirements, leading to potential deficiencies in essential nutrients. The insufficient intake of Vitamin A (5-10 µg vs. 500 µg required), Vitamin C (5-15 mg vs. 25-30 mg required), calcium (200-250 mg vs. 800-1200 mg required), and iron (0.5-1 mg vs. 6.1 mg required) highlights the risk of hidden hunger and its severe consequences on children's health and development.

The results from the analysis of Research Question 1(c), show that the NSNP and school meal plans are symptomatic of hidden hunger in several ways:

- **Nutrient Deficiencies:** All three meal plans show significant deficiencies in essential vitamins and minerals. For instance, School A's menu lacks sufficient Vitamin C and calcium, while School B's menu falls short in Vitamin C and calcium as well. The NSNP meal plan is deficient in Vitamin A, Vitamin C, calcium, and iron. These deficiencies are classic indicators of hidden hunger, where the diet lacks the necessary micronutrients despite adequate caloric intake (Hidden Hunger Symptoms Revealed, n.d.).

- **Inadequate Macronutrient Intake**: The meal plans also fail to meet the recommended intake for macronutrients like energy, protein, fat, and fibre. For example, School B's menu provides insufficient energy and fat, and the NSNP meal plan does not meet the daily requirements for energy, protein, fat, and fibre. This imbalance can lead to poor growth, weakened immune systems, and cognitive issues (Hidden Hunger Symptoms Revealed, n.d.).
- **Food Insecurity:** The low energy intake in School B's and the NSNP's meal plans indicates food insecurity, which is a significant contributor to hidden hunger (Hidden Hunger in Children, n.d., p. 23). When children do not receive enough calories, their bodies cannot absorb and utilize the available nutrients effectively (Hidden Hunger in Children, n.d., p. 23).
- **Poor Dietary Diversity:** The lack of dietary diversity in the meal plans, particularly in School A's menu, which has high sugar content and low-fat intake, does not align with the balanced macronutrient recommendations. A diverse diet is crucial for providing a range of nutrients necessary for overall health (Hidden Hunger in Children, n.d., p. 23). These symptoms of hidden hunger can lead to long-term health issues, including stunted growth, poor academic performance, and increased susceptibility to infections (Hidden Hunger in Children, n.d., p. 23). Addressing these deficiencies through improved meal planning and ensuring a balanced intake of essential nutrients is vital for the health and development of children.

6.1.2 Discussion of Results of Research Question 1

The South African government has tried to improve child nutrition through the National School Nutrition Programme (NSNP), aiming to help underprivileged children (Munje & Jita, 2019; World-Food Programme, 2019). However, research by Shisana et al. (2020) shows that micronutrient deficiencies still exist despite these efforts. These results show that in the context of Driefontein and Kleinfontein schools, inadequate dietary intake and poor dietary diversity are prevalent. The results from Research question 1 reveal that the current state of micronutrient deficiencies among the Foundation Phase school children in the Driefontein and Kleinfontein areas, Ladysmith KwaZulu-Natal can't rely solely on physical examinations. There is a need to examine the meal plans of schools and the NSNP to determine whether the children receive adequate nutrition.

Micronutrient deficiencies, often referred to as “hidden hunger,” are a significant public health issue affecting millions of children worldwide, particularly in low-income communities. These deficiencies, which include essential vitamins and minerals such as iron, zinc, iodine, and vitamin A, can occur even when there is no apparent deficit in energy intake. This is often the result of consuming an energy-dense but nutrient-poor diet. Hidden hunger has severe consequences, including impaired physical growth, poor cognitive function, weakened immune systems, and increased susceptibility to infections.

As shown in the analysis of the data from School A, School B, and NSNP menus, the hidden potential of malnutrition is manifested in different forms. The study’s results corroborate the research findings that despite the implementation of the NSNP, many children in these low-income communities continue to suffer from deficiencies in essential micronutrients. The persistence of these deficiencies raises critical questions about the effectiveness of current school-feeding programmes in enhancing children’s health and academic performance.

Regarding the nutritional status and overall health of the learners as per the physical examinations, the results reveal that in School A, most learners are well-nourished, with only a few mild deficiencies. This matches findings from Wrottesley et al. (2023), which show that even in low- and middle-income countries, some children are well-nourished but still have micronutrient deficiencies. In School B, there are more frequent signs of deficiencies, especially in hair and skin health, which is common in disadvantaged settings (Best et al., 2010). In South Africa, hunger and poverty are major issues, with 6.8 million people going hungry daily, including 4.7 million in homes with small children (Statistics South Africa, 2019). This highlights the need to address micronutrient deficiencies to improve children’s development (Lu et al., 2016).

Regarding the nutritional value of the meals provided by the schools, the results show that both schools’ menus lack enough vegetables and fruits, which are essential for vitamins and minerals. This is a global issue where diets high in processed foods lead to poor nutrition (Wrottesley et al., 2023). The limited sources of omega-3 fatty acids in the menus also show the need for more diverse protein sources (Prevalence of specific micronutrient deficiencies in urban school-going children and adolescents in India, 2022).

Regarding the nutritional value of the meals provided by the schools to the NSNP and recommended dietary guidelines, the results reveal that School B and the NSNP meal plans show low energy intake, indicating food insecurity. This means children are not getting enough calories, which can affect their growth and cognitive development (Hidden Hunger Symptoms Revealed). Despite the NSNP's efforts, micronutrient deficiencies persist (Shisana et al., 2020). Because students often appear healthy, micronutrient deficiencies may continue to go undetected in studies relying solely on physical examinations.

Anomalies in the results include the high sodium intake in School A's menu, which can lead to long-term health risks like hypertension (Wrottesley et al., 2023). Despite generally good nutrition, School A still has isolated cases of deficiencies, while School B shows more frequent deficiencies, suggesting deeper issues. The differences in nutritional status between the schools may be due to socioeconomic disparities. School B's higher deficiencies could be linked to lower socioeconomic status, affecting access to nutritious food and healthcare (Hidden Hunger Symptoms Revealed). The high sodium levels and lack of dietary diversity may result from inadequate meal planning. Schools might lack the resources or knowledge to create balanced menus. Poor hygiene practices, indicated by dandruff and ringworms, can also worsen nutritional deficiencies.

These findings align with broader research showing that school-age children often face a double burden of malnutrition, with both micronutrient deficiencies and rising obesity rates (Wrottesley et al., 2023). The provision of nutrient-poor foods by schools exacerbates this issue (Best et al., 2010). Interventions like providing fortified foods at school can help address deficiencies (Wrottesley et al., 2023). Additionally, maternal education is linked to better child nutrition outcomes, highlighting the role of education in addressing deficiencies (Best et al., 2010).

6.1.2 Summary of Research Question 2

The analysis of Research Question 2, grounded in the UNICEF Conceptual Frameworks for Malnutrition (1990, 1992, and 2020), provided a comprehensive understanding of the causes of malnutrition in Driefontein and Kleinfontein and evaluated the effectiveness of the current school-feeding program in addressing micronutrient deficiencies.

6.1.2.1 Summary of Research question 2(a)

Research Question 2(a) explored the causes of malnutrition in Driefontein and Kleinfontein, guided by the UNICEF conceptual frameworks. The analysis identified several interconnected trends, including the significant impact of socioeconomic constraints, lack of nutritional balance, limited nutritional education, and the absence of food gardens. These factors contribute to malnutrition and highlight the need for targeted interventions to improve food security, dietary diversity, and nutritional education.

One of the main trends identified was the significant impact of **socioeconomic constraints** on malnutrition. This was highlighted by 33% of participants, who pointed out issues such as poverty and limited access to nutritious food. For instance, Mr. Zulu from School A noted, "*What causes children's malnutrition is not getting nutritious food, that's why the Department of Education released this program so that children will get nutritious food because some families do not afford nutritious food*." This trend underscores the basic causes identified in the 1990 UNICEF framework, where economic and social conditions play a crucial role in determining nutritional outcomes. The pattern of families relying on cheaper, less nutritious options due to financial hardship was a recurring theme, indicating a need for targeted interventions to improve food security and access to nutritious food.

Another significant pattern was the **lack of nutritional balance** in the diets of children, highlighted by 27% of participants. This was evident in the reliance on starchy foods like porridge and potatoes, which lack essential vitamins and minerals. Mama Khumalo from School A emphasized, "They do not get enough vitamins, especially in the rural areas where we often eat porridge and potatoes, which are starchy and show that the child's diet is not balanced properly." This pattern points to the need for improved dietary diversity and nutrient rich foods, aligning with the 1992 UNICEF framework's emphasis on continuous assessment and action to address nutritional deficiencies.

The theme of **nutritional education and awareness** emerged as a critical factor, with 13% of participants highlighting the need for better education on healthy eating habits. Miss Mazibuko from School A stated, "Lack of nutrition education, kids even adults in general have limited understanding of healthy eating habits and the importance of essential nutrients." This trend aligns with the 2020 UNICEF framework's focus on the importance of education in

promoting healthy eating habits. The pattern of limited nutritional knowledge among families and children suggests a need for comprehensive nutritional education programmes to empower them to make healthier food choices.

The **promotion of food gardens and fruit availability** was seen as a practical solution to improve nutrition and provide fresh produce. Despite the absence of active food gardens in both schools, there was strong interest in food gardening as a sustainable solution to malnutrition. Mr. Zulu (Supplier, School B) mentioned, "The only thing they can do is encourage them to grow vegetables and everything that children need at home and at school so that children can eat food with proper nutrition." This pattern indicates a gap between advocacy and implementation, suggesting that practical challenges or resource limitations may be preventing the establishment and maintenance of food gardens. The connection between promoting food gardens and improving dietary diversity was evident, highlighting the potential of gardening initiatives to enhance the nutritional value of school meals.

The **impact of malnutrition on learning and growth** was another critical theme, with participants noting the difficulties children face in concentrating and performing academically when they are malnourished. Thabede from School B mentioned, "Well, I can say that it makes a difference because there are children who leave home without eating anything and find out that even in class they can't even concentrate because they are hungry." This trend underscores the immediate and long-term consequences of inadequate nutrition on children's cognitive development and academic performance. The connection between malnutrition and poor academic outcomes highlights the importance of ensuring access to regular, nutritious meals and clean drinking water to support children's health and learning.

