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THE SOCIAL CONTEXTS OF CHILDHOOD MALNUTRITION IN SOUTH AFRICA

BY

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STUDENT NUMBER: 681670

A Doctoral Thesis submitted to the Faculty of Humanities, University of the Witwatersrand, Johannesburg, South Africa, in fulfilment of the requirements for the award of PhD in Demography and Population Studies in the school of social science.

29 October 2024

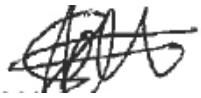
Supervisor: Professor Sunday Adedini

Co-supervisor: Professor Clifford Odimegwu

Declaration

I Matshidiso Valeria Sello, declare that this thesis is my own original work. All the secondary sources that have been used have been cited using the American Psychological Association Style (APA 7th edition). This study is being submitted for the degree Doctor of Philosophy in Demography and Population Studies, at the University of Witwatersrand, Johannesburg, South Africa.

This thesis has not been submitted before, in part of in full for examination of any degree or examination at this or any other university.



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List of abbreviations

CSG	Child Support Grant
DCs	District Councils
DSD	Department of Social Development
ECD	Early Childhood Development
FNS	Food and Nutrition Security Framework
HCU	Health Care Utilisation
HIV	Human Immunodeficiency Virus
HSRC	Human Sciences Research Council
ICC	Intra-class Correlation
INP	Integrated Nutrition Programme
KII	Key Informant Interview
KZN	KwaZulu Natal
LMICs	Low middle-income countries
NCF	Nurturing Care Framework
NDP	National Development Plan
NGO's	Non-Government Organizations
NIDS	National Income Dynamics Study
NPO	Non-Profit Organisation
NSNP	National School Nutrition Programme
PhD	Doctor of Philosophy
PCV	Proportional Change in Variance
PSU	Primary Sampling Unit
RDP	Reconstruction and Development Programme
SA	South Africa
SANHANES	South African National Health and Nutrition Examination Survey
SDGs	Sustainable Development Goals
STATSSA	Statistics South Africa

SUN	Scaling Up Nutrition
UN	United Nations
UNICEF	United Nations Children's Fund
UNDP	United Nations Development Program
USAID	United States Agency for International Development
VIF	Variance Inflation Factor
VPC	Variance Partition Coefficient
WHO	World Health Organisation

Abstract

Background: Childhood malnutrition is a major public health challenge of global importance. It may result from either excessive or deficient nutrients. Despite investments and several efforts made by the South African government and civil society organizations to improve child health, the prevalence of childhood malnutrition remains high in South Africa. South Africa is still lagging in in achieving the sustainable development goals 1-3 (i.e., 1- no poverty, 2 – zero hunger and 3 –good health and wellbeing). This is because the indicators of childhood malnutrition are significantly higher with one in four children being stunted, 13% overweight, and 7.5% underweight. These figures highlight a troubling trend that is echoed in many other African nations, where malnutrition rates are similarly concerning. For instance, while countries like Nigeria and Ethiopia face severe challenges with stunting rates exceeding 30%, South Africa's rates are comparatively lower but still indicative of a significant public health challenge. In contrast, developed nations such as the United States report much lower stunting rates—around 3.4%—and face different nutritional issues, such as rising obesity rates among children. The current malnutrition status is worrisome in South Africa given that these conditions have not changed much in nearly three decades. Among other factors recognised as the leading causes of poor nutrition outcomes is food insecurity in households -defined as the lack of regular access to safe, sufficient, and nutritious foods, disrupted eating patterns and reduced food intakes. Despite South Africa being a net exporter of food, it is characterised by high poverty, reduced opportunities for higher education, employment challenges, environmental hazards, substandard housing, and health disparities, still have challenges in access to affordable safe nutritious foods. Furthermore, due to the complexity of childhood malnutrition, an integrated multisectoral approach among families, communities, and government systems is critical to ensuring positive child health and nutritional outcomes. Addressing poor nutritional outcomes among under-5 children requires policy-relevant evidence. While the literature shows that childhood malnutrition is a multifaceted issue influenced by poverty and poor socio-economic outcomes, evidence is sparse on how structural and environmental factors operating at different levels influence childhood malnutrition. Therefore, an understanding of social contexts of childhood malnutrition is required to improve children's health outcomes in South Africa. Hence, this study examined the social context of childhood malnutrition in South Africa with a focus on individual child,

caregiver, and household-level characteristics. The study addressed five specific objectives: i) to determine the levels and patterns of childhood malnutrition in South Africa, (ii) to examine the individual child, caregiver, and household factors associated with childhood malnutrition in South Africa, (iii) to investigate the influence of food insecurity on childhood malnutrition, (iv) to explore the extent to which the socio-cultural and childcare practices of caregivers predispose under-5 children to malnutrition in selected low-income communities in South Africa, and (v) to investigate the role of a multi-sectorial approach in improving child nutritional outcomes in SA. This study was guided by the 2020 UNICEF conceptual Framework on Maternal and Child Nutrition as well as the Food and Nutrition Security Theory.

Methods: This study adopted an explanatory sequential mixed methods design (i.e., analysis of quantitative data followed by qualitative data collection and analysis). The research methodology was broken into the quantitative and qualitative study. The quantitative study entailed analysing the quantitative secondary data from the 2017 South Africa National Income Dynamics Study (NIDS Wave 5). The NIDS data was nationally representative. The sample was weighted using post-stratified weights. Data of 2 966 children and their mothers were analysed. These children were selected on the basis that they had complete anthropometric measurements (height and weight measurements) and were suitable and selected for the investigation of childhood malnutrition (stunting, overweight, and underweight). We also conducted qualitative in-depth interviews with Early Childhood Development (ECD) practitioners to gain a deeper understanding of their experiences in childcare and perceptions of feeding practices. They were key informants since under-5 children spent a lot of time at ECD centres. Data were analysed at the univariate level to obtain descriptive statistics, and at the bivariate level using the chi-square test of association. At the multivariate level, multi-level binary logistic regression was employed, and odds ratios were reported. The multilevel analysis involved two levels – the individual level (child and mother characteristics) and the household-level characteristics. Data were analysed using Stata software (version 17). The selection of the independent variables was guided by the literature review and conceptual framework of the study. The second part of the study was qualitative and was collected between June and August 2022. Twenty in-depth interviews, and five focus group discussions with mothers of under-5 children, and five in-depth interviews with early childhood development practitioners (ECD practitioners) were conducted. Interviews were conducted using semi-structured questionnaires in selected low-income communities in urban

Gauteng (i.e., Thulani in Soweto), and in rural Limpopo (i.e., GaMasemola in Sekhukhune District). These communities were selected based on high poverty and unemployment rates, had substandard houses, insufficient infrastructure and environmental issues. The qualitative data provided deeper understanding about ethe quantitative findings and explored questions that were not available to the researcher in the NIDS dataset. The focus group discussions and key-in-depth interviews further provided a follow-up and an explanation of the quantitative findings. Thematic analysis was used to analyse qualitative data.

Key findings from objective 1: In terms of descriptive findings, found that 22.16% of children were stunted, 16.40% were overweight, and 5.04% were underweight. The distribution of children among female and male children in the study population was almost the same. About 40% of the children had a low birth weight (<3 kg), 80.59% relied on the child support grant, and 67.22% were cared for at home during the day. Different patterns of malnutrition were observed. The highest percentage of children ages 12-23 months were stunted (33.43%) and overweight (32.69%), while the highest proportion of children ages 0-11 months and 48-59 months were underweight. Among children with a low birth weight of 1-2.9 kg, the highest percentage of stunting (30.07%) ($p = 0.001$, $\chi^2 = 71.2$) and underweight (7.05%) ($p = 0.026$, $\chi^2 = 16.9$) was observed. There was a relationship between access to medical aid, access to the child support grant, and childhood stunting ($p < 0.05$), while being cared for at home during the day was associated with stunting (24.98%) and overweight (18.99%) ($p = 0.002$, $\chi^2 = 36.3$). Caregivers' religion was associated with overweight ($p = 0.007$, $\chi^2 = 25.6$) among under-5 children, while caregiver's ethnicity ($p = 0.024$, $\chi^2 = 18.4$) was associated with underweight.

Key findings from objective 2: Female children had a lower likelihood (0.63 times) of being stunted compared to males. Children aged 12-23 months face a 60% higher risk of being overweight than those aged 0-11 months (AOR = 1.6). However, the risk of overweight declines steadily as age increases. Children aged 48-59 months are 83% less likely to be overweight compared to the youngest group of 0-11 months (AOR = 0.17). Children with a birthweight of 3 kg are 63% less likely to be underweight compared to those weighing 1-2 kg at birth (AOR = 0.37). Children attending crèches/day moms are 69% less likely to be underweight compared to those cared for at home (AOR = 0.31). Children cared for at home are 1.5 times more likely to be stunted (AOR=1.49) compared to children at a creche/day mom. Caregivers who were Nguni

had a 26% lower likelihood of having stunted children. Caregivers of other religions had 2 times higher likelihood of having overweight children compared to Christian caregivers (AOR=1.21). Middle-income households were associated with having overweight children (AOR=1.35) compared to low-income households. Children from structurally sound households had a 54% of high risk of being overweight compared to children from dilapidated household structures. The study found that a significant portion of the variation in child malnutrition (stunting, overweight, and underweight) occurred within communities. This is evident from the intraclass correlation of stunting (ICC) values from 27.9% to 30.2% variation, 34.3% to 38.2% overweight variation and 19.6% to 33,9% underweight variation within communities. The increase in ICC after adding additional variables suggest that these factors explain more of the variation within communities.

Key findings from objective 3: The results showed that nearly 30% of the households were below the lower-bound food poverty line of R890 per person per month in South Africa, and just about half of the households did not always have enough available foods all the time. The qualitative findings show that the COVID-19 pandemic exacerbated the food insecurity during the COVID-19 lockdown, when many caregivers lost their income sources due to job losses. Food affordability and availability in the households became a major issue, forcing households to make hard decisions between deciding on foods with high nutrition that should be eaten against diverting financial resources and paying for other household expenses such as rent or electricity. Caregivers understood that they should be feeding their children nutritious foods but due to financial constraints, they were forced to give children the available but less nutritious foods in the households.

Key findings from objective 4: Qualitative findings further showed that caregivers had various socio-cultural and childcare practices which influenced children's nutritional and health outcomes. Socio-cultural practices that influenced childhood malnutrition included dietary choices – these were not necessarily affected by cultural beliefs, but they were rather influenced by the lack of income. Traditional beliefs on food- such as foods like eggs and dairy products such as milk or yoghurts were not given to girls. This was from a belief that this food would make girls more fertile and grow much faster. Traditional healing practices influence the dietary restrictions, limiting access to some nutritious foods, which are based on superstitions and lead to stigma. With regards to the childcare practices, there was also a lack of clarity by caregivers

on the duration of exclusive breastfeeding as well as the duration when the children should stop breastfeeding. Caregivers did not have adequate knowledge about when to resume weaning. Some caregivers highlighted that the last time they received nutrition knowledge was when their children were infants, and they had taken the children for vaccinations. Caregivers were not aware of how responsive caregiving such as child feeding frequency and portion sizes could improve children's nutritional outcomes.