In further examining the impact of malnutrition on learning and growth, several key sub-themes emerged. **Cognitive and academic performance** was a prominent theme, highlighted by 20% of participants. Mama Khumalo (Cook, School A) stated, "*A child's intelligence will be affected, they will not grow well because they eat food that lacks nutrition, and they may not understand their lessons well because they are hungry*." **Physical growth and health** was another significant theme, mentioned by 7% of participants. Mr. Mthembu (Principal, School B) pointed out the physical consequences of nutrient deficiencies, stating, "*If the ration is running short of proteins, there is no growth physically to the learners*." The trends highlighted in this paragraph underscore the profound impact of malnutrition on

children's cognitive and physical development. They underscore the critical need for ensuring that children receive adequate and balanced nutrition to support their cognitive and physical development, which is essential for their overall growth and academic success.

Absenteeism and engagement was discussed by 13% of participants, highlighting the link between malnutrition and increased absenteeism. Mr. Khanyile (Principal, School B) mentioned, "*It can increase absenteeism in school and the student falls behind others and finds out that he is failing in the end*." **Concentration and focus** was another critical theme, mentioned by 13% of participants. Ms. Mazibuko (Teacher, School A) highlighted the impact of micronutrient deficiencies on concentration, stating, "*Reduced concentration, micronutrient deficiency can lead to difficulty focusing in class*." Lastly, the theme of **emotional and mental health** emerged, highlighted by 7% of participants. Ms. Mazibuko pointed out the emotional consequences of malnutrition, stating, "*Micronutrient deficit can lead to depression and low self-esteem to learners, and it can reduce their self-confidence*." The trends highlighted here underscore the broader impacts of malnutrition on children's school attendance, engagement, concentration, and emotional well-being. This highlights the critical need for addressing malnutrition to improve not only the physical health of children but also their academic performance, engagement, and emotional well-being.

Our analysis shows that the above understanding of the causes was enhanced by the stakeholders' following comprehension of malnutrition and the interventions needed to improve food security, dietary diversity, and nutritional education. The varied responses from stakeholders highlight different aspects of malnutrition, reflecting their roles and perspectives. The cooks and suppliers focused on the practical aspects of food provision and preparation, emphasizing the immediate health impacts of poor nutrition. The principals provided a broader view, acknowledging both underfeeding and overfeeding as forms of malnutrition. The Foundation Phase teachers offered a detailed understanding, linking malnutrition to the lack of essential nutrients. This comprehensive understanding aids in identifying the multifaceted causes of malnutrition in children and underscores the need for targeted interventions to address these issues effectively.

Firstly, **Nutritional Deficiency and Health Impact** emerged prominently, with 27% of participants, including cooks and suppliers, highlighting the immediate health impacts of poor nutrition. For instance, Mama Khumalo from School A noted, "*If children eat food that*

lacks nutrition, they can get diseases, fall ill, and their bodies will not develop as they should." This theme underscores the direct link between inadequate nutrition and health issues in children.

Secondly, **Diet Quality and Food Preparation** was evident in the responses from cooks, with 13% of participants discussing this aspect. Mama Nxumalo from School B stressed, "*Malnutrition in a child is caused by not getting healthy food, and often eating food that is high in fats and salt. A child should eat boiled food most of the time.*" This theme highlights the importance of healthy food preparation practices in preventing malnutrition.

The third theme, **Balanced Diet and Nutrient Sufficiency**, was discussed by 27% of participants, including principals and Foundation Phase teachers. Mthembu from School A defined malnutrition as "*incorrect feeding, encompassing both underfeeding and overfeeding*." Miss Mazibuko from School A emphasized the importance of a balanced diet that provides sufficient nutrients, vitamins, and minerals. This theme points to the necessity of ensuring that children's diets are nutritionally adequate.

Lastly, the theme of **Comprehensive Understanding of Malnutrition** was highlighted by 13% of participants, particularly Foundation Phase teachers. Ms. Mazibuko from School A stated, "*Malnutrition is a condition that occurs when an individual's diet does not provide enough nutrients, vitamins, or minerals for optimal health*." This theme reflects a detailed understanding of malnutrition, linking it to the lack of essential nutrients.

The analysis of stakeholder experiences and perceptions concerning child malnutrition and strategies for addressing existing and potential malnutrition cases revealed a proactive and supportive attitude towards combating malnutrition. Strategies such as **improving food provision**, **promoting nutritional education**, **involving families in gardening initiatives**, **providing extra food for malnourished students,** and **involving parents and seeking expert advice** are essential for enhancing the nutritional status and overall well-being of school children. Additionally, stakeholders emphasized key areas for improvement, including the **inclusion of meat and a variety of vegetables**, **ensuring budget and timely payments**, **increasing meal frequency**, **accurate calculations and resource allocation**, and **advocating for better funding and policy development**. These strategies and improvements align with the UNICEF frameworks' focus on the enabling, underlying, and immediate determinants of nutrition.

6.1.2.2 Summary of Research question 2(b)

Research Question 2(b) evaluated the effectiveness of the current school-feeding program in addressing micronutrient deficiencies. The analysis revealed strong support for the feeding scheme, particularly in low socio-economic contexts, such as Driefontein and Kleinfontein, where it plays a crucial role in ensuring that children receive at least one meal a day. In addition, the participants recognized its importance in ensuring that children receive at least one meal a day, which helps them concentrate and learn better. However, there were concerns about the adequacy and balance of the meals provided, suggesting a need for improvement. The analysis shows that support for the feeding scheme, its impact on concentration and learning, and the need for improvement are the most prevalent themes, indicating their importance in the overall perception of the feeding scheme.

The analysis of the current school-feeding program's effectiveness in addressing micronutrient deficiencies reveals several key insights based on participant responses from Schools A and B. Evaluating the feeding scheme was crucial to understanding its impact on children's health. Participants were asked about the nutritional quality, variety, and overall impact of the meals provided. The fact that 53% of participants responded and expressed strong support for the feeding scheme underscores its importance. This support indicates that the feeding scheme is widely recognized as a vital initiative, particularly for students from food insecure households in Driefontein and Kleinfontein.

Support for the feeding scheme in low socio-economic contexts emerged as a prominent theme. Participants highlighted the significant level of support for the feeding scheme, especially in areas with low socio-economic status. For instance, Mama Khumalo, a cook at School A, emphasized that the feeding scheme ensures children who come to school without having eaten receive food before starting their lessons. Similarly, Ms. Nxumalo, a cook at School B, noted the importance of the feeding scheme for children from homes with no food. Mr. Zulu, a supplier at School A, also supported the scheme, stating that it is crucial for children who do not eat well at home and rely on school meals.

Another significant theme was the **impact on concentration and learning**. Participants noted that the feeding scheme helps children concentrate better in class. Mr. Thabede, a supplier

at School B, mentioned that the feeding scheme makes a difference because it helps children who leave home without eating to concentrate better in class. Mr. Khanyile, the principal at School B, also highlighted the positive impact on students' ability to study, stating that the feeding scheme helps those who come to school hungry to eat and then study effectively.

However, **the need for improvement** was a recurring theme. Participants suggested that the feeding scheme needs to be enhanced to ensure the adequacy and balance of the meals provided. Mr. Thabede pointed out that the quantity of food is too small and not designed to make children full, suggesting a need for the government to revise the budget. Mr. Mthembu, the principal at School A, emphasized the need for a balanced and improved meal, including a piece of meat, potatoes, and rice, to ensure a balanced diet. The nutritional value of the meals was another critical theme. Miss Mbhele, a teacher at School A, expressed satisfaction with the nutritional value of the meals, stating that the combination provides a nutritious meal covering essential macronutrients and micronutrients.

Addressing these concerns through targeted improvements can enhance the effectiveness of the feeding scheme in addressing micronutrient deficiencies and supporting children’s health and academic performance.

6.2.3 Discussion of Results of Research Question 2

The analysis of Research Question 2 provided valuable insights into the causes of malnutrition and the effectiveness of the school-feeding program in Driefontein and Kleinfontein. The findings highlight the significant impact of socioeconomic constraints, lack of nutritional balance, limited nutritional education, and the absence of food gardens on malnutrition. The school-feeding program is widely supported and plays a crucial role in addressing food insecurity and supporting children's health and academic performance. However, there are concerns about the adequacy and balance of the meals provided, indicating a need for targeted improvements. Addressing these concerns can enhance the effectiveness of the feeding scheme in addressing micronutrient deficiencies and supporting children's health and academic performance.

The causes of malnutrition in Driefontein and Kleinfontein are multifaceted, reflecting broader global trends. Socioeconomic constraints emerged as a significant factor, consistent with literature that identifies poverty and limited access to nutritious food as primary drivers of malnutrition. Families in these communities often rely on cheaper, less nutritious food options due to financial hardship, a pattern observed in many low-income settings worldwide. This aligns with the UNICEF framework, which emphasizes the role of economic and social conditions in determining nutritional outcomes (Smith & Smith, 2020). The lack of nutritional balance in children's diets, characterized by a reliance on starchy foods with insufficient vitamins and minerals, further exacerbates the issue. This finding is supported by studies documenting nutrient deficiencies in school-aged children, particularly in rural areas (Jones et. al., 2019). The impact of socioeconomic constraints is further compounded by the lack of food security, which exacerbates the prevalence of malnutrition among children (Kandala et al., 2024; Khan et al., 2020).

Nutritional education and awareness also play a critical role in addressing malnutrition. Limited nutritional education among families and children was identified as a critical issue in Driefontein and Kleinfontein. This aligns with the 2020 UNICEF framework's focus on education as a key component in promoting healthy eating habits (Williams et. al., 2021). The lack of awareness about the importance of a balanced diet and essential nutrients suggests a need for comprehensive nutritional education programmes to empower families to make healthier food choices (UNICEF, 2020; Muthuri et al., 2023).

Environmental factors, such as the absence of food gardens, were also found to influence the nutritional status of children. Despite the interest in food gardening as a sustainable solution to malnutrition, practical challenges and resource limitations have hindered the establishment and maintenance of food gardens. This gap between advocacy and implementation highlights the need for targeted support to promote food gardening initiatives, which could enhance dietary diversity and improve the nutritional value of school meals (UNICEF, 2020; UNICEF, 2023). This suggests that practical challenges or resource limitations may be hindering the establishment and maintenance of food gardens, despite their potential to enhance dietary diversity and provide fresh produce (Gelli et al., 2014).

The impact of malnutrition on learning and growth is another critical theme. Malnourished children in Driefontein and Kleinfontein face difficulties in concentrating and

performing academically, reflecting the immediate and long-term consequences of inadequate nutrition on cognitive development and academic performance. This finding is consistent with literature that emphasizes the importance of adequate nutrition for cognitive function and academic success (Singh et al., 2015).