Key findings from objective 5: From the qualitative interviews with early childhood development (ECD) practitioners, findings indicated a growing disintegration of childcare systems, including the family, health, and social systems, where a lack of parental support in nutrition programmes, a lack of support in health services and other social services when making referrals. Furthermore, various systems of care were working in silos in childcare service provision, resulting in children facing multiple adversities.

Conclusions: The study demonstrated that individual-level child characteristics appear to exacerbate childhood malnutrition more than the mother and household-level characteristics. For example, the child level characteristics showed high significance, with age, sex, and child support grant, compared to the caregiver characteristics such as education, employment, and income. At the household level, variables such as household size and income did not show any significance. While this is the case, it does not necessarily mean that the mother and household-level characteristics were not important. This gap can be explained by the small sample, which can cause challenges of limited statistical power, making it harder to detect statistically significant differences. Furthermore, the qualitative assessment filled some gaps regarding these findings and gave an in-depth understanding on how the income disparities among caregivers and households result from high unemployment rates, highlighting the importance of socio-economic status and food security in child nutritional outcomes. From the ECD practitioners' interviews, given the disintegration of childcare systems, the coordination and multisectoral collaboration of different sectors of care for children is urgently needed to improve children's nutritional outcomes. Understanding the social context in which a child is brought up is important for the design of programmes and policies that will be effective in addressing this public health challenge. This understanding will enable efficient and effective service referral and service delivery to improve childhood nutrition in South Africa. This study highlights the need for a good

coordination of food, family, health, and social systems to ensure a positive childhood nutritional outcome.

Keywords: malnutrition, stunting, overweight, underweight, social context, food insecurity, childcare, socio-cultural practises, low-income, South Africa

Chapter 1

Introduction and statement of the problem

1.1 Introduction

Childhood malnutrition is a significant public health concern of global importance. In 2021, there were 5 million deaths of children under the age of five worldwide, with 80% of these deaths occurring in sub-Saharan Africa. It is estimated that 45% of these annual childhood deaths are linked to nutrition-related factors (UNICEF, 2021a). Malnutrition is defined as a health condition resulting from either excessive or deficient nutrient intake and is categorized into two broad categories: under-nutrition and over-nutrition (Bhattacharya et al., 2019). Undernutrition includes sub-forms such as stunting (low height for age), wasting (low weight for height), and underweight (low weight for age). Over-nutrition refers to overweight (high weight for age) and obesity (high weight for height) (World Health Organization, 2020). However, the severity of child malnutrition must be taken into account, and children who have two or more indicators of malnutrition are classified as severely malnourished (Dukhi, 2020).

In this study, malnutrition encompasses both undernutrition and overnutrition, which are critical components of child health. Undernutrition includes conditions such as stunting (low height for age), wasting (low weight for height), and underweight (low weight for age). These conditions result from inadequate intake of calories and essential nutrients, leading to impaired growth and development (UNICEF, 2023). While overnutrition refers to overweight and obesity, which are characterized by excessive calorie intake and insufficient nutrient quality. Overweight is defined as having a weight-for-height Z-score greater than +2 standard deviations or a BMI-for-age Z-score above +2 standard deviations (UNICEF, 2021b). The cut-offs for malnutrition

are critical as they correlate with various health risks and outcomes. For example, a prevalence of stunting above 20% is considered high public health significance, indicating an urgent need for intervention. Stunted children are at increased risk for morbidity, mortality, and long-term cognitive deficits. While for wasting, the prevalence exceeding 5% indicates a serious public health concern, with higher rates associated with increased mortality risk. Severe wasting (MUAC < 11.5 cm) significantly heightens the risk of death among children (Fiorentino et al., 2016). Additionally, overweight and obesity, which are characterized by excessive calorie intake and insufficient nutrient quality. Overweight is defined as having a weight-for-height Z-score greater than +2 standard deviations or a BMI-for-age Z-score above +2 standard deviations(The Global Nutrition Report, 2023; UNICEF, 2023; World Health Organization, 2020).

Globally, nearly 148.1 million children under the age of five were stunted, which represents 22.3% of all children in this age group. Additionally, 39 million were overweight, accounting for about 6% of the global under-five population and 37 million were wasted in 2022, equating to approximately 5.5%. Of the children who were wasted, 13.7 million suffered from severe wasting in 2022, with Africa and Asia having the highest prevalence (UNICEF, 2023). The progress in reducing child malnutrition has varied across indicators over time. For example, the number of stunted children has decreased from 199.5 million in 2000 to 144 million in 2019, but Africa has seen an increase, with 1.4 million more children in Southern and Eastern Africa and 6.5 million more in Central and Western Africa over the past 18 years (UNICEF, 2019). However, the COVID-19 pandemic has had devastating consequences, leading to a 4 million increase in the number of stunted children, from 144 million in 2019 to 148.1 million in 2022 (UNICEF, 2021a). Additionally, obesity, which was previously viewed as a problem in high-income countries, is now on the rise in low-income and middle-income countries. The number of overweight children

has increased from 30.3 million in 2000 to 37 million in 2022 (WHO, 2023). In 2019, the WHO intensified global efforts to reduce child wasting, with nearly 11 million children receiving treatment for wasting worldwide(Unicef/ WHO/The World Bank, 2019). However, access to wasting treatment coverage remains low, with only 1 in 3 severely wasted children having access to treatment (UNICEF, 2021a). Despite global efforts such as the Global Agriculture and Food Security Programme (GAFSP) and the Nutrition Movement to address food insecurity, significant disparities in food security persist between developing and developed countries (Committee on World Food Security, 2017; FAO et al., 2022).

Social context and child malnutrition at the global and regional levels

Globally, the causes of childhood malnutrition are multifaceted; hence child malnutrition is a public health concern as it contributes to global poverty, impedes economic growth and productivity (Dukhi, 2020). According to the literature, approximately one-third of the world's children are malnourished (Ghosh, 2020). In specific regions, such as the West Nile Region of Uganda, the cure rate for malnourished children is significantly lower than international standards, with a 50.4% cure rate compared to the Sphere standard of 75% (Lazzerini et al., 2020). In India, Gun (2023) suggests that state-level economic growth does not necessarily correlate with improved nutritional outcomes for children, implying that malnutrition persists despite economic advances. In Ethiopia, the prevalence of stunting, underweight, and wasting among under-five children is reported at 39.5%, 29.8%, and 15.4% respectively, with significant spatial variations in malnutrition among clusters within the country (Lemessa et al., 2020).

The situation is also dire in urban slums, such as the M-East ward in Mumbai, where the prevalence of acute malnutrition ranges from 16% to 59.8% (Nohwar et al., 2021). Therefore, it

remains critical to understand the social context of child malnutrition, which refers to the social interactions or circumstances that shape individuals and their surroundings. The social context further creates the context of an individual's growth and behaviour and the opportunities and barriers that impact their development. This includes and is not limited to the cultural and immediate social settings in which children live and grow (Umberson & Karas Montez, 2010). Undernutrition is particularly prevalent in developing or poorer nations (Amare et al., 2019; Bridgman & von Fintel, 2021). Moreover, overnutrition is now a problem in affluent or middle-income countries, faced with a two-fold problem of malnutrition (Minos, 2020; Popkin et al., 2020). Caregivers are a crucial interface between children and their children's health; therefore, studies have found that socioeconomic factors, rather than financial poverty alone, are the major causes of childhood malnutrition worldwide. These factors include a mother's knowledge of her children's health, her education level, employment status, marital status, household wealth, climatic stress, and her place of residence (Ghosh, 2020; Mkhize & Sibanda, 2020; Sandler & Sun, 2020; Scherer et al., 2019; Yakubu & Schutte, 2018).

The Impact of Malnutrition on Child Health Outcomes

The social context of childhood malnutrition also includes social institutions such as the family or neighbourhoods, shared beliefs, cultural norms and values, social roles or identities, social relationships such as friends or neighbours, and the broader political structures affecting the communities in which individuals live (Viswanath & Bond, 2007). Individual studies were conducted on the contextual factors contributing to the burden of child malnutrition in various regions. Rising living costs, increased globalization, and poverty in sub-Saharan Africa were

significant factors associated with the social context of childhood malnutrition (Adebisi et al., 2019; Akombi et al., 2017; Pavanello et al., 2016).

Malnutrition makes children more vulnerable to illness, aggravates their disease burden, and delays their recovery from health conditions (Tankoi et al., 2016; UNICEF, 2018). A high under-five mortality rate in a country is an indication of the country's nutritional status, knowledge of health care by caregivers, caregiver care practices, availability of maternal and child health care services (including antenatal care [ANC]), immunizations, and the availability of adequate water and basic sanitation (UNICEF, 2017). When the conditions of wasting and stunting are simultaneously present in one child, they are referred to as acute malnutrition and may directly contribute to under-five mortality (WHO, 2021).

South Africa now faces a double burden of malnutrition among children under the age of five, with 13% of children being overweight and 27% of children being stunted (Modjadji & Madiba, 2019). Between 2012 and 2013, 31% of deaths of children at hospitals in South Africa were due to severe acute malnutrition, and 30% of children who died were underweight (L Jamieson et al., 2017). The District Health Information System reported a decrease in the national cases of severe acute malnutrition in South Africa to a low of 7.7% reported in 2019/20 but notes the variation in cases, with some districts still reporting severe child malnutrition cases, with the highest reaching up to 20% or more (Thorogood et al., 2020). Furthermore, in 2017, an estimated 27% of children were stunted, 7.5% were underweight, 13% were overweight, and 5% were wasted or severely malnourished in the country (Lucy Jamieson et al., 2017; STATSSA, 2017b; UNICEF, 2017). The problem of malnutrition is persistent. Unfortunately, 5 years later, in 2023, these statistics remain unchanged, except for wasting, with only 3.4% of children wasted, a figure

lower than the 6% African average (The Global Nutrition Report, 2023). In 2018, 8% of all deaths of children under the age of five were due to acute malnutrition (Statistics South Africa, 2018). Most under-five deaths are due to avoidable causes, including prematurity, neonatal infections, malnutrition, pneumonia, and diarrhoea (Shung-King et al., 2019; UNICEF, 2018). Despite the decrease in the under-5 mortality rate - from 56 deaths (per 1000 live births) in 2009 to 33.8 deaths in 2019, there is a need to end all preventable child deaths if South Africa is to reach the target of 3.2 of the Sustainable Development Goal (SDG) by 2030 (STATSSA, 2019b). However, there is a need to investigate the roles of social context in childhood malnutrition, being an essential driver of health outcomes in developing countries.

Food security and childhood malnutrition

Globally, nearly 9% of the world's population experiences hunger (FAO, 2020). Food insecurity, defined as the lack of regular access to safe and nutritious foods, includes reduced quality variety of foods, disrupted eating patterns, and reduced food intake (Roser & Ritchie, 2019). Food insecurity resulting from a lack of money or other resources to buy nutritious foods has been recognized as the leading cause of poor nutrition outcomes among children under five and the elderly (Govender et al., 2017b). Other factors associated with food insecurity, ultimately affecting households' ability to grow and produce food, include environmental factors such as climate change and droughts (Ngumbela et al., 2020). The adverse consequences of food insecurity are related and may have long-term negative effects on children's health, as some families may go days without eating. In 2019, nearly 20% of people in sub-Saharan Africa were experiencing hunger, a figure that nearly doubles the global statistics of 9% (FAO, 2020). According to STATSSA, South Africa is a food secure country at a national level. This means that there is enough available food at the national level. However, the challenge is that although

the country has sufficient food, it is unfortunate that many South Africans still experience food insecurity, lacking access to safe and nutritious healthy food. The fact that many people in South Africa are still experiencing poverty and hunger is a depiction of failure in the country's development plans, especially given the country's attempt to achieve democratic transformation since 1994. Hunger and malnutrition deepen the social and economic divide in South Africa. The most impoverished areas, such as rural and townships, are stuck in structural poverty, with a substantial number of families not knowing when their next meal will come and going to bed hungry (Govender et al., 2017a; Ngumbela et al., 2020; S Van der Berg et al., 2021). The country still faces high unemployment rates, inequality, and poverty, resulting in food insecurity. Although South Africa has available food and meets the food requirements at the national level, 16% of the population has been experiencing severe poverty from September to December 2020 (IPC, 2021).

Childcare and childhood malnutrition

Caregiving practices play a crucial role in shaping children's nutritional outcomes. The term caregiving is a broad term that encapsulates all those that are caring for the children. For example, some children may be cared for by multiple carers (Sello, Adedini, Odimegwu, et al., 2023). Inclusive in the caregivers are the Early Childhood Development (ECD) practitioners who play a crucial role in addressing childhood malnutrition (Matjokana, 2023; Smit et al., 2021). Their role include early identification of malnutrition through growth monitoring, referring caregivers of malnourished children to appropriate services to improve child health outcomes and also educate caregivers and parents of children on proper feeding, complementary feeding practices which is essential for improving child malnutrition (Mahajan & Kaushal, 2015; McLaren et al., 2024; Modise, 2018; Sello, Adedini, & Odimegwu, 2023).

Although the 2019 General Household Survey estimates depict that limited access to food by households has decreased from 21.2% in 2011 to 17.8% in 2019, the COVID-19 pandemic has changed this narrative (STATSSA, 2019a). The lockdown measures in the country had resulted in an unprecedented human tragedy compounded by the slow economic activities due to restrictions in population movements (Altman, 2022; Casale & Shepherd, 2022). The COVID-19 pandemic not only harmed children's nutritional status, but also had a harsh impact on the economy. People not only lost their jobs and had restricted movements, but they also lost their livelihoods (Alaba et al., 2022; Altman, 2022; Servaas van der Berg et al., 2022). The country experienced severe demographic changes, particularly among the elderly and the working-age population, due to mortalities (Dorrington et al., 2021). Life expectancy also decreased, moving from a high of 68.4 years among females to 64.6 years and from 62.4 years to 59.3 years among males in South Africa (STATSSA, 2022). Caregivers of children under 5 who contracted COVID-19 placed an increased burden of care on their family members, and those who unfortunately passed away left children as orphans (Arndt et al., 2020; Corburn et al., 2020).

International efforts had been implemented to improve and strengthen multisectoral systems for improving children's nutritional outcomes. In South Africa, there is a lack of evidence on how different sectors work together to reduce child malnutrition, which dates back to 1994 when South Africa first became a democratic country (DoH, 2013). Various programs had been introduced to reduce childhood malnutrition, including the Integrated Nutrition Programme (INP), National School Nutrition Programme, and National Nutrition Security Plan (Dladla, 2002; Iversen et al., 2012; Republic of South Africa, 2017). Among these programs, government departments such as Social Development, the Department of Basic Education, the

Department of Health, and the Department of Agriculture are also working independently to address the issue of childhood malnutrition (Dladla, 2002).

In South Africa, there is a lack of evidence on the social context of child malnutrition. The need for this evidence is critical since many studies have emphasized the prevalence of child malnutrition (Abera et al., 2017; Said-Mohamed et al., 2020; Tsawe et al., 2015). Previous studies have also established the importance of household characteristics, such as household size, household income, number of people living in the household, and household poverty (Naicker et al., 2015; Nwosu & Ndinda, 2018; Sisha, 2020). Likewise, the National Development Plan (NDP) considers the household context in which child malnutrition occurs. This is done by using the multidimensional poverty index, which considers the three major contributors: health (child mortality), living standards (water, sanitation, and electricity), and education (NDP, 2011).

Poverty and food insecurity are part of the social determinants driving childhood malnutrition. According to the South African National Nutrition survey (SANHANES), food insecurity in the country is still high, with over 6 million people experiencing hunger in 2017 (HSRC, 2018; STATSSA, 2017b). Furthermore, the South African constitution emphasizes the right to food (South Africa, 1996). The history of apartheid and the political economy has had lasting adverse effects on many households (Clark & Worger, 2013). Social issues such as hunger, poverty, inequality, unemployment (Kekana et al., 2020), and the intermittent outbreak of epidemics such as Ebola and COVID-19 have grave implications for childhood nutrition and threaten child survival. The government's grants, such as the child support grant, pension grant, and the social relief of distress grant implementation, have slightly alleviated the poverty situation in South Africa. The provision of these grants is more evident during the COVID-19 pandemic,

with the child support grant reaching nearly 12 million children and the social relief of distress grant reaching 1.5 million people (Goldman et al., 2021; Granlund & Hochfeld, 2020). Despite this intervention, over 60% of children under 5 still live below the upper-bound poverty line (Hall & Sambu, 2018).

The larger social context, in which children are born and brought up, plays a role in influencing their health outcomes. Findings from studies on child malnutrition in South Africa indicate that unemployment is rising, which has worsened the rapid increase in urbanization and the growth of informal settlements, resulting in intermittent poverty and hunger in households (Oldewage-Theron & Slabbert, 2008; The World Bank, 2018). The implementation of effective and multi-sectoral nutrition programs will be critical. Reducing child malnutrition can be achieved through programs and interventions from provincial and national governments, as well as efforts from other development partners (Brown et al., 2020). Childhood malnutrition negatively impacts human and economic development, although differences exist across communities. It will be helpful to analyse the levels and trends of undernutrition, while also identifying the social context of growing malnutrition (Tzioumis & Adair, 2014). Other studies outside South Africa have attempted to understand the role of context in different health outcomes, such as child mortality, contraceptive use, maternal mortality, and maternal and child healthcare utilization. Furthermore, while individual interventions such as improving children's health, nutrition, social services, food security, water, and sanitation are essential, a multisectoral approach is crucial for ensuring effective and sustainable improvements in children's nutritional outcomes (Kim et al., 2020). In the context of this study, a multisectoral approach refers to a collaborative effort involving multiple government departments, non-governmental organizations, private sector entities, and communities such as Ealy Childhood Development

Centres (ECD) working together to address childhood malnutrition (Ntambara & Chu, 2021; Patel et al., 2021; Sello, Adedini, & Odimegwu, 2023). The key strategy to ensuring a multisectoral approach is to integrate how the various sectors work together, including combining nutrition-specific and nutrition sensitive interventions to ensure that children under 5 have access to the services they need (Kim et al., 2020; May et al., 2020; Motlwo et al., 2022). Moreover, this includes strengthening community-based nutrition services that would detect malnutrition early and provide treatment swiftly, nutrition promotion, education on nutrition practices and breastfeeding (Ntambara & Chu, 2021). Despite the established evidence on the critical role of the social context, there is limited evidence regarding the influence of the social context on childhood malnutrition in South Africa. The hypothesized links that this study makes is that undernutrition is often a direct consequence of poverty and food insecurity. Families living in poverty may lack access to enough food, leading to inadequate caloric intake and deficiencies in essential nutrients. This situation is exacerbated by high food prices, limited availability of nutritious foods, and insufficient knowledge about healthy eating practices. Children from low-income households are at a higher risk of stunting, wasting, and underweight due to these factors. The cycle of poverty can perpetuate malnutrition as undernourished children may experience impaired cognitive and physical development, limiting their future economic opportunities. Furthermore, overnutrition, characterized by overweight and obesity, is increasingly recognized as a public health issue even in low- and middle-income countries. This contradiction occurs when families facing food insecurity resort to cheaper, energy-dense but nutrient-poor foods that contribute to excessive calorie intake without providing essential nutrients. Additionally, urbanization and lifestyle changes associated with poverty can lead to decreased physical activity and increased consumption of processed foods. This shift can result in higher rates of overweight

and obesity among children in disadvantaged communities. Therefore, this study aims to provide empirical evidence on how the social context influences child malnutrition in socially and poor neighbourhoods, such as informal settlements and rural areas in South Africa.

1.2 Problem statement

Globally, it is well known that child malnutrition is linked to suboptimal brain development, thus affecting the child's survival, growth, and cognitive development, and is the primary driver of under-5 mortality and morbidities (Akombi et al., 2017). In South Africa, child malnutrition puts the health system under pressure. Over 80% of the South African population relies on the public health system, with only 16% having access to medical aid (Adedini et al., 2020; Shung-King et al., 2019). In poor households, children's health and nutrition status may be compromised, particularly when care is not taken in the first 1000 days of a child's life (De & Chattopadhyay, 2019). When the child is malnourished, they are likely to have permanent consequences such as poor academic performance, which is expected to affect their future jobs and earnings. As adults, they will be exposed to major lifelong health risk factors such as chronic diseases, including hypertension, diabetes, obesity, and cardiovascular diseases (Akombi et al., 2017; World Health Organization, 2020).

It is well established in the literature that the social context affecting child malnutrition may include demographic, socio-economic, environmental, parental, and household factors (Chowdhury et al., 2018). Previous findings have demonstrated that there needs to be an enabling environment for the child to grow and survive beyond pregnancy. A healthy environment includes safe and sufficient nutritious foods and access to health care (Clark et al., 2020; Shung-King et al., 2019; WHO, 2018). Unfortunately, in South Africa, 61.3% of children live in households with poor living conditions: overcrowding, poor sanitation, poor ventilation, and the

dilapidation of dwelling units (STATSSA, 2017a; Young, 2009). Researchers have argued that the burden of child malnutrition is more pervasive in low-income settings, particularly in rural areas, townships, and informal settlements. In these areas, growing social inequalities exist, and indicators such as stunting, wasting, and being underweight are still relatively high (Kismul et al., 2015; Nickanor & Kazembe, 2016). In South Africa, Gauteng and the Free State had the highest prevalence of stunting, 34%, among children under 5 in 2016 compared to the Northern Cape, which has the majority of 21% (Said-Mohamed et al., 2020). A previous study conducted nearly 2 decades ago in Limpopo showed that about 19% of children were stunted and wasted (Mamabolo et al., 2005). In South Africa, poverty remains widespread, with nearly 50% of South Africans living below the upper bound line of poverty the upper bound poverty line of R1 335 (STATSSA, 2021b).