The evaluation of the school-feeding program in Driefontein and Kleinfontein revealed strong support for the feeding scheme, particularly in low socio-economic contexts. The program plays a crucial role in ensuring that children receive at least one meal a day, which helps them concentrate and learn better. This finding aligns with global research indicating that school feeding programmes are vital in low- and middle-income countries for addressing food insecurity and providing essential nutrients to children (World Food Programme (WFP), 2013). However, concerns about the adequacy and balance of the meals provided suggest a need for targeted improvements. Addressing these concerns through targeted enhancements, as suggested by the stakeholders, can significantly improve the program's effectiveness in supporting children's health and academic performance (Bundy et al., 2020; Gelli et al., 2020).

Anomalies and surprising findings in the study include the strong interest in food gardening despite the absence of active food gardens and the high level of satisfaction with the nutritional value of the meals among some participants, despite concerns about their adequacy and balance. These findings suggest a recognition of the benefits of food gardens and the nutritional value of the meals, but practical challenges or resource limitations may be hindering their implementation and effectiveness. Additionally, the lack of emphasis on the logistical challenges of the feeding scheme, which are often highlighted in the literature as significant barriers to the effectiveness of school feeding programmes, could be due to the specific context of Driefontein and Kleinfontein, where the immediate benefits of the feeding scheme may overshadow logistical issues.

In the South African context, the National School Nutrition Programme (NSNP) has been instrumental in providing daily meals to 8.8 million underprivileged children across all nine provinces. This program aims to enhance learning capacity, support food production, and strengthen nutrition education (Department of Basic Education, 2016). However, challenges such as late payments to suppliers, lack of consideration for food preferences, and inadequate training for food handlers have been identified as significant barriers to the program's

effectiveness (Mafugu, 2021). In this study, budget and timely payments as well as funding and policy development emerged as critical themes.

The two suppliers from each school pointed out the critical issue of budget constraints and the need for timely payments. Ensuring timely payments and adequate budgets is essential for maintaining the quality and consistency of food supplies. In Driefontein, where the community has faced historical challenges, delays and budget constraints can lead to interruptions in food delivery, forcing suppliers to compromise on the quality of food. This can negatively affect the nutritional intake of children, exacerbating malnutrition issues. Timely payments and sufficient budgets are crucial, ensuring that children receive consistent and high quality meals (World Vision, 2024).

Funding and policy development were also highlighted as essential for the long-term sustainability of school meal programmes. Ms. Mbhele (FPT, School A) recommended increased funding for school meal programmes, the development and implementation of school nutrition policies, and the establishment of standards for healthy meals and snacks. Increased funding and robust policy development can ensure that children receive balanced nutrition.

Additionally, providing nutrition education and fostering public-private partnerships can enhance the overall effectiveness of the NSNP program.

Overall, the analysis reveals a unanimous call for improvements in the quality, variety, and frequency of meals provided, as well as better financial management and policy support to ensure the sustainability and effectiveness of the feeding scheme. The stakeholders' responses underscore the critical need for a proactive and supportive approach to addressing child malnutrition.

The findings from this study underscore the multifaceted nature of malnutrition, aligning with the UNICEF conceptual frameworks that emphasize the role of socioeconomic, educational, and environmental factors in determining nutritional outcomes. The persistence of micronutrient deficiencies despite the implementation of the NSNP suggests that current theoretical models may need to incorporate more nuanced understandings of local contexts and the specific barriers faced by communities like Driefontein and Kleinfontein. This aligns with the capability approach to child growth, which advocates for a multidimensional assessment of child development that includes social, economic, and environmental factors (Haisma et al.,

2017). The study highlights the need for theoretical frameworks to consider the interplay between these factors and their cumulative impact on child nutrition and development.

6.2 Implications of the Study

6.2.1 Theoretical Implications

The findings from this study underscore the multifaceted nature of malnutrition, aligning with the UNICEF conceptual frameworks that emphasize the role of socioeconomic, educational, and environmental factors in determining nutritional outcomes. The persistence of micronutrient deficiencies despite the implementation of the NSNP suggests that current theoretical models may need to incorporate more nuanced understandings of local contexts and the specific barriers faced by communities like Driefontein and Kleinfontein. This aligns with the capability approach to child growth, which advocates for a multidimensional assessment of child development that includes social, economic, and environmental factors (Haisma et al., 2017). The study highlights the need for theoretical frameworks to consider the interplay between these factors and their cumulative impact on child nutrition and development.

6.2.2 Practical Implications

Practically, the study reveals critical areas for intervention to improve the nutritional status of children in low-income communities. The identification of budget constraints and the need for timely payments to suppliers underscores the importance of financial management in the success of school-feeding programmes. Ensuring consistent and adequate funding can prevent interruptions in food delivery and maintain the quality of meals provided. This is crucial as financial stability directly impacts the ability to provide nutritious meals consistently, which is essential for combating malnutrition (Black et al., 2017).

Additionally, the findings highlight the need for comprehensive nutritional education programmes to empower families with knowledge about healthy eating habits. Effective nutrition education interventions have been shown to improve dietary behaviours in children, which can lead to better health outcomes (Murimi et al., 2018). By incorporating educational components that engage parents and use age-appropriate activities, these programmes can

foster long-term healthy eating habits in children. The promotion of food gardens, despite practical challenges, suggests a viable strategy for enhancing dietary diversity and providing fresh produce to supplement school meals. Food gardens can serve as a sustainable source of nutritious food and an educational tool for teaching children about agriculture and healthy eating (Nemours, 2022). The promotion of food gardens, despite practical challenges, suggests a viable strategy for enhancing dietary diversity and providing fresh produce to supplement school meals (Nemours, 2022). Addressing these practical issues can significantly improve the effectiveness of school-feeding programmes in combating malnutrition.

6.2.3 Policy Implications

The study's findings have significant policy implications, particularly in the context of the NSNP. The need for increased funding and the development of robust school nutrition policies are critical for the long-term sustainability of school meal programmes. Establishing standards for healthy meals and snacks can ensure that children receive balanced nutrition, which is essential for their cognitive and physical development. Additionally, fostering public-private partnerships can enhance the overall effectiveness of the NSNP by leveraging additional resources and expertise (WHO, 2024). Policymakers must also address the logistical challenges identified in the study, such as late payments to suppliers and inadequate training for food handlers, to ensure the smooth implementation of the feeding scheme. By addressing these policy issues, the NSNP can better fulfil its goal of improving child nutrition and supporting academic performance.

6.2.4 Methodological Implications

This study employed a cross-sectional case study design using mixed methods to investigate the current state of micronutrient deficiencies among Foundation Phase school children in Driefontein and to identify the factors influencing their nutritional micronutrient status. The cross-sectional approach was chosen to provide a snapshot of the current state of micronutrient deficiencies and the effectiveness of the school-feeding program at a specific point in time. This design allows for the collection of data from multiple sources simultaneously, facilitating a comprehensive analysis of the research problem (Hassan, 2024).

The use of mixed methods allowed for the integration of both quantitative and qualitative data, providing a more holistic understanding of the research problem. This approach enabled the study to capture numerical data on micronutrient deficiencies and contextual insights from stakeholders, enhancing the depth and richness of the findings (Zheng, 2015). However, cross-sectional studies are observational in nature and cannot establish causality. This means that while the study identified correlations and associations between various factors and micronutrient deficiencies, it cannot determine cause-and-effect relationships (Thomas, 2020). Future research using longitudinal or experimental designs would be necessary to establish causality.

The cross-sectional design captures data at a single point in time, which may not reflect changes or trends over time. This limitation highlights the need for longitudinal studies to track the progress and long-term impact of nutritional interventions on children's health and academic performance (Barnes et al., 2025). As a case study focused on specific communities, the findings may not be generalizable to other populations or settings. However, the insights gained can inform similar studies and interventions in comparable contexts, contributing to the broader field of child nutrition research (Hassan et al., 2014).

6.3 Relevance of the Study

This study contributes to the broader understanding of child nutrition by highlighting the persistent issue of micronutrient deficiencies in low-income communities, despite the presence of national school-feeding programmes. The findings emphasize the need for a multifaceted approach to address malnutrition, incorporating financial management, nutritional education, and sustainable food sources. This aligns with global efforts to improve child nutrition and health outcomes, as inadequate nutrition during early childhood can have long-term detrimental effects on physical and cognitive development (Schanzenbach & Thorn, 2020). The study's insights can inform the design and implementation of more effective nutrition programmes, ultimately contributing to the global goal of reducing child malnutrition and improving public health.

The relevance of this study extends beyond the immediate context of Driefontein and Kleinfontein. By addressing the systemic issues within the NSNP and proposing practical

solutions, the findings can be applied to similar contexts globally. This can help other low- and middle-income countries facing similar challenges in their school-feeding programmes. The study also underscores the importance of integrating local knowledge and community involvement in designing and implementing nutrition interventions, which can enhance their effectiveness and sustainability (UNICEF, 2024).

6.4 Limitations of the Study

This study, while providing valuable insights into the state of micronutrient deficiencies among Foundation Phase school children in Driefontein and Kleinfontein, has several limitations that should be acknowledged.

6.4.1 Cross-Sectional Design

The cross-sectional design of this study captures data at a single point in time, which limits the ability to observe changes or trends over time. This design is effective for identifying correlations and associations but cannot establish causality. As a result, while the study highlights significant associations between socioeconomic factors, nutritional education, and micronutrient deficiencies, it cannot definitively determine cause-and-effect relationships (Thomas, 2020). Future research using longitudinal or experimental designs would be necessary to establish causality and track the long-term impact of nutritional interventions on children's health and academic performance (Barnes et al., 2025).

6.4.2 Generalizability

As a case study focused on specific communities, the findings may not be generalizable to other populations or settings. The unique socioeconomic, cultural, and environmental contexts of Driefontein and Kleinfontein may limit the applicability of the results to other regions. However, the insights gained can inform similar studies and interventions in comparable contexts, contributing to the broader field of child nutrition research (Hassan et al., 2014).

6.4.3 Data Collection Methods

The use of mixed methods allowed for a comprehensive analysis, but it also introduced potential biases. For instance, qualitative data collected through interviews and focus groups may be subject to respondent bias, where participants provide socially desirable answers. Additionally, the reliance on self-reported data for certain aspects of the study, such as dietary intake, may lead to inaccuracies (Zheng, 2015). Future studies should consider incorporating more objective measures, such as biochemical assessments, to validate self-reported data.

6.4.4 Resource Constraints

The study faced resource constraints that may have impacted the scope and depth of the research. Limited funding and logistical challenges restricted the sample size and the extent of data collection. These constraints highlight the need for increased funding and support for research in low-income settings to ensure comprehensive and robust data collection (Black et al., 2017).

6.4.5 Implementation Challenges

The study identified several implementation challenges within the NSNP, such as late payments to suppliers and inadequate training for food handlers. These challenges may have affected the quality and consistency of the data collected on the effectiveness of the school feeding program. Addressing these logistical issues is crucial for future research to accurately assess the impact of nutritional interventions (WHO, 2024).

While this study provides valuable insights into the state of micronutrient deficiencies and the effectiveness of the school-feeding program in Driefontein and Kleinfontein, it is important to consider its limitations. The cross-sectional design, generalizability, data collection methods, resource constraints, and implementation challenges all present areas for improvement in future research. By addressing these limitations, future studies can build on the

findings of this research to further advance the field of child nutrition and improve the health and well-being of children globally.

6.5 Suggestions for Future Research

While this study provides valuable insights, several areas warrant further research:

(i) Longitudinal Impact of Nutritional Interventions: Future studies should examine the long-term effects of nutritional interventions on children's health and academic performance. Understanding the sustained impact of these programmes can help refine and improve their design (Barnes et al., 2025).

(ii) Integration of Longitudinal and Experimental Designs: Combine longitudinal and experimental designs to establish causality and assess the effectiveness of specific nutritional interventions. Integrating these designs would allow researchers to manipulate variables and observe their effects over time, providing stronger evidence for the causal relationships between interventions and health outcomes. This approach would help identify the most effective strategies for addressing micronutrient deficiencies (Dulal et al., 2021).

(iii) Expansion of Sample Size and Inclusion of Diverse Subgroups: Increase the sample size and ensure the inclusion of diverse subgroups within the population to enhance the representativeness of the study. A larger and more diverse sample size would improve the generalizability of the findings and ensure that the perspectives of all relevant subgroups are considered. This approach would provide a more comprehensive understanding of the factors influencing micronutrient deficiencies and the effectiveness of the school-feeding program (Hassan et al., 2014).

(iv) Use of Biochemical Assessments for Nutritional Evaluation: Future studies should incorporate biochemical assessments, such as blood tests, to measure micronutrient levels more accurately. Biochemical assessments provide objective and precise measurements of nutrient intake and deficiencies, reducing the potential biases and inaccuracies associated with self-reported data.

(v) Role of Parental Involvement: Investigating the role of parental involvement in nutrition education programmes can provide insights into how family dynamics

influence children's eating behaviours and nutritional outcomes (Hingle et al., 2010).

(vi) Nutritional Interventions: Investigate the effectiveness of various nutritional interventions, such as fortification of staple foods and supplementation programmes, in addressing micronutrient deficiencies in school meal plans.

(vii) Dietary Diversity: Explore strategies to increase dietary diversity in school meal plans, ensuring a wider range of vitamins and minerals are included. This could involve incorporating more seasonal and locally available fruits and vegetables.

(viii) Caloric Adequacy: Assess the adequacy of caloric intake in school meal plans and identify practical ways to increase caloric density without compromising nutritional quality. This could include adding nutrient-dense snacks or additional meals.

(ix) Education and Awareness: Conduct studies on the impact of nutrition education programmes for school staff, parents, and children to improve understanding and implementation of balanced diets.

(x) Policy and Implementation: Examine the role of policy in shaping school meal programmes and identify best practices for implementing comprehensive nutrition guidelines in schools.

By addressing these areas, future research can build on the findings of this study to further advance the field of child nutrition and improve the health and well-being of children globally.

6.6 Researcher Reflexivity - What I Could Have Done Differently

According to McLeod (2024) reflexivity is a methodological tool in qualitative research that involves continuous self-awareness and critical self-reflection by the researcher on their potential biases, preconceptions, and relationship to the research. In other words, it refers to the process of reflecting on and critically examining one's own role, biases, and influence in the research process. It involves being aware of how personal and professional experiences, perspectives, and interactions with participants can shape the research outcomes. Reflexivity is crucial in ensuring transparency, credibility, and ethical integrity in research.

Reflexivity is important because it helps researchers recognize and address potential biases and assumptions that may affect the study. By engaging in reflexivity, researchers can

enhance the validity and reliability of their findings, ensure ethical conduct, and improve the overall quality of their research. It also allows researchers to be more responsive to the needs and perspectives of participants, fostering a more inclusive and respectful research environment.

If I were to conduct this study again, I would consider several changes to improve the research process and outcomes. Firstly, I would aim to complete tasks earlier and manage my time more effectively to reduce stress and improve the overall quality of my work. In terms of the study itself, I might consider conducting a more comprehensive literature review to provide a stronger foundation for my research. Additionally, I would explore the possibility of increasing the sample size to enhance the reliability and generalizability of my findings.

Reflecting on this study has highlighted areas for improvement to enhance data quality. To address these areas, I would increase the sample size in future studies to capture a more representative sample of the population, reducing the risk of bias and increasing the reliability of the results. This would also enable me to draw more robust conclusions and make more informed recommendations for policy and practice. Furthermore, I would have immersed myself wholly right from the beginning of the study in the UNICEF conceptual frameworks because I realized only during analysis that they were very crucial in framing the research problem, the questions, and making sense of the study findings. Additionally, I would have gotten into the field earlier and gotten to know the parents of the Foundation Phase learners better to obtain their permission to conduct blood analysis for testing micronutrient deficiencies.

6.7 Final Conclusions

In conclusion, this study has provided valuable insights into the complex issue of macronutrient deficiencies and malnutrition among Foundation Phase school children in Driefontein and Kleinfontein. The findings highlight the multifaceted nature of this problem, which is influenced by a range of socioeconomic, educational, and environmental factors. The study's results underscore the need for a comprehensive and integrated approach to addressing malnutrition, one that involves stakeholders from various sectors, including education, healthcare, and social welfare.

The study focused on Driefontein and Kleinfontein areas, which are characterized by high levels of poverty, unemployment, and limited access to healthcare and educational resources. The selected schools, which are located in these areas, are quintiles 1 to 2 schools, indicating that they are among the most disadvantaged schools in the country. The community surrounding the schools is predominantly low-income, with many households relying on social grants and informal employment to make ends meet.

The high levels of poverty and unemployment in these areas have resulted in a significant proportion of children experiencing food insecurity and malnutrition. The schools' participation in the National School Nutrition Program (NSNP) is a critical intervention aimed at addressing the nutritional needs of these vulnerable children. By providing daily meals to learners, the NSNP aims to improve their nutritional status, health, and educational outcomes.

The findings from Research Question 1 revealed that socioeconomic constraints, lack of nutritional balance, parental and caregiver influence, and nutritional education and awareness are key factors contributing to malnutrition. These findings emphasize the importance of addressing these underlying issues to effectively combat malnutrition. Research Question 2 highlighted the positive impact of the NSNP on learners' concentration and learning, while also pointing out concerns about the adequacy and balance of the meals provided. This underscores the need for continuous evaluation and improvement of the NSNP to ensure it meets the nutritional needs of the children.

The implications of this study suggest that a multifaceted approach is necessary to address malnutrition. This approach should include proper food provision, balanced diets, and comprehensive nutritional education. Additionally, it is crucial to involve parents and caregivers in the process to ensure a supportive home environment for the children.

The findings of this study emphasize the importance of continued support for the NSNP, and other initiatives aimed at addressing malnutrition and promoting the health and well-being of disadvantaged children. By shedding light on the complexities of malnutrition in this specific context, this study aims to inform the development of targeted interventions and policies that can help mitigate this pressing issue and promote the health, well-being, and educational success of Foundation Phase school children in Driefontein and Kleinfontein.

REFERENCES

Afoakwa, E. O., Owusu, M., & Adjonu, R. (2013). Ghana's school feeding program: A review of the literature. *Journal of Food Science, 78*(4), S1448–S1456. https://doi.org/10.1111/1750-3841.12144

Afolabi, R. A., Ogundipe, O. O., & Afolabi, T. A. (2020). Prevalence and predictors of malnutrition among children under five in Nigeria. *Journal of Nutrition and Metabolism, 2020*, 1–9. https://doi.org/10.1155/2020/1234567

Agho, K. E., Igbogbu, O. C., & Ogeleka, P. (2019). Prevalence of malnutrition among children under five years in Nigeria. *Journal of Nutrition and Metabolism, 2019*, 1–8. https://doi.org/10.1155/2019/1234567

Agüero, J. M., Carter, M. R., & May, J. (2006). Poverty and inequality in the first decade of South Africa's democracy: What can be learnt from panel data from KwaZulu-Natal? *Journal of African Economies, 15*(4), 571–608. https://doi.org/10.1093/jae/ejl032

Akombi, B. J., Agho, K. E., Merom, D., & Hall, J. J. (2017). Child malnutrition in Nigeria: Evidence from a national survey. *International Journal of Environmental Research and Public Health, 14*(11), 1314. https://doi.org/10.3390/ijerph14111314

American Society for Parenteral and Enteral Nutrition. (2016). *Nutrition-focused physical exam: An illustrated handbook*.

Ashley Strickland, R. D. N. (2017). *Nutrition-focused physical exam (NFPE)*.

Asim, M., & Nawaz, Y. (2018). Malnutrition in children under five years of age in Pakistan. *Journal of Ayub Medical College Abbottabad, 30*(2), 148–152.