In 2020, South Africa was categorized as a high human development country, defined by a high Human Development Index (HDI) of 0.709 in that year. HDI is a metric that assesses a country's progress or achievements based on health, life expectancy, standard of living, literacy, and per capita income (UNDP, 2022). Despite South Africa being classified as a highly developed country, more than half of the children living in South Africa live below the upper-bound poverty line of R1,335, and 62.1% are multidimensionally poor as they suffer from different types of deprivations. These deprivations may include nutrition, health, sanitation, hygiene, water, protection, and care (STATSSA, 2020, 2021a). Children in South Africa experience both over and undernourishment, with nearly 13% of children being overweight, 27% stunted, 5.9% underweight, and 2.5% experiencing wasting. Furthermore, South Africa is far from reaching the targeted 10% malnutrition rate by 2030, as stipulated by the National Development Plan (NDP, 2011). The double burden of child malnutrition exposes children to the risk of growth retardation.

The coexistence of both over and undernutrition exposes children to communicable diseases and diet-related non-communicable diseases, such as diabetes and hypertension (Shung-King et al., 2019).

While the value of various sectors working together to improve nutrition is acknowledged, South Africa, like many low-income countries, is still challenged in achieving multi-sectoral collaboration to resolve the problem of childhood malnutrition (Bennett et al., 2018; Thow et al., 2018). This is because different sectors of childcare are working in silos to improve childhood malnutrition. This approach is more problematic given that often strategies to resolve childhood malnutrition from a health perspective focus more on micronutrient supplementation or the promotion of breastfeeding, rather than considering the broader context, such as individual and household-level factors (Mugware et al., 2022; Scherbaum & Srour, 2016; Tam et al., 2020). An example of household-level factors includes household size, socioeconomic status, and household hygiene and sanitation. This narrow focus results in a limited understanding of the determinants of malnutrition (Mkhize & Sibanda, 2020). Secondly, because the determinants of childhood malnutrition are interconnected, there is a high likelihood that ineffective interventions will be delivered, given that malnutrition is influenced by numerous interrelated factors such as access to healthcare, socioeconomic status, food security, cultural and care practices (Bhutta et al., 2017; Govender et al., 2021; Siddiqui et al., 2020). Additionally, the siloed approach results in duplication of efforts and inefficiency in service delivery, where multiple organizations or departments are working independently to achieve the same objective, which is reducing childhood malnutrition, thereby wasting valuable time and resources (Leila Patel et al., 2021). Granted, this resource inefficiency may result in the incorrect distribution of resources, and children with the most need may risk not receiving the right interventions (Siddiqui et al., 2020).

Furthermore, this fragmentation between different sectors risks children receiving mixed messages related to the same outcome, leading to ineffective care (Govender et al., 2021). Because different departments are collecting data, the use of separate data systems can hinder efforts to provide a more comprehensive picture of child nutrition and its determinants in South Africa (Govender et al., 2021; May et al., 2020; Modjadji & Madiba, 2019).

Evidence from previous studies shows that promoting good health and hygiene for better child health outcomes has always been prevalent; however, this awareness did not always translate into action. The gap this study seeks to fill is to find out how the social context of child malnutrition and people's food choices is shaped by various structural and environmental forces that operate at different levels. For example, in South Africa, food adequacy and hunger remain pressing challenges in many households, despite South Africa being a net-exporter of food (Liu et al., 2022). Since more than 500,000 households with children under 5 years old live in homes experiencing hunger, and more than half of those children reside in urban areas (STATSSA, 2017). Although food security is a fundamental right in the country, nearly 70% of all households living in informal settlements suffer from food insecurity (Naicker et al., 2015). They may be subjected to eating the same type of food daily, miss meals at some parts of the day, or may not even have anything to eat at all (Naicker et al., 2015). The COVID-19 virus did not necessarily pose a risk to children under five, but the pandemic has had collateral damage to children's health, posing a threat to underweight and overweight among children (Zemrani et al., 2021). Children are impacted directly and indirectly by the pandemic. The pandemic's direct effects include poor diets and the inability to attend Early Childhood Centres – where poor children miss out on receiving free nutritious breakfasts and lunches from school. Social isolation and disrupted healthcare services such as primary care and immunization programs are other direct impacts.

The indirect effects include mental health and social protection (Headey et al., 2020; Zemrani et al., 2021). Furthermore, this study sought to understand how the COVID-19 pandemic affects food security and child malnutrition. What has not been widely explored is how families coped during the lockdown. The caregivers' perceptions of secondary care, how secondary care affected their children's nutritional status, and whether the family experienced food insecurity need further exploration.

In addition to environmental and household economic determinants, socio-cultural practices and norms impact child malnutrition (Nyati et al., 2019a). Child malnutrition may be considered a syndemic (a health problem contributing to a burden of diseases) given its complexity, with several reinforcing circumstances exacerbating it. The environmental, socio-economic situation, socio-cultural, and familial practices in which children grow up are essential for their health and development (Banwell et al., 2011). Therefore, it is crucial to understand the social context of child malnutrition to achieve improved health outcomes among children.

1.3 Research question

1.3.1 Main research question

To what extent do the individual and social contexts influence childhood malnutrition in South Africa?

1.3.2 Sub questions

i) What are the levels and patterns of childhood malnutrition in South Africa?

ii) What are the individual child, caregiver and household-level factors associated with childhood malnutrition in the study setting?

iii) In what way does household food insecurity affect the nutritional status of under-5 children in selected low-income communities?

iv) To what extent do socio-cultural practices of caregivers predispose under-five children to malnutrition in selected low-income communities in South Africa?

v) How can a multi-sectorial approach be employed towards improving child nutritional outcomes in South Africa?

1.4 Research objectives

1.4.1 General objective

The study's general objective is to investigate the influences of the social contexts on childhood malnutrition in South Africa.

1.4.2 Specific objectives

i) To determine the levels and patterns of childhood malnutrition in South Africa

ii) To examine the individual child, caregiver, and household factors associated with childhood malnutrition in South Africa

iii) To investigate the influence of food insecurity on childhood malnutrition

iv) To explore the extent to which the socio-cultural and childcare practices of caregivers predispose under-5 children to malnutrition in selected low-income communities in South Africa

v) To investigate the role of a multi-sectorial approach in improving child nutritional outcomes in SA.

1.5 Justification of the study

Childhood malnutrition remains a challenging problem in South Africa. In 1993, South Africa signed an international human rights treaty to affirm children's rights and welfare in the African charter at the United Nations convention. Despite that commitment, the country has been lagging in ensuring Section 28 of the Bill of Rights, which emphasizes the importance of basic nutrition, health care, social protection, and shelter for children under 5 (Parliament of RSA, 2019). Over the years, childhood malnutrition has received attention, and numerous studies have been conducted to identify the risk factors associated with high rates of stunting, wasting, and obesity among children under 5. Furthermore, these studies have also extensively reviewed the available policies to help fight against the problem of child malnutrition (HSRC, 2018; Jonah et al., 2018; Modjadji & Madiba, 2019; Nyati et al., 2019b; Tette et al., 2015, 2016; Tydeman-Edwards et al., 2018). Despite these research efforts, South Africa still falls short of meeting Sustainable Development Goals 1 to 3.

Regardless of all the strenuous international and national attempts to fight against child malnutrition, poor health outcomes are still observed among children under 5, and malnutrition continues to be an unbearable issue in the country. The Sustainable Development Goals (SDGs) are a blueprint and a universal call to action that seeks to improve health, well-being, and a sustainable future for all (UNDP, 2016; United Nations, 2019). The first three SDG goals are to end poverty, hunger, and promote good health and well-being, and they are expected to reduce stunting by 40% and low birth weight by 30% for children under five by 2030 (UNSCN, 2017). However, countries in sub-Saharan Africa, including South Africa, are still lagging in achieving this goal. Although several studies have been conducted on child malnutrition in sub-Saharan

Africa, the sub-national evidence base is weak on the micro and macro-level factors predisposing children to malnutrition, particularly in vulnerable and low-income settings.

In many urban or low-income areas of South Africa, the determinants of child malnutrition are not entirely understood as there are limited published studies on the social contexts of childhood malnutrition. Childhood malnutrition cannot be viewed in isolation from the individuals as the obvious social conditions of the caregivers, as well as their environmental factors, need to be considered. This includes their income, access to healthcare, level of education, and living conditions (Bircher & Kuruvilla, 2014). Most studies have rarely tackled the influence of the social contexts on childhood malnutrition and the impacts of pandemics on children's nutritional status. A study conducted in West Africa established that the relationship between household food accessibility, food production, and children's nutritional quality is not apparent (Hampshire et al., 2009). Consequently, the social contexts in which children are raised and brought up have implications for children's food and nutritional security, which impacts their health (Fanzo, 2015; Madhavan & Townsend, 2010).

1.6 Study Area and Rational for selection

South Africa, a country with the highest income disparities and inequality in the world, was chosen as a study area. The country has extreme disparities when looking at its income and wealth distribution, characterized by a Gini coefficient of 0.63 in 2021, which makes the country part of the top 164 countries with the highest inequality (Sulla et al., 2022). South Africa is part of the sub-Saharan African region, located in the southernmost part of the region, and shares borders with six countries, including Namibia, Mozambique, Zimbabwe, Botswana, Eswatini, and Lesotho (South African government, n.d.). South Africa gained its independence from the

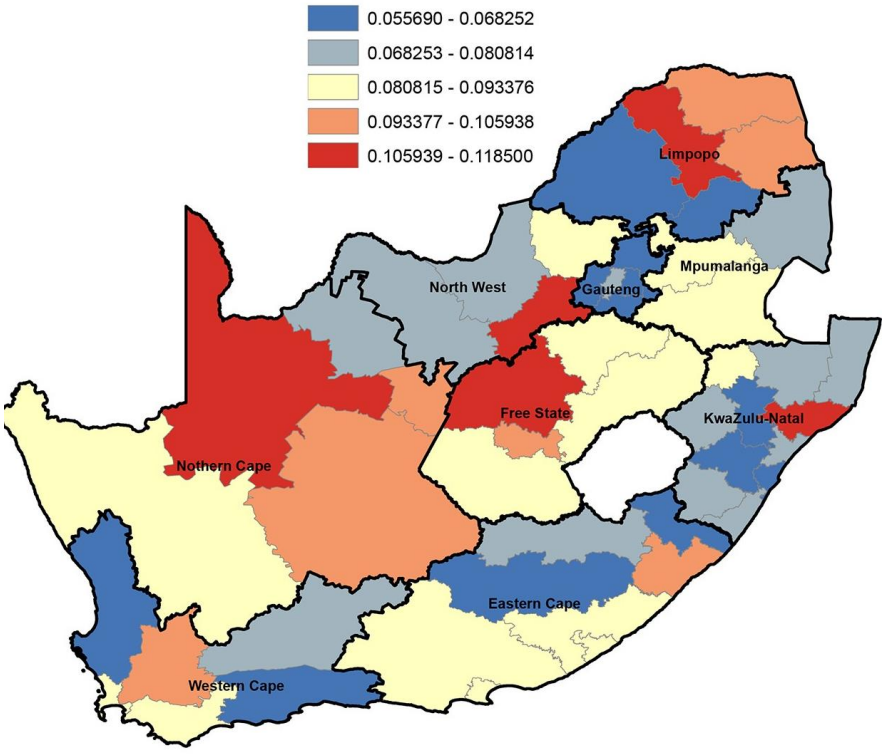
British Colony on May 31, 1910. However, in 1948, the system of Apartheid was introduced when the National Party came into power. Apartheid enforced discrimination against black people and other people of colour (Clark & Worger, 2013). This included racial segregation in all aspects of life, such as education, housing, employment, and forced removals of black people from areas that were considered "highly esteemed". Furthermore, this system ensured that the white minority would have economic and political privileges despite being the minority group, with black African people and other people of colour being denied basic human rights such as freedom of movement, voting, and property ownership (Evans, 2019; Tshishonga, 2019). Following racial tensions and resistance in the country from civil society movements, student protests, and international pressure, the Apartheid system was ended in 1994 when the country held its first democratic elections and adopted a progressive constitution (Posel & Casale, 2019). South Africa is characterized by cultural, religious, and ethnic diversity. This includes black, Indian, White, Chinese, and mixed-race communities, as well as 11 official languages. The black African communities have four main ethnic groups, including Nguni, Sotho, Venda, and Shangaan-Tsonga, of which the Nguni include Zulu, Ndebele, Xhosa and Swati speaking people (Frankental & Sichone, 2005). As shown in Figure 1.1 below, South Africa has nine provinces.