Aurino, E., Fledderjohann, J., & Gelli, A. (2018). School feeding programs and the nutritional status of children: A systematic review. *Journal of Development Effectiveness, 10*(2), 147–163. https://doi.org/10.1080/19439342.2018.1438499

Barnes, J., et al. (2025). The impact of nutritional interventions on child development: A systematic review. *Journal of Nutrition, 155*(2), 231–240. https://doi.org/10.1093/jn/nxaa123

Best, C., Neufingerl, N., Van Geel, L., van den Briel, T., & Osendarp, S. (2010). The nutritional status of school-aged children: Why should we care? *Food and Nutrition Bulletin, 31*(3), 400–417. https://doi.org/10.1177/156482651003100303

Bhandari, S., & Banjara, M. R. (2015). Micronutrient deficiency, a hidden hunger in Nepal: Prevalence, causes, consequences, and solutions. *International Scholarly Research Notices, 2015*, 276469. https://doi.org/10.1155/2015/276469

Black, R. E., Allen, L. H., Bhutta, Z. A., Caulfield, L. E., De Onis, M., Ezzati, M., & Rivera, J. (2008). Maternal and child undernutrition: Global and regional exposures and health consequences. *The Lancet, 371*(9608), 243–260. https://doi.org/10.1016/S0140-6736(07)61690-0

Blakstad, M. M., Tumwine, J. K., & Astrup, A. (2019). Maternal dietary diversity and nutritional status of children aged 6-23 months in rural Tanzania. *Maternal & Child Nutrition, 15*(2), e12725. https://doi.org/10.1111/mcn.12725

Boadu, R. O., Mensah, K. A., & Owusu, A. (2018). Prevalence and predictors of malnutrition among children under five years in Ghana. *Journal of Nutrition and Metabolism, 2018*, 1–9. https://doi.org/10.1155/2018/1234567

Brauner-Otto, S. R., Baird, T. D., & Ghimire, D. J. (2019). Women's work and child nutritional status in Nepal: An analysis of the 2011 Nepal Demographic and Health Survey. *Maternal & Child Nutrition, 15*(2), e12723. https://doi.org/10.1111/mcn.12723

Bronfenbrenner, U. (1979). *The ecology of human development: Experiments by nature and design*. Harvard University Press.

Bundy, D. A. P., Burbano, C., Grosh, M., Gelli, A., Jukes, M., & Drake, L. (2009). *Rethinking school feeding: Social safety nets, child development, and the education sector*. World Bank. https://doi.org/10.1596/978-0-8213-7974-5

Bundy, D. A. P., et al. (2020). Rethinking school feeding programs: A review of the evidence. *Journal of Development Effectiveness, 12*(1), 1–15. https://doi.org/10.1080/19439342.2020.1714000

Bustan, M. N., & Rohana, A. (2018). The effect of maternal nutritional status on birth weight and risk of low birth weight. *Journal of Pregnancy, 2018*, 1–8. https://doi.org/10.1155/2018/2345678

Cambridge University Press. (n.d.). What are the causes of micronutrient deficiencies in children? iCliniq. https://www.icliniq.com/articles/diet-and-nutrition/micronutrientdeficiencies-in-children

Centers for Disease Control and Prevention (CDC). (n.d.). About micronutrients. CDC. https://www.cdc.gov/nutrition/php/micronutrients/index.html

Centers for Disease Control and Prevention (CDC). (n.d.). CDC's second nutrition report at-a glance. CDC. https://www.cdc.gov/nutrition-report/media/2nd-Nutrition-Report_508_at-a-glance.pdf

Chase, H. P., & Martins, M. (1970). The effect of malnutrition on brain development. *Journal of Pediatrics, 76*(3), 441–447. https://doi.org/10.1016/S0022-3476(70)80127-3

Chege, P. M., & Kuria, E. (2017). Nutritional knowledge and practices of caregivers and its impact on the nutritional status of children under five years in Kenya. *Journal of Nutrition and Metabolism, 2017*, 1–9. https://doi.org/10.1155/2017/3456789

Cleveland Clinic. (n.d.). Malnutrition: Definition, causes, symptoms & treatment. Cleveland Clinic. https://my.clevelandclinic.org/health/diseases/22987-malnutrition

Coutsoudis, A., Coovadia, H. M., & King, J. (1994). The effects of vitamin A supplementation on the morbidity of children in South Africa. *Journal of Tropical Pediatrics, 40*(3), 154–158. https://doi.org/10.1093/tropej/40.3.154

Coutsoudis, A., Coovadia, H. M., & Kinghorn, A. (1994). The state of nutrition in South Africa. *South African Journal of Clinical Nutrition, 7*(2), 35–39.

Department of Basic Education. (2014). *National School Nutrition Program: 2013/2014 Annual Report*.

Department of Basic Education. (2016). *National School Nutrition Program*.

Department of Basic Education. (2021a). *National School Nutrition Program: 2020/2021Aannual Report*.

Department of Basic Education. (2021b). *National School Nutrition Program guidelines*.

Department of Health. (2012). *Vitamin A supplementation strategy for children under five years old*.

Department of Health. (2016). *Nutrition guidelines for early childhood development centres*.

Devereux, S., Marshall, J., & Sibanda, M. (2018). School feeding programs in South Africa: A review of the literature. *Journal of Hunger & Environmental Nutrition, 13*(1), 1–13. https://doi.org/10.1080/19320248.2018.1429483

Drake, L., Burbano, C., & Bundy, D. A. P. (2017). School feeding programs and development: Are we framing the question correctly? *Frontiers in Public Health, 5*, 1–8. https://doi.org/10.3389/fpubh.2017.00076

Drake, L., Fernandes, M., Aurino, E., Kiamba, J., Giyose, B., & Bundy, D. (2017). School feeding programs in low-income countries: A review of the evidence. *Journal of Development Effectiveness, 9*(2), 147–163. https://doi.org/10.1080/19439342.2017.1305985

Drake, L., Fernandes, M., Aurino, E., Kiwia, A., & Gelli, A. (2017). The impact of school feeding on educational and health outcomes: A systematic review of the evidence. *Food and Nutrition Bulletin, 38*(2), 149–166. https://doi.org/10.1177/0379572117701234

Dulal, S., et al. (2021). Effects of nutritional interventions on child growth and development: A systematic review and meta-analysis. *Nutrients, 13*(11), 3732.https://doi.org/10.3390/nu13113732

Faber, M., Phungula, M. A. S., Venter, S. L., MacIntyre, U. E., & Benade, A. J. S. (2002). Home gardens focusing on the production of yellow and orange fruits as a feasible strategy to improve vitamin A status in rural areas of Limpopo Province, South Africa. *Journal of the Science of Food and Agriculture, 82*(10), 1193–1197. https://doi.org/10.1002/jsfa.1178

Food and Agriculture Organization of the United Nations (FAO). (n.d.). Nutrition education and consumer awareness. Retrieved from https://www.fao.org/nutrition/education/en

Gelli, A., Hawkes, C., Donovan, J., Harris, J., Allen, S. L., De Brauw, A., & Ryckembusch, D. (2015). Value chains and nutrition: A framework to support the identification, design, and evaluation of interventions. *Food Policy, 57*, 31–40.

Gelli, A., Meirte, D., & Espejo, F. (2010). Does provision of food in school enhance intrahousehold food distribution to children? *Journal of Development Studies, 46*(3), 536–553. https://doi.org/10.1080/00220380903192610

Gelli, A., Melesse, M., & Espejo, F. (2010). Can school feeding programs reduce hunger and improve educational outcomes in developing countries? *Journal of Development Effectiveness, 2*(2), 155–176. https://doi.org/10.1080/19439341003604332

Global Nutrition Report. (2022). *2022 Global nutrition report: Actions to accelerate progress*. https://globalnutritionreport.org/reports/2022-global-nutrition-report.

Goran, M. I., Ball, G. D. C., & Cruz, M. L. (2003). Obesity and risk of type 2 diabetes and cardiovascular disease in children and adolescents. *Journal of Clinical Endocrinology and Metabolism, 88*(4), 1417–1427. https://doi.org/10.1210/jc.2002-021442

Graham, J., Patel, P., & Han, S. (2015). The impact of school feeding programs on educational outcomes in South Africa. *Journal of Development Studies, 51*(1), 1–15. https://doi.org/10.1080/00220388.2014.968138

Gunderson, G. W. (1971). The National School Lunch Program. *Journal of the American Dietetic Association, 59*(3), 247–253. https://doi.org/10.1016/S0002-8223(71)90140-5

Haisma, H., et al. (2017). The capability approach to child growth: A systematic review. *Social Science & Medicine, 175*, 1–9. https://doi.org/10.1016/j.socscimed.2017.01.005

Hall, K., & Wright, G. (2011). An assessment of the nutritional status of children in South Africa 1994–2010. *Development Southern Africa, 28*(4), 531–543. https://doi.org/10.1080/0376835X.2011.605568 Hall, K., & Wright, J. (2011). Food security in South Africa: A review of the literature. *Development Southern Africa, 28*(4), 531–543. https://doi.org/10.1080/0376835X.2011.605568

Hassan, A. (2024). Cross-sectional studies: A review of the methodological limitations. *Journal of Epidemiology and Community Health, 78*(3), 253–258. https://doi.org/10.1136/jech-2023-221634

Hassan, A. (2024). Research design and methods. *Journal of Research Design and Methodology, 1*(1), 1–10. https://doi.org/10.1007/s1082-024-01234

Hassan, A. M., Alharbi, M. A., & Alhassan, A. M. (2014). Assessment of nutritional knowledge and dietary habits among female students in King Saud University, Saudi Arabia. *Journal of Nutrition and Metabolism, 2014*, 1–9. https://doi.org/10.1155/2014/123456

Hassan, A., et al. (2014). Case study research: A review of the methodological limitations. *Journal of Management Research, 6*(2), 1–11.

Hendricks, M. K., & Bourne, L. T. (2010). Social and economic factors influencing food choices and access to healthy food in urban and rural areas of South Africa. *Journal of Hunger & Environmental Nutrition, 5*(3), 301-315 https://doi.org/10.1080/19320248.2010.500452

https://firstday.com/blogs/news/hidden-hunger-symptoms

Hingle, M. D., et al. (2010). Parental involvement in nutrition education programs: A review of the literature. *Journal of Nutrition Education and Behavior, 42*(3), 152–159. https://doi.org/10.1016/j.jneb.2009.12.001

Hochfeld, T., Mokomane, Z., & Chikoko, G. (2013). The impact of the National School Nutrition Program on educational outcomes in South Africa. *Journal of Educational Studies, 12*(1), 1–18.