Within these provinces, 52 districts and 278 municipalities exist. To date, the country is home to 60.6 million people (STATSSA, 2022b).

Figure 1. 1 South Africa map showing stunting prevalence by district in 2017. Source: (Sartorius et al., 2020)

The demography of South Africa

South Africa, a developing country, is experiencing continuous growth. In 2017, the population of South Africa was 57.01 million. However, by 2021, mid-year population estimates showed that South Africa had a population of 60.1 million, with almost 68% of the population residing in urban areas and cities. Children under the age of 5 accounted for 9.5% of the total population, with a population size of 5.7 million children. Among them, 80.9% were African,



followed by Coloured people at 8.8%. The provinces of Gauteng, Kwa Zulu Natal, and the Western Cape were the most populous, with Gauteng leading the way with 15.8 million people

(STATISTICA, 2021). It is projected that this population will increase to 70 million by 2035 (STATSSA, 2022c).

There are several reasons why South Africa was selected as the study location. Firstly, South Africa still faces high rates of child morbidity and infant mortality. In 2022, the infant mortality rate and under-five mortality rate stood at 24.3 deaths per 1000 live births, with the under-5 mortality rate at 30.7 per live births (STATSSA, 2022b). These rates remain higher than the global targets set by the sustainable development goals, which aim to reduce infant mortality to a minimum of 12 per 1000 live births and under-5 mortality to a low of 25 per 1000 live births by 2030 (UNSCN, 2017). The elevated rates of under-five mortalities and morbidities are attributed to the growing levels of poverty and inequality, with the lower-bound food poverty line set at R890 and the upper bound poverty line at R1,335 (STATSSA, 2021a). In 2020/2021, nearly 18.2 million people in the country received social grants, including the child support grant, Old Age grant, Disability grant, and other grants apart from the Social Relief of Distress Grant (South African Social Security Agency, 2022). Despite these government interventions, many households still lack access to nutritious food, water, sanitation, and basic healthcare, which are key risk factors for avoidable childhood morbidities and deaths (Chakona & Shackleton, 2019; Devereux & Waidler, 2017; Waidler & Devereux, 2019).

Secondly, South Africa bears a significant burden of HIV prevalence rates, which further contribute to morbidity and mortality among children under five if the virus is transmitted to them (Gona et al., 2020; Nannan et al., 2019). Thirdly, inadequate sanitation increases the risk factors for infectious diseases such as pneumonia, diarrhoea, and cholera, weakening children's immune systems and making them more susceptible to illnesses (Salam et al., 2015).

Despite its status as one of the most developed countries, South Africa continues to face the persistent "slow violence" of malnutrition among children under five. This can be attributed to the ongoing nutrition transition, characterized by a shift from traditional foods to highly processed foods that are high in salt, calories, fats, and sugars, leading to non-communicable diseases (Kimani-Murage, 2013; May et al., 2020; Motlwo et al., 2022).

Considering the above reasons, South Africa provides a crucial setting for studying child malnutrition, investigating its causes and effects, and developing solutions to address this significant public health issue. This offers an opportunity to examine the complex relationships within the social context of childhood malnutrition, particularly the interplay of poverty, diet, and health, and to develop interventions that tackle these interconnected problems. The South African government has demonstrated a strong commitment to addressing child malnutrition and improving health and well-being through its National Policy on Food and Nutrition Security, as part of the National Development Plan (Thow et al., 2018). This commitment from the government encourages the development of research and interventions and increases the likelihood of implementing the study's findings.

1.7 Definition of terms

BMI: This concept refers to Body Mass Index, which is calculated as the weight divided by the square of the height.

Childcare practices: This concept encompasses feeding practices, hygiene practices, healthcare utilization, and ensuring that children are raised in healthy and safe environments.

Child health: It encompasses various factors that impact a child's growth and development, including diet, immunizations, access to healthcare, and social and environmental variables.

Childhood: This concept denotes the state of being a child and being dependent on others for care.

Complementary feeding: This concept refers to the introduction of solid foods or liquids to infants when breast milk alone is no longer sufficient to meet their nutritional needs.

Contextual characteristics: This concept refers to the elements of the environment that affect individuals and are beyond their control.

Diet: This concept pertains to the types of food typically consumed by individuals or members of a household.

Disease episode: It refers to the period from the onset of the first symptoms during a child's illness through their recovery.

Double burden of malnutrition: It denotes the coexistence of both overnutrition and undernutrition in a population.

Early childhood development: This term describes the stage from birth until the age at which children start attending school, during which significant physical, cognitive, social, and emotional changes occur.

Food insecurity: It refers to a state in which people or households lack reliable access to sufficient safe and nutritious food to meet their dietary needs.

Food security: This concept pertains to the ability to access safe, healthy, nutritious, and adequate food that meets the dietary needs of all household members.

Health equity: It is the principle that every individual, regardless of their social or economic standing, should have equal opportunities to achieve optimal health.

Household: A term used to refer to a group of people who share meals and pool resources.

Household characteristics: This term encompasses the composition of the household, its size, and the assets it possesses.

Livelihood strategies: This term refers to the means or activities that individuals adopt to generate income and make a living, as well as how they utilize their available assets and financial resources to meet their basic needs.

Lower bound poverty line: It represents the minimum level of income or consumption needed to purchase a basic basket of goods and services that is sufficient for an individual's survival. It is typically set at the bare minimum needed to prevent extreme poverty.

Malnutrition: This concept refers to a condition that results from a deficiency, excess, or imbalance in an individual's diet (in terms of energy and specific nutrients) relative to their health requirements.

Micronutrient deficiencies: These are a type of malnutrition that leads to various health problems due to insufficient intake of essential vitamins and minerals by the body.

Multi-level modelling: A statistical technique used to analyse data that is hierarchically organized, with individuals nested within groups or clusters. It calculates the variance both within and between groups.

Multi-sectoral approach: A strategic collaboration between various sectors and stakeholders, including government, civil society, healthcare providers, and other organizations. This approach aims to address complex challenges by working together to achieve specific goals.

Neighbourhood: A concept that refers to a geographic community characterized by social relationships among individuals within a particular suburb or town.

Overnutrition: An imbalance in nutrition resulting from excessive nutrient consumption, leading to the accumulation of body fat and health problems.

Overweight: Overweight is defined as having a weight-for-height Z-score greater than +2 standard deviations or a BMI-for-age Z-score above +2 standard deviations.

Parity: A concept that quantifies the total number of children ever born to a woman.

Poverty: The experience of deprivation, as evidenced by hunger and insufficient financial resources to meet basic needs such as food, shelter, and clothing.

Service delivery: The ability of a country's administration to provide adequate and reliable services efficiently and promptly to the public.

Socio-economic practices: A concept that encompasses the behaviours and actions of social groups within a society, including their consumer practices.

Socio-cultural practices: A concept that encompasses the emotional, spiritual, and material aspects that characterize a society or social group. This includes religious or spiritual practices, dietary practices, and childcare practices.

Social context: The immediate social situations in which individuals live, including the cultures and institutions within which they interact.

Social determinants of health: The social and economic factors, such as poverty, education, employment, social support, and access to healthcare, that influence health outcomes.

Stunting: is defined as a height-for-age Z-score (HAZ) less than -2 standard deviations from the median of the World Health Organization (WHO) growth standards.

Undernutrition: Inadequate nutrition resulting from insufficient food intake or a lack of nutrients necessary for optimal growth.

Underweight: is defined as a weight-for-age Z-score less than -2 standard deviations.

Upper bound poverty line: The minimum level of income or consumption required to afford a minimal amount of goods and services to maintain a higher standard of living.

Wasting: is identified using a weight-for-height Z-score (WHZ) less than -2 standard deviations or a mid-upper arm circumference (MUAC) of less than 12.5 cm for children under five years old.

1.8 Organization of the Thesis

This thesis is structured as follows: chapter 1 provides the background and introduction to the social context of childhood malnutrition. Chapter 2 provides the review of the relevant literature and the theoretical framework. In chapter 3, the methodology underpinning the study is presented. Objectives 1, 2, 3 and 4 are covered in chapters 4, which gives the quantitative results and qualitative findings. Chapter 5 provides the summary of findings and hypothesis testing. Chapter 6 discusses the study findings and chapter 7 provides the study conclusions and policy recommendations. Appendices contain additional crucial details.

Chapter 2

Literature review and Theoretical framework

2.0 Introduction

This section presents a comprehensive literature review on the social context of childhood malnutrition among children under five, as well as the theoretical framework of the study. Various sources were utilized for this literature review, including search engines such as Google, Google Scholar, ScienceDirect, PubMed, JSTOR, Wits-Wired Space, and reports from websites focusing on child health and child malnutrition. The University of Witwatersrand library was also accessed to obtain journal articles that were not openly available. In addition, supervisors provided assistance in sharing relevant articles during the literature search. The key terms used for searching the literature encompassed child malnutrition, child health, child stunting, child wasting, child underweight, child obesity, social context, determinants of child malnutrition, childcare practices, and multi-level analysis of childhood malnutrition.

The literature review includes research from the field of public health, which explores the demographic and contextual determinants of various health outcomes. Numerous studies have investigated the causes and factors contributing to childhood malnutrition. It is well-documented in the existing body of literature that sub-Saharan Africa exhibits poor health outcomes. Children under five are especially vulnerable to adverse health outcomes, such as childhood malnutrition, childhood morbidities, and mortalities. To ensure a comprehensive exploration of childhood malnutrition, this literature review is organized into six subheadings. These subheadings encompass: (1) providing a broad overview of childhood malnutrition, (2) reviewing malnutrition among children in Africa, (3) providing an overview of child malnutrition and health outcomes

in South Africa, and (4) examining the social context of childhood malnutrition, including individual-level child and caregiver determinants, as well as household and community-level contextual determinants contributing to child malnutrition among children under five.

2.1 Global overview of childhood malnutrition

Child nutrition pertains to the dietary requirements of children for their growth and overall health. Enhancing nutrition has been linked to improved health outcomes for both infants and mothers, strengthening the immune system, and reducing the risk of non-communicable diseases (World Health Organization, 2020). Childhood malnutrition refers to a state of inadequate nutrition, which includes overnutrition, characterized by excessive consumption of energy-dense foods leading to overweight or obesity in children (Seferidi et al., 2022).

Anthropometric measurements, such as Mid-Upper Arm Circumference (MUAC), weight, and height, are commonly used to assess childhood malnutrition in data collection. These measurements are often compared against growth charts, such as those provided by the WHO or CDC, which define thresholds for malnutrition based on standard deviations (SD) from the median (World Health Organization, 2020). Z-scores are statistical measures that indicate how many standard deviations a child's measurement is from the mean of a reference population. They are calculated for weight-for-age, height-for-age, and weight-for-height. The Z-score method allows for a more nuanced understanding of a child's nutritional status by considering multiple dimensions simultaneously (Ge & Chang, 2001). Consequently, nutritional outcomes include deficiency-related disorders resulting in growth restrictions and weight loss, such as kwashiorkor (caused by inadequate protein intake, often accompanied by fluid retention and liver abnormalities) and marasmus (severe undernutrition due to insufficient protein and calorie intake,

leading to severe wasting) (Bhutta et al., 2017; Kismul et al., 2015). These nutrition related disorders can be assessed clinically, through physical examinations to identify clinical signs of malnutrition, such as oedema or skinfold thickness measurements. Clinical assessment provide immediate insights into a child's health but may lack specificity without accompanying anthropometric data (Klanjsek et al., 2019). Dietary assessments evaluate food intake through methods like 24-hour recalls or food frequency questionnaires. While they provide insights into nutrient intake adequacy, they can be subject to recall bias and may not accurately reflect an individual's usual dietary habits (Harper et al., 2022; Modjadji et al., 2020).

The age of the child serves as a crucial indicator of their nutritional status. For instance, at birth, indicators such as birth weight are used to gauge the child's nutritional status, while weight-for-age is an indicator for school-age children (Amare et al., 2019b; Gavhi et al., 2020; Modjadji & Madiba, 2019b). In assessing the nutritional status of children under the age of five, the Bt20+ study in South Africa expanded beyond height and weight measurements to include hip circumference and waist measurements (Nyati et al., 2019a). A previous study on BMI in children found that waist circumference serves as a better marker for diagnosing metabolic syndrome, a condition related to diet and nutrition in children (Goon et al., 2011).

In various contexts, studies have demonstrated the intricate nature of childhood malnutrition as a health outcome, highlighting its severity and multifaceted characteristics (Ansuya et al., 2018; Sanchoas et al., 2017; Tydeman-Edwards et al., 2018). It has been argued that the social context influencing children's nutritional outcomes encompasses individual, household, and community-level factors (Bhutta et al., 2017). Over the years, numerous efforts have been made at global and national levels to combat childhood malnutrition through the

implementation of various strategies and programs. International initiatives such as the International Malnutrition Task force, The Global Nutrition Policy, Scaling up Nutrition (SUN) Movement, the Global Panel on Agriculture and Food Systems Nutrition, Global Alliance for Improved Nutrition (GAIN), Food fortification, Water, Sanitation and Hygiene practices (WASH), Education and behaviour change programs, the Renewed Efforts Against Child Hunger (REACH), The UN Standing Committee on Nutrition (UNSC), and Humanitarian responses to natural disasters have been introduced (Jackson et al., 2022; Pearson & Ljungqvist, 2011; Scaling up Nutrition, 2020; World Health Organization, 2018). While these programs share a common goal of reducing childhood malnutrition, they also aim to provide guidelines and policy proposals to advance food and nutrition systems (Fanzo, 2017). However, studies have yielded varied results regarding the effectiveness of nutrition programs, with some showing success while others have demonstrated limited impact (Mahmudiono et al., 2018; Mohammed et al., 2022; R, 2019). For instance, in Senegal, the introduction of complementary foods did not correlate with changes in children's nutritional status (Gupta et al., 2007). Conversely, in Iran, nutrition-based intervention counselling and education, along with subsidized complementary foods, resulted in a 21% improvement in the odds of stunting (Shenavar et al., 2022).

Although the importance of integrated systems to improve nutrition is acknowledged, many countries face numerous challenges in implementing and coordinating these proposed systems (Shahid & Bishop, 2019). Consequently, in many cases, sound programs and policies are formulated at higher levels, but their implementation proves challenging on the ground due to factors such as corruption, limited financial resources, unmotivated staff, inadequate engagement with the target population, and insufficient coordination (Mafugu, 2021; Mawela & Van Den Berg, 2018; Uchendu & Abolarin, 2015). As a result, the most vulnerable populations, such as

children and the poor, are disproportionately affected. In Africa, ongoing efforts to improve childhood malnutrition can be traced back to the implementation of the Millennium Development Goals in 2000, with a focus on ending poverty and hunger, reducing child mortality, and improving child and maternal health (World Bank, 2005). The introduction of the Sustainable Development Goals (SDGs) in 2016 marked the conclusion of the MDGs, with SDGs 1 to 3 aiming to reduce poverty and hunger and ensure good health and wellbeing for all (United Nations Sustainable Development, 2015).

Despite global initiatives to improve child health outcomes, childhood malnutrition remains a significant and pressing public health challenge worldwide, particularly in developing regions like Sub-Saharan Africa. According to the World Health Organization, approximately 45% of all deaths among children under the age of five are attributed to malnutrition, and in 2020, an estimated 5 million children in this age group died from malnutrition globally (UNICEF, 2021a). The authors also noted that the leading causes of death among children under five include infectious diseases, malnutrition, diarrhoea, malaria, and premature births (Perin et al., 2022; UNICEF, 2021a). These statistics highlight a noteworthy shift in childhood mortality rates, as the number of deaths has decreased from 1 in 11 children in 1990 to 1 in 27 children in 2020. Furthermore, the authors discovered that in 2020, approximately 149 million children were stunted, 45.4 million were wasted, and 38.9 million were overweight or obese (UNICEF, 2021a). Although the Global Nutrition Report shows a significant decline in malnutrition indicators, with stunting decreasing from 32.7% in 2000 to 22.2% in 2019, regions like South Asia and Sub-Saharan Africa continue to lag, with stunting rates as high as 30.7% in Sub-Saharan Africa and wasting rates of 14.7% in South Asia, surpassing the global figure of 6.5% in 2019 (Global Nutrition Report, 2020). Additionally, studies have revealed that the detrimental consequences

of childhood malnutrition are further exacerbated by various factors, including inadequate economic strategies and policy plans for implementing nutrition intervention programs, as well as pandemics negatively impacting access to food and healthcare services (Sotiraki et al., 2022; Vaivada et al., 2017).

2.2 Overview of childhood malnutrition in Africa

Childhood malnutrition is a significant issue in Sub-Saharan Africa. The region has some of the highest rates of malnutrition in the world. It is estimated that 40% of young children under the age of five have stunted growth due to chronic malnutrition (Akombi et al., 2017; Quamme & Iversen, 2022). Stunting has become a persistent problem in Sub-Saharan Africa, creating a vicious cycle. A study conducted by Nahalomo and colleagues in rural Uganda found that 38% of children were stunted and 4% were wasted (Nahalomo et al., 2022). These findings are consistent with a systematic review that showed high rates of stunting in West Africa (34%) compared to countries in the Southern Africa region (27%) (Nahalomo et al., 2022). Another study conducted in Southern Ethiopia sampled 717 children and found that 60% were stunted and 9% were wasted (Toma et al., 2023). Despite a global decline in stunting, Sub-Saharan Africa continues to have a growing number of stunted children, indicating limited progress in comparison to the global community (Akombi et al., 2017). Previous research has highlighted that malnutrition in Sub-Saharan Africa is exacerbated by food insecurity, poor infrastructure, resource conflicts, and limited access to health services (Fanzo, 2012). May et al. argue that failure to address this challenge will have adverse implications for human capital and economic growth in the region (May et al., 2020). Childhood malnutrition has wide-ranging implications for health and the economy. Research indicates that the complex interplay of social, economic, and political factors contributes to socio-economic inequalities in health, particularly in

developing countries where disparities in health outcomes exist among different socio-economic groups (Gordon et al., 2020; Yaya et al., 2020). Marginalized groups are particularly vulnerable to severe forms of childhood malnutrition (Reinhardt & Fanzo, 2014). While a multidimensional approach is necessary to address malnutrition, Amri et al. emphasize the need for coordinated efforts from individuals, households, government departments, NGOs, and NPOs (Amri et al., 2022). This is important in recognizing the impact that positive nutrition outcomes can have on human development, human capital, and overall health (Banking on Nutrition, 2017; King et al., 2021).

2.3 Overview of childhood malnutrition in South Africa

South Africa's contribution to global statistics on adverse health outcomes, such as child mortality and childhood malnutrition, cannot be underestimated. The country's under-five mortality rate in 2020 was reported as 32.63 deaths per one thousand live births, showing a significant improvement compared to 1974 when it was an alarmingly high 125.5 deaths per one thousand live births. Despite the progress made in addressing adverse health outcomes, child malnutrition remains a persistent public health concern in South Africa. Various studies conducted in the country have highlighted that children face multiple adversities, with the most vulnerable being those exposed to malnutrition. These children often come from poverty-stricken households, have unemployed caregivers, caregivers with low educational attainment, limited access to healthcare services, and live in areas with poor housing and sanitation. Additionally, a significant number of children in South Africa are orphans.

May et al. (2020) argue that malnutrition is a form of slow violence against children, with 27% of them still experiencing stunted growth and 10% being underweight. They also note that

this disappointing figure is accompanied by a high number of overweight children, which contributes to diet-related non-communicable diseases. A study by Mbogori et al. (2020) investigated shifts in nutritional status and found that South Africa, along with other low- and middle-income countries like Malawi, Kenya, and Ghana, is currently undergoing a nutrition transition. This transition is characterized by changing economic and social developments that have resulted in shifts in diets, from traditional staple foods to westernized, high calorie processed foods, leading to the coexistence of over and undernutrition. In line with Mbogori et al., Mkhize et al. (2020) have identified low dietary intake as a major contributor to child nutritional outcomes.

In South Africa, the enduring effects of Apartheid have resulted in persistent inequalities and income disparities, which have fostered concerns regarding childhood malnutrition. A comprehensive analysis conducted nearly two decades ago demonstrated that health disparities in South Africa were largely attributable to socio-economic status, illustrating that individuals from lower socio-economic backgrounds were disproportionately burdened by diseases and mortality across all age groups (Zere & McIntyre, 2003). Similarly, Iversen and colleagues conducted a study spanning the initial 16 years after democracy and asserted that Apartheid was a fundamental driver of the persisting poverty experienced by the majority of black South Africans (Iversen et al., 2011).