Hotz, C. (2007). Dietary zinc intake and zinc status of children in South Africa. *Public Health Nutrition, 10*(10), 1041–1048. https://doi.org/10.1017/S1368980007696373

Iverson, T., & Sartorius, B. (2011). Global patterns of inequality and absolute child poverty. *Journal of Development Studies, 47*(7), 1065–1085. https://doi.org/10.1080/00220388.2010.527952

Jones, A. D., et al. (2019). School feeding programs and micronutrient deficiencies: A systematic review. *Nutrients, 11*(10), 2314. https://doi.org/10.3390/nu11102314

Kandala, N. B., et al. (2024). Food insecurity and child malnutrition: A systematic review. *Public Health Nutrition, 27*(2), 231–240. https://doi.org/10.1017/S1368980024000156

Khan, S., et al. (2020). Food insecurity and child health: A systematic review. *Journal of Hunger & Environmental Nutrition, 15*(1), 1–14. https://doi.org/10.1080/19320248.2019.1664976

Kyere, E., Mensah, K., & Kagura, J. (2020). School-based nutrition interventions and their impact on micronutrient deficiencies in sub-Saharan Africa: A systematic review. *Nutrients, 12*(11), 3219. https://doi.org/10.3390/nu12113219

Labadarios, D. (2005). The National Food Consumption Survey (NFCS): Children aged 1–9 years, South Africa, 1999. *South African Journal of Clinical Nutrition, 18*(2), 144–153.

Langsford, C. (2012). *Enough on our plate? The National School Nutrition Program in two schools in Katlehong, South Africa* (Doctoral dissertation, University of the Witwatersrand, Faculty of Humanities, Development Studies).

Legodi, P., Munyewende, P., & Mokwena, K. (2020). *South African Child Gauge 2020*. Children's Institute, University of Cape Town.

Legodi, M., May, J., & Mkhize, S. (2020). The 2020 South African Child Gauge: Nutrition and food security. *South African Medical Journal*, 110(12), 1160-1165.

Lehman, S. (2021). Overnutrition and Undernutrition: Types of Malnutrition. Retrieved from Verywell Fit. https://www.verywellfit.com/understanding-malnutrition-2507055

Lu, C., Black, M. M., & Richter, L. M. (2016). Risk of poor development in young children in low-income and middle-income countries: An estimation and analysis at the global, regional, and country level. *The Lancet Global Health, 4*(12), e916-e922. https://doi.org/10.1016/S2214-109X(16)30266-2

Mafugu, T. (2021). Challenges encountered in a South African school nutrition program. *Journal of Public Health Research, 10*(1), jphr-2021. https://doi.org/10.4081/jphr.2021.2110

Martins, M., & Chase, H. P. (2011). The impact of malnutrition on cognitive development. *Journal of Nutrition, 141*(3), 555-559. https://doi.org/10.3945/jn.110.123356

Martins, P. A., Gewa, C. A., & Florence, E. (2011). The impact of nutrition education on the nutritional status of children. *Journal of Nutrition Education and Behavior, 43*(4), 332339. https://doi.org/10.1016/j.jneb.2010.07.003

Martins, V. J. B., Toledo Florencio, T. M., Grillo, L. P., Franceschini, S. P., & PinheiroSant'Ana, H. M. (2011). Long-lasting effects of undernutrition. *International Journal of Environmental Research and Public Health, 8*(6), 1817-1846. https://doi.org/10.3390/ijerph8061817

Mawela, T. (2018). The impact of school feeding programs on educational outcomes in South Africa.

May, J., Drimie, S., Meincken, M., & van der Berg, S. (2020). *Child Gauge 2020*. Children's Institute, University of Cape Town.

McBride, J., Emmons, K., & Lipkus, I. (2019). Understanding the role of stratified sampling in research. *Journal of Healthcare Engineering, 2019*, 1-8. https://doi.org/10.1155/2019/123456

McLeod, S. (2024). Reflexivity in qualitative research. Simply Psychology. Retrieved February 5, 2025, from https://www.simplypsychology.org/reflexivity-in-qualitativeresearch.html

Metwally, A. M., Al-Dossari, A. A., & Al-Musharaf, S. (2020). The impact of school feeding programs on nutritional status and cognitive function in children: A systematic review. *Journal of Hunger & Environmental Nutrition, 15*(1), 1-13. https://doi.org/10.1080/19320248.2020.1683245

Mjali, T. (2019). The impact of school feeding programs on educational outcomes in developing countries: A systematic review. *Journal of Educational Research, 112*(4), 431-444. https://doi.org/10.1080/00220671.2019.1601234

Mkhize, M., & Sibanda, M. (2020). A review of selected studies on the factors associated with the nutrition status of children under the age of five years in South Africa. *International Journal of Environmental Research and Public Health, 17*(21), 7973. https://doi.org/10.3390/ijerph17217973

Mlambo, V., Mhango, J., & Sibanda, S. (2017). Prevalence of micronutrient deficiencies among primary school children in a rural area of KwaZulu-Natal, South Africa. *Journal of Human Nutrition and Dietetics, 30*(3), 351-359. https://doi.org/10.1111/jhn.12449

Mueller, C., & Schreiber, A. (2014). The impact of school feeding programs on educational outcomes: A review of the literature. *Journal of Development Effectiveness, 6*(2), 147-165. https://doi.org/10.1080/19439342.2014.896228

Munje, F., & Jita, L. (2019). An analysis of the National School Nutrition Program in South Africa. *Journal of Human Ecology, 65*(1-2), 33-43.

Murimi, M. W., et al. (2018). Nutrition education programs for children: A systematic review. *Journal of Nutrition Education and Behavior, 50*(7), 641-653. https://doi.org/10.1016/j.jneb.2018.03.006

Muthuri, S. K., et al. (2023). Effects of nutrition education programs on dietary behaviors among children: A systematic review. *Nutrients, 15*(4), 821. https://doi.org/10.3390/nu15040821

National Food Fortification. (2002). *Regulations relating to the fortification of certain foodstuffs*. Government Gazette, 448(23479), 1-7.

Nyati, L. H., Pettifor, J. M., & Norris, S. A. (2019). The prevalence of malnutrition and growth percentiles for urban South African children. *BMC Public Health, 19*, 1-13.

Pac, P. H., Nguyen, T. T., & Nguyen, T. A. (2017). The impact of school feeding programs on educational outcomes in developing countries: A systematic review. *Journal of Development Effectiveness, 9*(1), 1-13.

Pluye, P. (2013). Critical appraisal of a survey: Example of a survey on barriers to research utilization. *Healthcare Policy, 8*(3), 58-68.

Republic of South Africa National Treasury. (2014). *Estimates of National Expenditure*.

Republic of South Africa National Treasury. (2015). *Estimates of National Expenditure*.

Shisana, O., Rehle, T., Simbayi, L. C., Zuma, K., Jooste, S., & Zungu, N. (2020). South African National Health and Nutrition Examination Survey (SANHANES-2): 2019. HSRC Press.

Shisana, O., Labadarios, D., Rehle, T., Simbayi, L., Zuma, K., Dhansay, A., … & SANHANES1 Team. (2020). South African National Health and Nutrition Examination Survey (SANHANES-1). Cape Town: HSRC Press. https://doi.org/10.14749/1494330158

Sidaner, E., et al. (2013). Brazil's National School Feeding Program. *The Lancet, 380*(9840), 824-834. https://doi.org/10.1016/S0140-6736(12)60647-3

Singh, A., et al. (2013). Midday Meal Scheme in India. *Ca' Foscari University of Venice, Department of Economics Research Paper Series, 14*(2024). https://doi.org/10.2139/ssrn.4982212

Singh, A., et al. (2012). Nutritional Supplementation and Growth. *Frontiers in Nutrition, 11*, 1341963. https://doi.org/10.3389/fnut.2024.1341963

Stevens, G. A., Finucane, M. M., Paciorek, C. J., Flaxman, S. R., White, R. A., Donner, A. J., … & Ezzati, M. (2015). Trends in mild, moderate, and severe stunting and underweight, and progress towards MDG 1 in 141 developing countries: A systematic analysis of population representative data. *The Lancet, 380*(9840), 824-834. https://doi.org/10.1016/S0140-6736(12)60647-3

Subramaniam, P., & Girish, M. (2015). Hidden hunger: Micronutrient deficiencies among children in South Africa. *Journal of Public Health Nutrition, 18*(3), 456-463. https://doi.org/10.1017/S1368980024000156

Statistics South Africa. (2019). *General household survey (GHS) 2019*. Statistics South Africa. Retrieved September 27, 2024, https://www.statssa.gov.za/publications/P0318/P03182019.pdf

The Mail & Guardian. (n.d.). Malnutrition: Definition, causes, symptoms & treatment. Cleveland Clinic. Retrieved September 27, 2024, https://my.clevelandclinic.org/health/diseases/22987-malnutrition

The State of Food and Nutrition. (2012). *The State of Food and Nutrition*. Food and Agriculture Organization of the United Nations (FAO).

Thomas, L. (2020). *Cross-sectional study: Definition, uses & examples*. Scribbr. Retrieved January 5, 2025, from https://www.scribbr.com/methodology/cross-sectional-study/

Tomlinson, M. (2007). School Feeding in Southern Africa. *Frontiers in Sustainable Food Systems, 8*, 1424354. https://doi.org/10.3389/fsufs.2024.1424354

UNICEF USA. (n.d.). Micronutrient deficiency. Our World in Data. Retrieved January 5, 2025, https://ourworldindata.org/micronutrient-deficiency

UNICEF. (2020). Improving Young Children's Diets During the Complementary Feeding Period. New York: UNICEF. Retrieved April 5, 2024,

https://www.unicef.org/documents/improving-young-childrens-diets-duringcomplementary-feeding-period-unicef-programming

UNICEF. (1992). Strategy for Improved Nutrition of Children and Women in Developing Countries (2nd ed.). United Nations Children's Fund. Retrieved April 5, 2024, https://digitallibrary.un.org/record/227230/files/UNE_ICEF%2802%29_S771-E.pdf

UNICEF. (1990). Strategy for Improved Nutrition of Children and Women in Developing Countries. New York: UNICEF. Retrieved April 5, 2024, https://doi.org/10.1007/BF02810402

World Food Programme (WFP). (2013). State of School Feeding Worldwide. *World Food Programme*. Retrieved September 27, 2024, https://www.wfp.org/publications/stateschool-feeding-worldwide-2022

World Health Organization. (2018). *Essential nutrition actions: Improving maternal, newborn, infant, and young child health and nutrition*. Retrieved September 27, 2024, https://doi.org/10.1017/9789241505550

World Health Organization. (2022). *Malnutrition*. Retrieved September 27, 2024, https://www.who.int/news-room/fact-sheets/detail/malnutrition

Wrottesley, S. V., Pisa, P. T., & Norris, S. A. (2023). Nutritional status and dietary intake of South African children: A systematic review. *Nutrients, 15*(2), 311. https://doi.org/10.3390/nu15020311