While several studies have contended that hunger and food security have improved in South African households since the cessation of apartheid in 1994 (Cichello & Rogan, 2018; M. Leibbrandt et al., 2010; Omotoso & Koch, 2018), caution must be exercised in interpreting these

findings since hunger is often measured through surveys, making quantification challenging (De Weerdt et al., 2016). Additionally, Weerdt and colleagues emphasize that hunger counts derived from survey designs necessitate careful consideration due to their inherent limitations and fragility (De Weerdt et al., 2016). Furthermore, the termination of Apartheid saw the establishment of the Child Support Grant (CSG). Nearly a decade following its implementation in 1998, Altman and colleagues discovered a notable reduction in deep chronic hunger among food-insecure households (Altman et al., 2009). Priscilla's study further reaffirms that social grants constitute a significant source of income in impoverished households, albeit not the sole one (Gutura, 2014). However, Patel and Ross argue that although cash transfers in the form of social grants have proven effective in alleviating poverty, combining them with measures to strengthen families is indispensable for improving children's nutritional outcomes (Leila Patel & Ross, 2022).

Although mounting evidence in South Africa demonstrates that the CSG has made strides in improving dietary conditions and marginally reducing childhood malnutrition within households (Granlund & Hochfeld, 2019; Hajdu et al., 2020; Leila Patel et al., 2017; Zembe-Mkabile et al., 2016), a study conducted with caregivers in the country produced contrasting findings, suggesting that the grant amount was insufficient to significantly enhance children's nutrition (Zembe-Mkabile et al., 2018).Childhood malnutrition has a significant negative social and economic impact on individuals, families, households, and communities. The social context surrounding child malnutrition encompasses the cultural and immediate social environments in which children reside (Viswanath & Bond, 2007). Previous research indicates that childhood malnutrition is not attributable to a single factor, but rather arises from a combination of various social factors (Bhutta et al., 2017).

The social context of childhood malnutrition can be assessed at the individual household and community levels. At the individual level, the caregivers' level of empowerment or their social circumstances, such as education, marital status, and employment, play a vital role in understanding child malnutrition in South Africa (Dukhi, 2020). Children under the age of 5 have diverse experiences. While they grow within their own homes, their growth and development are influenced by social factors, including the family, neighborhood, and broader political structures that impact their communities (Viswanath & Bond, 2007). These social institutions are interconnected. According to Iversen and colleagues, South Africa has made efforts since 1994 to address childhood malnutrition, including enhancing household access to food and nutrition security, implementing a social wage package encompassing social grants, free basic education, and free primary health care, as well as promoting exclusive breastfeeding and providing fortified foods as supplements (Iversen et al., 2012; P. O. Iversen et al., 2011). Additionally, initiatives such as the Integrated Nutrition Program, Protein Energy Malnutrition Scheme, and Primary School Nutrition Programme have been introduced (Manley et al., 2022; Said-Mohamed et al., 2020).

Programmes to improve child malnutrition

Various policy interventions have been developed to address the challenge of childhood malnutrition, with school feeding programmes, cash transfers, food vouchers and community gardens emerging as one of the most effective strategies (Graham et al., 2018; Granlund & Hochfeld, 2019; Patel et al., 2019; Sello et al., 2024). Among older school going children, school feeding schemes directly address malnutrition by supplying balanced meals that meet dietary needs. This benefits children who do not have access to nutritious foods at home (Graham et al., 2018; Kristjansson et al., 2022; Wang & Fawzi, 2020). Some studies not only found school

feeding programmes to improve children's nutritional outcomes but also increased the children's educational outcomes. This was observed through increased enrolment rates, reduced absenteeism, improved concentration and overall academic performance (Kristjansson et al., 2022; Mostert, 2021). In South Africa, there is a recognized need for a multi-sectorial approach to combat child malnutrition. This approach should involve civil society, national, provincial, and local government departments, as well as the private sector. This recognition dates to 1994, when South Africa first became a democratic country (DoH, 2013).

To address the nutrition needs of children at various levels, the Integrated Nutrition Programme (INP) was introduced in 1994 (Iversen et al., 2012). However, it has been observed that these programs have had little impact on reducing childhood malnutrition in South Africa. While the country has implemented nutrition programs to address child malnutrition, these programs have been strengthened since the emergence of democracy in 1994 (Iversen et al., 2012). Apart from the INP, other programs intended to improve child malnutrition include the National School Nutrition Program (NSNP) and feeding schemes. The INP is composed of three components: health, community, and nutrition promotion. However, these sectors have been working independently, and there is a lack of evidence on their success in reducing child malnutrition (Iversen et al., 2012).

2.4 The social context of childhood malnutrition

2.4.1 Maternal related factors associated with child malnutrition

There is much debate surrounding the issue of maternal age and child malnutrition. A study conducted by Yu and colleagues, using data from low- and middle-income countries in Africa, Asia, and Latin America (LMICs), found that young maternal age is associated with factors such

as the risk of premature birth and low birth weight, which contribute to child malnutrition (Yu et al., 2016). However, a study conducted in a high-income country like Sweden provided contrasting evidence. The findings from this study indicated that women of advanced maternal age (40 years and older) had a higher risk of adverse health outcomes during pregnancy, including gestational diabetes, caesarean section delivery, pre-term birth, low birth weight, and intrauterine foetal deaths (Blomberg et al., 2014). Therefore, based on the evidence presented by these studies, it can be concluded that both too young and too advanced maternal ages are risk factors for adverse pregnancy health outcomes, regardless of whether the country is developing or developed (Amugsi et al., 2013; Galgamuwa et al., 2017; Khattak et al., 2017).

In a recent systematic review, Vavaida and colleagues emphasized that childhood malnutrition cannot be considered in isolation from the physical and mental health of the caregiver. Similarly, physical, and mental health conditions can increase the risk of malnutrition in children. For instance, chronic illnesses can lead to malabsorption of nutrients, decreased appetite, and difficulties in ingesting food, which can ultimately result in undernutrition or overnutrition and reduced life expectancy when these children grow up (Larson-Nath & Goday, 2019; Westwood, 2015). Mothers with poor mental health, such as depression, may also be less likely to provide appropriate care for their children (Vaivada et al., 2017). According to Amaha and Woldeamanuel (2021), mothers are the primary caregivers of their children, and their health and well-being have a significant impact on their children's health. Studies have shown that depression, as a mental health condition, is more prevalent among women of reproductive age (Kessler & Bromet, 2013). Therefore, understanding the well-being of mothers is crucial in determining child health outcomes. A study conducted in Botswana found that children whose caregivers were depressed were more likely to be malnourished (Motlhatlhedi et al., 2017).

It is widely recognized in the literature that the caregiver's level of education is a crucial determinant of childhood malnutrition. Kalu (2018), in his analysis of data from developing countries, discovered that the nutrition outcomes of a child's life can be established within the first five years, and the caregivers' knowledge of health and nutrition practices is crucial (Kalu & Etim, 2018). Previous studies conducted by Armar in Accra (2000) and a recent survey conducted by Khattak (2017) in Pakistan found that caregivers with a low level of education were associated with poor feeding practices and inadequate health-seeking behaviours for their children (Armar-Klemesu et al., 2000; Khattak et al., 2017). In contrast, a study conducted in urban Nigeria and Sri Lanka found that caregivers with higher levels of education were more likely to be higher wage earners and had a better understanding of the nutritional values of healthy food and how it affects children's cognitive and physical growth (Ejike, 2016; Galgamuwa et al., 2017). Chen argued that women with higher education tended to delay childbirth, thus reducing infant mortality (Chen, 1986). Moreover, studies found that women with higher education were more likely to marry men with higher incomes and higher-paid positions at work, and live in affluent neighbourhoods, and this may have a direct or indirect effect on the health and survival of their children (Haddrill et al., 2014; Jones & Bramm, 2019; Kalu & Etim, 2018). Similarly, findings confirm that caregivers with high socioeconomic status can promote good health through good nutrition, thereby likely reducing infections and morbidities.

On the other hand, lower socioeconomic status serves as a significant hazard resulting from inadequate food intake, which ultimately affects the household's nutritional status (Kizilyildiz et al., 2016). Some studies have found that unemployed caregivers are more likely to have children who are better nourished than working caregivers. This is because present caregivers have the time to prepare nutritious meals for their children. Conversely, other studies

have found that the early return to work by caregivers who have just given birth, as well as the long distance to their workplace, often result in adverse outcomes for the family structure and have an impact on the mental and physical development of the children (Tette et al., 2016; Yeleswarapu & Nallapu, 2012).

Numerous studies have recognized the role of income as a contributing factor in childhood malnutrition. The introduction of redistributive income, such as cash transfers to the less fortunate, has improved the overall well-being of caregivers (Granlund & Hochfeld, 2019; Leila Patel, Hochfeld, & Chiba, 2019). Maternal workload can also impact child malnutrition. When mothers must work long hours, they may have less time to care for their children and provide them with nutritious meals. In their study, Ketema and colleagues found that children aged 6-23 months whose mothers were unemployed had better nutrition outcomes compared to women who were employed (Ketema et al., 2022).

2.4.2 Child-related factors and childhood malnutrition

When studying malnutrition, it is essential to consider the age and sex of children. Findings from a study conducted in Sri Lanka indicate that children attending nursery school were better nourished than children in primary schools. This can be attributed to the fact that children in nursery school were still breastfed by their caregivers, and breast milk protected them from infectious diseases. Evidence from the literature shows that stunting is associated with poor complementary feeding practices and inadequate breastfeeding (Amaha & Woldeamanuel, 2021). However, the same study found that primary school children were more reliant on complementary foods, which often did not meet their necessary dietary requirements for growth (Galgamuwa et al., 2017).

Additionally, a study conducted in Kenya by Olack and colleagues found that children under 12 months had an average wasting percentage of 4.1%, whereas children aged 48-59 months had a lower wasting percentage of 1.1% (Olack et al., 2011). Based on the evidence provided above, infants were better nourished compared to slightly older children, as they relied more on breast milk. Regarding the child's sex, studies in some African cultures have found that male children are given preferential treatment over their female counterparts (Adebowale & Palamuleni, 2015; Nwokocha, 2007). Averett et al. (2017) argues that female children are expected to leave their fathers' house through marriage, while male children are expected to stay and ensure continuity of the family name. Supporting this notion, Sharaf (2019) found evidence of gender bias against girls in her study conducted in Arab countries.

Furthermore, Sharp discusses the concept of plate mapping in his research, where he suggests that there is an overall preference for smaller plate sizes and smaller food quantities for females compared to males (Sharp et al., 2014). The relationship between gender and malnutrition is complex and multifaceted. while gender biases can exist in caregiving practices, the outcomes for boys and girls can differ based on various factors, including socio-economic status, cultural norms, and access to resources. Some studies indicate that investing in young boys can inadvertently increase the risk of undernutrition among girls, it is essential to recognize that boys may also experience both overweight and underweight at higher rates than girls in certain contexts (Averett et al., 2017; Sharaf et al., 2019). Meta-analyses have shown that boys are at higher risk for various forms of malnutrition, including wasting, stunting, and underweight. For instance, boys exhibit a 26% higher odds of being wasted compared to girls (pooled odds ratio [OR] 1.26) and a 31% higher likelihood of being stunted (pooled OR 1.31) (Thurstans et al., 2020). The preference for male children among caregivers and in certain cultures is widespread,

which disadvantages girls and exposes them to nutritional risks. Zader's analysis (2012) found that in some cultures, males are given first preference and are served food first. They often receive larger portions, especially when it comes to meat, compared to their female counterparts (Samuel et al., 2022; Sharp et al., 2014; Zader, 2012). Based on these findings, women are more disadvantaged in terms of food servings, making them more likely to experience malnutrition compared to men.