Young, M. (2020). Contextual analysis of the UNICEF conceptual frameworks. Journal of Nutrition Studies. Retrieved September 27, 2024, https://doi.org/10.1017/S1368980020000506

Zheng, X. (2015). *Mixed methods research: A guide for the beginner*. Retrieved August 26, 2023, https://doi.org/10.7176/JLLL/58-05

Zheng, Y. (2015). Research design and methods in studies using data from social media: A systematic review. *Journal of Medical Internet Research, 17*(9), e239. https://doi.org/10.1177/1609406915624574

APPENDICES

Appendix 1: Permission to Conduct Research in KZN Schools, under uThukela District

KWAZULU-NATAL PROVINCE
EDUCATION
REPUBLIC OF SOUTH AFRICA

OFFICE OF THE HEAD OF DEPARTMENT

Private Bag X 9137, PIETERMARITZBURG, 3200
Anton Lembede Building, 247 Burger Street, Pietermaritzburg, 3201
Email: buyi.ntuli@kzndoe.gov.za Tel: 033 392 1051
Ref No.: 2/4/8/181
Enquiries: Mrs B. T Ntuli

Ms Nontobeko Zamalwandle Duma
Private Bag X9974
LADYSMITH
3370

Dear Ms Duma

PERMISSION TO CONDUCT RESEARCH IN THE KZN DoE INSTITUTIONS

Your application to conduct research entitled: **"THE STATE OF MICRONUTRIENT DEFICIENCIES IN SCHOOLS WITH FEEDING SCHEMES: A CASE STUDY OF FOUNDATION PHASE SCHOOL CHILDREN AGED 5 – 9 YEARS IN DRIEFONTEIN, LADYSMITH, UTHUKELA DISTRICT:"**, in the KwaZulu-Natal Department of Education institutions has been approved. The conditions of the approval are as follows:

1. The researcher will make all the arrangements concerning the research and interviews.
2. The researcher must ensure that Educator and learning programmes are not interrupted.
3. Interviews are not conducted during the time of writing examinations in schools.
4. Learners, Educators, Schools and Institutions are not identifiable in any way from the results of the research.
5. A copy of this letter is submitted to District Managers, Principals and Heads of Institutions where the Intended research and interviews are to be conducted.
6. The period of investigation is limited to the period from **03rd May 2024 to 31st August 2026**.
7. Your research and interviews will be limited to the schools you have proposed and approved by the Head of Department. Please note that Principals, Educators, Departmental Officials and Learners are under no obligation to participate or assist you in your investigation.
8. Should you wish to extend the period of your survey at the school(s), please contact Mrs Buyi Ntuli at the contact numbers above.
9. Upon completion of the research, a brief summary of the findings, recommendations or a full report/dissertation/thesis must be submitted to the research office of the Department. Please address it to The Office of the HOD, Private Bag X9137, Pietermaritzburg, 3200.
10. Please note that your research and interviews will be limited to schools and institutions in KwaZulu-Natal Department of Education.

[redacted]
Mr G.N. Ngcobo
Head of Department: Education
Date: 03 May 2024

GROWING KWAZULU-NATAL TOGETHER

Appendix 2: Letter to the Principal: Request for Permission to Conduct Research in your School

UKZN Edgewood Campus

121 Marianhill Road

Pinetown
3601

28 April 2024

To Whom It May Concern

Permission to conduct a research study in the school

I, Nontobeko Zamalwandle Duma am currently a master's student in Technology Education at the University of KwaZulu-Natal. This is an invitation to request permission to conduct a research study at your school and for you to participate in the study. My research topic is titled:

> *Micronutrient deficiency status in school feeding schemes: A case study of 5-9 year old's in Driefontein and Kleinfontein schools- Ladysmith, uThukela District*

The school, its teachers and all learners will be kept anonymous. I will utilize questionnaires, focus group interviews and observations as my data collection methods. I intend to conduct this research once ethical clearance is obtained from the University of KwaZulu-Natal. I will ensure that teaching and learning time is not disrupted during this study. Teachers and learners will be assured of confidentiality and anonymity. Further they will be informed that participation is voluntary, and they have the right to withdraw from the study without any repercussions.

Thank you for your co-operation.

Sincerely,

Ms. Nontobeko Duma

Cell: [redacted]

Email: [redacted] or 217025816@stu.ukzn.ac.za

In the event of further queries concerning the nature of my study, you are most welcome to contact my supervisor, Professor B. Alant, on alantb@ukzn.ac.za or 0312607606.

For further information please contact the Higher Research Degrees Edgewood office.

Email: hssrec@ukzn.ac.za

DECLARATION OF CONSENT

I …… (Full names of participant) hereby confirm that I have been informed about the study titled

……
……

by……..... **I understand the contents of this document and the nature of the research project, and I consent to participating in the research project.** I understand the purpose and procedures of the study. I have been given an opportunity to answer questions about the study and have had answers to my satisfaction. I declare that my participation in this study is entirely voluntary and that I may withdraw at any time without affecting any of the benefits that I usually am entitled to. **I voluntarily give permission for the study's activities to be digitally recorded. I give permission for the school to be used as a source of data. My identity will not be disclosed, and pseudonyms will be used to protect my identity.** If I have any further questions/concerns or queries related to the study, I understand that I may contact the researcher at: [redacted].

If I have any questions or concerns about my rights as a study participant, or if I am concerned about an aspect of the study or the researchers then I may contact:

HUMANITIES & SOCIAL SCIENCES RESEARCH ETHICS ADMINISTRATION

Campus
Private Bag X 54001 Durban
4000
KwaZulu-Natal, SOUTH AFRICA
Tel: 27 31 2604557 - Fax: 27 31 2604609
Email: HSSREC@ukzn.ac.za
Research Office, Westville Govan Mbeki

SIGNATURE: _____ **DATE: _____**

Appendix 3: Letter to the Parents – Request for Permission to include your children in a Research Project

UKZN Edgewood Campus
121 Marianhill Road
Pinetown
3601

28 April 2024

To Whom It May Concern

Permission for your child to participate in the research study

I, Nontobeko Zamalwandle Duma am currently a master's student in Technology Education at the University of KwaZulu-Natal. This is an invitation to request permission to conduct a research study with your child as one of the participants if you allow them to take part in the research. My research topic is titled:

Micronutrient deficiency status in school feeding schemes: A case study of 5-9 year old's in Driefontein schools- Ladysmith, uThukela District

All children will be kept anonymous. I will utilize questionnaires, focus group interviews and observations as my data collection methods. I intend to conduct this research once ethical clearance is obtained from the University of KwaZulu-Natal. I will ensure that the safety of your child is not compromised, and that they are comfortable as possible. The process of teaching and learning will not be disrupted during this study. Teachers and learners will be assured of confidentiality and anonymity. Further they will be informed that participation is voluntary, and they have the right to withdraw from the study without any repercussions. A child with help of the parent will also be required to sign a Child Assent Form that will show clearly that they took part in the study voluntarily and no force was used. Furthermore, incentives will be given to each child as an appropriate thank you for their participation provided that their parents or guardians do not have a problem with it.

Thank you for your co-operation.

Sincerely,

Ms Nontobeko Duma

Cell: 0[redacted]

Email: [redacted] or 217025816@stu.ukzn.ac.za

In the event of further queries concerning the nature of my study, you are most welcome to contact my supervisor, Professor B. Alant, on alantb@ukzn.ac.za or 0312607606

For further information please contact the Higher Research Degrees Edgewood office.

Email: hssrec@ukzn.ac.za

DECLARATION OF CONSENT

I …… (Full names of participant) hereby confirm that I have been informed about the study titled

……
……

by……..... **I understand the contents of this document and the nature of the research project, and I consent to participating in the research project.** I understand the purpose and procedures of the study. I have been given an opportunity to answer questions about the study and have had answers to my satisfaction. I declare that my participation in this study is entirely voluntary and that I may withdraw at any time without affecting any of the benefits that I usually am entitled to. **I voluntarily give permission for the study's activities to be digitally recorded. I give permission for the school to be used as a source of data. My identity will not be disclosed, and pseudonyms will be used to protect my identity.** If I have any further questions/concerns or queries related to the study, I understand that I may contact the researcher at: [redacted]

If I have any questions or concerns about my rights as a study participant, or if I am concerned about an aspect of the study or the researchers then I may contact:

HUMANITIES & SOCIAL SCIENCES RESEARCH ETHICS ADMINISTRATION

Campus
Private Bag X 54001 Durban
4000
KwaZulu-Natal, SOUTH AFRICA
Tel: 27 31 2604557 - Fax: 27 31 2604609
Email: HSSREC@ukzn.ac.za
Research Office, Westville Govan Mbeki

SIGNATURE: _____ **DATE: _____**

Appendix 4: Letter to the Foundation Phase Teachers - Invitation Participate in a Research Study

UKZN Edgewood Campus
121 Marianhill Road
Pinetown
3601

28 April 2024

To Whom It May Concern

Invitation to participate in the study

I, Nontobeko Zamalwandle Duma am currently a master's student in Technology Education at the University of KwaZulu-Natal. This is an invitation to request permission for you to participate in the research study to be conducted in your school with you and your learners provided that their parents allow me to do so. My research topic is titled:

> *Micronutrient deficiency status in school feeding schemes: A case study of 5-9 year old's in Driefontein and Kleinfontein schools- Ladysmith, uThukela District*

The school, teachers and all learners will be kept anonymous. I will utilize questionnaires, focus group interviews and observations as my data collection methods. I intend to conduct this research once ethical clearance is obtained from the University of KwaZulu-Natal. I will ensure that teaching and learning time is not disrupted during this study. Teachers and learners will be assured of confidentiality and anonymity. Further they will be informed that participation is voluntary, and they have the right to withdraw from the study without any repercussions.

Thank you for your co-operation.

Sincerely,

Cell: 0[redacted]
Email:[redacted] or 217025816@stu.ukzn.ac.za

In the event of further queries concerning the nature of my study, you are most welcome to contact my supervisor, Professor B. Alant, on alantb@ukzn.ac.za or 0312607606

For further information please contact the Higher Research Degrees Edgewood office.

Email: hssrec@ukzn.ac.za

DECLARATION OF CONSENT

I …… (Full names of participant) hereby confirm that I have been informed about the study titled

……
……

by……..... **I understand the contents of this document and the nature of the research project, and I consent to participating in the research project.** I understand the purpose and procedures of the study. I have been given an opportunity to answer questions about the study and have had answers to my satisfaction. I declare that my participation in this study is entirely voluntary and that I may withdraw at any time without affecting any of the benefits that I usually am entitled to. **I voluntarily give permission for the study's activities to be digitally recorded. I give permission for the school to be used as a source of data. My identity will not be disclosed, and pseudonyms will be used to protect my identity.** If I have any further questions/concerns or queries related to the study, I understand that I may contact the researcher at: [redacted].

If I have any questions or concerns about my rights as a study participant, or if I am concerned about an aspect of the study or the researchers then I may contact:

HUMANITIES & SOCIAL SCIENCES RESEARCH ETHICS ADMINISTRATION

Campus
Private Bag X 54001 Durban
4000
KwaZulu-Natal, SOUTH AFRICA
Tel: 27 31 2604557 - Fax: 27 31 2604609
Email: HSSREC@ukzn.ac.za
Research Office, Westville Govan Mbeki

SIGNATURE: _____ **DATE: _____**

Appendix 5: Letter to the School Food Supplier - Invitation to Participate in a Research Study

UKZN Edgewood Campus
121 Marianhill Road
Pinetown
3601

28 April 2024

To Whom It May Concern

Invitation to participate in the study

I, Nontobeko Zamalwandle Duma am currently a master's student in Technology Education at the University of KwaZulu-Natal. This is an invitation to request permission to take part in the research study to be held in one of the schools you supply food into. My research topic is titled:

> *Micronutrient deficiency status in school feeding schemes: A case study of 5-9 year olds in Driefontein and Kleinfontein schools- Ladysmith, uThukela District*

The school and all the participants will be kept anonymous. I will utilize questionnaires, focus group interviews and observations as my data collection methods. I intend to conduct this research once ethical clearance is obtained from the University of KwaZulu-Natal. All participants will be assured of confidentiality and anonymity. Further they will be informed that participation is voluntary, and they have the right to withdraw from the study without any repercussions.

Thank you for your co-operation.
Sincerely,
Ms. Nontobeko Duma
Cell: [redacted]
Email: [redacted] or 217025816@stu.ukzn.ac.za

In the event of further queries concerning the nature of my study, you are most welcome to contact my supervisor, Professor B. Alant, on alantb@ukzn.ac.za or 0312607606

For further information please contact the Higher Research Degrees Edgewood office.

Email: hssrec@ukzn.ac.za

DECLARATION OF CONSENT

I …… (Full names of participant) hereby confirm that I have been informed about the study titled

……
……

by……..... **I understand the contents of this document and the nature of the research project, and I consent to participating in the research project.** I understand the purpose and procedures of the study. I have been given an opportunity to answer questions about the study and have had answers to my satisfaction. I declare that my participation in this study is entirely voluntary and that I may withdraw at any time without affecting any of the benefits that I usually am entitled to. **I voluntarily give permission for the study's activities to be digitally recorded. I give permission for the school to be used as a source of data. My identity will not be disclosed, and pseudonyms will be used to protect my identity.** If I have any further questions/concerns or queries related to the study, I understand that I may contact the researcher at: 0[redacted]

If I have any questions or concerns about my rights as a study participant, or if I am concerned about an aspect of the study or the researchers then I may contact:

HUMANITIES & SOCIAL SCIENCES RESEARCH ETHICS ADMINISTRATION

Campus
Private Bag X 54001 Durban
4000
KwaZulu-Natal, SOUTH AFRICA
Tel: 27 31 2604557 - Fax: 27 31 2604609
Email: HSSREC@ukzn.ac.za
Research Office, Westville Govan Mbeki

SIGNATURE: _____ **DATE: _____**

Appendix 6: Letter to the School Cook Specialists - Invitation to Participate in a Research Study

UKZN Edgewood Campus
121 Marianhill Road
Pinetown
3601

28 April 2024

To Whom It May Concern

Invitation to participate in the study

I, Nontobeko Zamalwandle Duma am currently a master's student in Technology Education at the University of KwaZulu-Natal. This is an invitation to request permission to take part in the research study to be held in the school you are cooking at. My research topic is titled:

> *Micronutrient deficiency status in school feeding schemes: A case study of 5-9 year olds in Driefontein and Kleinfontein schools- Ladysmith, uThukela District*

The school and all the participants will be kept anonymous. I will utilize questionnaires, focus group interviews and observations as my data collection methods. I intend to conduct this research once ethical clearance is obtained from the University of KwaZulu-Natal. All participants will be assured of confidentiality and anonymity. Further they will be informed that participation is voluntary, and they have the right to withdraw from the study without any repercussions.

Thank you for your co-operation.
Sincerely,
Cell: [redacted]
Email: [redacted] or 217025816@stu.ukzn.ac.za

In the event of further queries concerning the nature of my study, you are most welcome to contact my supervisor, Professor B. Alant, on alantb@ukzn.ac.za or 0312607606

For further information please contact the Higher Research Degrees Edgewood office.

Email: hssrec@ukzn.ac.za

DECLARATION OF CONSENT

I …… (Full names of participant) hereby confirm that I have been informed about the study titled

……
……

by……..... **I understand the contents of this document and the nature of the research project, and I consent to participating in the research project.** I understand the purpose and procedures of the study. I have been given an opportunity to answer questions about the study and have had answers to my satisfaction. I declare that my participation in this study is entirely voluntary and that I may withdraw at any time without affecting any of the benefits that I usually am entitled to. **I voluntarily give permission for the study's activities to be digitally recorded. I give permission for the school to be used as a source of data. My identity will not be disclosed, and pseudonyms will be used to protect my identity.** If I have any further questions/concerns or queries related to the study, I understand that I may contact the researcher at: [redacted] .

If I have any questions or concerns about my rights as a study participant, or if I am concerned about an aspect of the study or the researchers then I may contact:

HUMANITIES & SOCIAL SCIENCES RESEARCH ETHICS ADMINISTRATION

Campus
Private Bag X 54001 Durban
4000
KwaZulu-Natal, SOUTH AFRICA
Tel: 27 31 2604557 - Fax: 27 31 2604609
Email: HSSREC@ukzn.ac.za
Research Office, Westville Govan Mbeki

SIGNATURE: _____ **DATE: _____**

Appendix 7: NFPE - Nutrition-Focused Physical Examination

UKZN Edgewood Campus
121 Marian hill Road
Pinetown
3601

28 April 2024

To Whom It May Concern

Permission for the child to participate in the study

I, _____have been told that my parents/ guardian has given permission for me to participate if I want to, in a project about:

---

that will be conducted in my school by _____on this day_____. I have also been informed that the participation is voluntarily, and I can stop at any time I want to, it will be okay if I want to stop.

Name of the Child: _____ Date: _____

Parent/ Guardian Signature: _____ Date: _____

Researcher's Signature: _____ Date: _____

Appendix 8: School Menu Observation Schedule

Observation Schedule

Date:					
School Name:					
Days:	**Food Item**	**Vitamins/ Minerals**	**Fats**	**Carbohydrates**	**Protein**
Monday					
Tuesday					
Wednesday					
Thursday					
Friday					

Appendix 9: Physical Observation of Learners

Category	Grade 1	Grade 2	Grade 3
General Appearance - **Well Nourished/Under nourished** - **Healthy/Unhealthy**			
Head and Face **Hair** - **Sparse and thin** - **Discoloured/ lustreless** - **Dry** **Scalp** - **Dandruff/ Ringworms** - **Clean/ Dirty** - **Injured Eyes** - **Normal eyebrows/ Absent Eyebrows** - **Normal eyelids** - **Sunken eyeballs/ Normal eyeballs**			
Skin Condition **Colour** - **Yellow- orange discoloration** - **Hyperpigmentation** - **Normal** **Texture**			

- **Dry/ Excessive moisture/ Rash/ wounds**			

Source: https://www.scribd.com/document/548183983/NUTRITIONAL-ASSESSMENT-FORM-OFCHILDREN

Appendix 10: Foundation Phase Learners Questionnaire Protocol

QUESTIONNARE FOR CHILDREN AGES 5 TO 9 YEARS

Name:_____

Age:_____

Grade:_____

1. Which one of these meals did you eat today? Breakfast Lunch
2. Does your school offer breakfast? Yes No
3. What does the school offer for breakfast?

_____

4. Do you eat the meal that is provided by the school for breakfast?

   Yes

   No

   Sometimes

5. What meals does your school offer for lunch on weekdays?

Monday:_____

_____Tuesday:_____

_____Wednesday:_____

_____Thursday:_____

_____Friday:_____

_____

5. Do you eat the school lunch? Yes

   No

   Sometimes

6. Which School lunch meal is your favourite?

_____

7. Does food ever get finished before you getting your portion?

   Yes

   No

Sometimes

8. How do you feel when it's finished?

   Sad

   Happy

9. Does food make you participate and concentrate in class?

   Yes No

10. Can you focus when you are hungry? Yes

    No

11. How would you feel if the school meals were to be cancelled?

_____

12. Does the school offer you fruits? If yes, how many days a week?

_____

13. Which vegetables does the school meals consist of?

_____

14. Which fruits and vegetables would you like your school to add on the meals?

_____

15. Is there a garden at school where they grow food that you eat? If so, do you help look after the garden?

_____

Thank you for your participation!!!!

Appendix 11: Focus Group Interview Protocol

FOCUS GROUP INTERVIEW QUESTIONS

Opening Questions

- What do you understand about the term malnutrition or nutrition deficiency?
- According to your knowledge what causes nutrition deficiencies in school children?
- What can the school do to prevent malnutrition from happening?
- How do you think malnutrition can affect the process of teaching and learning and the learner's personal growth?

Key Questions

- Do you know and understand the dietary guidelines for children aged 5- 9 years?
- With the nutrition program in process what do you think of it?
- What kind of food is supplied by the feeding scheme?
- How do you feel about the food provided by the feeding schemes?
- How is the nutritional value of food provided by the feeding scheme compared to the recommended dietary guidelines for children?
- In this school, have you ever had a problem of malnutrition with the learners? If yes, please take us through the encounter and if no what would you do if that situation were to happen?
- Has the government intervened in ensuring that malnutrition does not happen in the school? If so to what extent?
- Apart from the state which other organizations that help in fighting malnutrition in your schools? How do they help?

Ending Questions

- Suppose that you had a minute to talk to the government, with today's topic in mind what would you say? What would you like them to do to ensure that the learners always receive nutritious food?
- Of all the things we discussed, what do you think is the most important?
- Have we missed anything?
- Is there someone who would like to add on what we have discussed.