Some studies suggest that the age of the child is a crucial factor that impacts their health and nutritional status. Fragile newborns and infants are vulnerable to compromised nutrition when there are multiple children under the age of five in a household (Hawk et al., 2018; Warner et al., 2017). Caregivers tend to prioritize infants, who rely on them for breastfeeding and survival, leaving older children in nutritionally compromised situations (Hall & Sambu, 2018). Moreover, research acknowledges that child caregiving plays a significant role in children's nutritional outcomes. This includes providing nutritional support, monitoring their health, ensuring hygiene and sanitation, and fostering child-caregiver engagement. A study conducted in South Africa by Sello and colleagues (2023) found a significant association between the child's care during the day and their nutritional outcomes. Children attending schools or creches exhibited better health outcomes. According to the Nurturing Care Framework (NCF) developed by the WHO and UNICEF, responsive caregiving involves providing nurturing, consistent love, and care to the child. It emphasizes being attentive and affectionate, fostering positive relationships and secure attachments for children (UNICEF/WHO/The World Bank, 2018; WHO, 2018).

2.4.3 Household characteristics and childhood malnutrition

In South Africa, child malnutrition indicators are associated with factors such as socio-economic status, biological factors, and environmental factors (HSRC, 2018). According to the 2019 Child Gauge report, severe child malnutrition accounted for 25% of all under-5 deaths in hospitals (Shung-King et al., 2019). Furthermore, the HSRC (2018) states that child malnutrition is more prevalent in low-income settings, specifically in townships and informal settlements, where indicators such as stunting, wasting, and underweight are still relatively high. Poverty is a significant issue in South Africa, with nearly half of the adult population living in poverty and over 3 million households experiencing food shortage and hunger (Stats SA, 2023).

Measuring poverty is a complex task due to its presence in social, political, and economic structures, making it challenging to define poverty under a single definition (Yang, 2017). Moreover, STATS SA (2023) defines poverty as the lack of access to income, employment, basic services, asset ownership, social inclusion, participation in decision-making, ability to purchase basic needs, and money to buy goods and services. This definition encompasses various aspects such as health, education, living standards, and employment. Unfortunately, childhood malnutrition is exacerbated by the problem of hunger (Roser & Ritchie, 2019; Siddiqui et al., 2020). Dawson-McClure and colleagues argue that disadvantaged households in urban or informal settlements are disproportionately affected by health issues such as obesity or being underweight due to food insecurity and poverty stressors (Dawson-McClure et al., 2014).

Some authors argue that certain children experience multidimensional poverty characterized by deprivations such as poor access to healthcare, lack of education among caregivers, poor living standards, lack of caregiver empowerment, and exposure to harsh living conditions (Hall & Sambu, 2018; May et al., 2020; Vaaltein & Schiller, 2017). Additionally,

poverty includes lack of adequate nutrition, lack of sanitation, lack of clean water, social exclusion, and poor housing conditions (Siddiqui et al., 2020).

According to Modjadji and Madida, both forms of over and undernutrition can coexist within the same community at the population level. They also reference how other low- and middle-income countries, such as Brazil and China, have experienced similar conditions with households that have both underweight and overweight individuals (Modjadji & Madiba, 2019b). A study in the UK found that children aged five years living in homes with the lowest income bracket had a 2.0 increase in obesity compared to children who lived in households with higher income brackets (Goisis et al., 2015).

In their study, Govender et al. (2018) argue that in developing countries, overpopulation persists and affects food security, leading to inadequate food intake or poor nutritional quality (L. Govender et al., 2017a). Furthermore, findings from STATS SA estimate that in South Africa, nearly 1.2 million households and a population of 3.3 million reside in informal settlements (shacks) (Statistics South Africa, 2012). The composition of households is crucial when assessing the nutritional status of children. In Southern Africa, children are likely to live in multi-generational households, with extended families living together, and this living arrangement contributes to increased food insecurity and has adverse consequences for the health of children and adults in those homes (Ntshebe et al., 2019; Ziliak & Gundersen, 2016). These are among the multiple barriers to child well-being and growth.

Moreover, previous studies have demonstrated that large family sizes are associated with increased nutritional risk for all members of the household, as larger families tend to have decreased per capita household inputs (Modjadji et al., 2020; Modjadji & Madiba, 2019b; Ntshebe et al., 2019). In Brazil, however, large family size is often an indicator of high family

socioeconomic status (Cauduro et al., 2019). It is important to consider the ratio of adults to children in households, as children are often the most affected when there are more adults present (Ratcliffe & Caroline, 2015). A study conducted in South Africa also observed intergenerational family structures, where children live with their grandparents, parents, and extended family members in the same household, and caregiving responsibilities are shared (Mabetha et al., 2021).

While food security is a fundamental right in the country, Naicker (2015) found that nearly 70% of households in informal settlements in South Africa experienced food insecurity. Poverty has persisted during economic crises such as the COVID-19 pandemic, leading to food shortages (van der Berg et al., 2022a). Previous studies from the South African National Income Dynamics Study Wave 1 revealed that although child support grants increased household income, nearly 40% of children lived in homes that lacked sufficient food (Leila Patel et al., 2017). Globally, there has been a significant increase in food prices, leaving those who cannot afford nutritious food at risk of food insecurity and negative health outcomes (Alkire et al., 2021; Mulu & Mengistie, 2017; Zembe-Mkabile et al., 2018). According to the World Bank, approximately 719 million people live in extreme poverty worldwide (World Bank, n.d.). Based on this evidence, household members are exposed to adverse health conditions, such as chronic illnesses and obesity. The poor are particularly vulnerable to high food prices and limited access to grocery stores (Tydeman-Edwards et al., 2018). Consequently, they are more likely to purchase affordable but low-nutritional-value food (Strydom & Davis, 2018). Naicker (2015) also highlights that some households may have limited food options, leading to daily consumption of the same type of food, missed meals, or even no food at all (Naicker et al., 2015). For instance, inadequate food intake can contribute to wasting in children under the age of 5, which is classified as acute malnutrition (Bain et al., 2013). Among those experiencing severe poverty and hunger,

women and children are disproportionately affected (Chakona & Shackleton, 2017). Although global hunger rates have decreased significantly from 15% in 2000 to 8.9% in 2019, women and children have been severely impacted by the pandemic (Alkire et al., 2021; Gayatri & Puspitasari, 2022).

According to Mulu & Mengistie (2017), household food insecurity has significant implications for the nutrition and health status of household members. Their study, conducted in Western Ethiopia, found that food insecurity was associated with underweight children due to reduced quantity and quality of diets (Mulu & Mengistie, 2017). The literature consistently supports the link between household food security and positive health outcomes. This finding is reinforced by a previous study conducted by Saaka and Osman in Ghana (2013), which revealed that 46% of children from food-secure households were protected from chronic malnutrition (Saaka & Osman, 2013). Chakona and Shackleton (2018) argued in their study that in South Africa, different forms of child malnutrition are dependent on household income, access to farming land, or the ability to purchase quality food (Chakona & Shackleton, 2018). Galanakis (2020) highlights that the recent global COVID-19 pandemic has exacerbated challenges related to food security in the international community. Furthermore, with nearly a third of the global population experiencing lockdown since March 29th, 2020, livelihoods have been severely impacted, resulting in food shortages and supply challenges due to panic buying (Galanakis, 2020). Like previous pandemics, COVID-19 has had severe consequences, including the loss of skills, caregivers, life expectancy, increased poverty, and vulnerability (Ndhlovu & Mhlanga, 2023; Parry & Gordon, 2021). According to the United Nations, child malnutrition is expected to worsen during the COVID-19 pandemic, with approximately 42-66 million children falling into extreme poverty in 2020. In summary, Arndt and colleagues argue that malnutrition and the

COVID-19 pandemic will have dire consequences for South Africa's already strained healthcare system, particularly impacting children under 5 and pregnant women (Arndt et al., 2020; UN et al., 2020). The UN further states that global economic hardships faced by households threaten the health and survival of children, potentially leading to hundreds of avoidable deaths from malnutrition and other causes (UN et al., 2020). Moreover, the pandemic has resulted in demographic changes such as increased mortality rates among the elderly and working-age population (Nonde, 2022). The economic inactivity of those who fell ill due to COVID-19 has placed an additional burden on family members for social care (Casale & Shepherd, 2022; Parry & Gordon, 2021).

2.4.4 Community/Environmental factors and child malnutrition

The environment in which children are born and raised plays a crucial role in their physical growth and cognitive development. The community in which children grow up also poses a threat to their well-being, depending on their setting (Dabar et al., 2020; Osorio et al., 2018). Safety and security have become significant social problems, with high poverty rates, the presence of diseases, and issues of crime, domestic violence, and gender-based violence still prevalent. These challenges force people to make alternative arrangements to survive, which may not always be acceptable and can exacerbate childhood malnutrition (May et al., 2020; Siddiqui et al., 2020). The type of residence in which residents live can result in differences in the nutritional status of children (Khanam et al., 2019). Corburn et al. (2020) argue that urban dwellers generally have better access to resources such as housing, water, drainage systems, and healthcare providers compared to those in rural areas and urban townships. However, a study conducted in South Africa found that some parts of the country still face challenges with spoiled and polluted water, highlighting the need for clean and safe drinking water (Edokpayi et al.,

2018). Furthermore, other researchers attribute sanitation issues to urbanization and overpopulation (Crush et al., 2011; Neiderud, 2015; Nickanor & Kazembe, 2016). These studies indicate that the rise in urbanization can lead to an increase in infectious diseases due to rapid poverty in certain areas, resulting in poor health outcomes. Ejike's study also found that urbanization in some parts of the world has dire consequences, with a significant increase in informal settlements (Ejike, 2016). Tydeman-Edwards and colleagues found that poor living conditions contribute to a vicious cycle of infectious diseases such as diarrhea, which claim the lives of approximately 1.8 million children under the age of 5 globally and contribute to child malnutrition (Tydeman-Edwards et al., 2018). Poor hygiene and sanitation are indicators of poverty, and those living in informal settlements are often the most affected. For example, a study conducted in Ghana found that stunting is associated with deprived environmental settings (Boah et al., 2019).

A healthy environment means having clean and safe drinking water, good sanitation, access to food, and access to healthcare. Diseases such as cholera, typhoid, and hepatitis A are often the result of unsafe drinking water and unnecessarily cause the deaths of children under the age of 5 (Matariya et al., 2016; Young, 2004). An unhealthy environment has severe consequences for the health and well-being of children and contributes to climate change. Climate change, resulting in droughts and floods, leads to the migration and displacement of populations, with droughts severely impacting agriculture and food production in countries (Quamme & Iversen, 2022; Tacoli et al., 2013). In South Africa, high migration rates have led to increased urbanization, with more people migrating from rural areas to urban areas, ultimately resulting in changes in social and family support structures (M. Leibbrandt et al., 2010). An earlier study conducted in Khayelitsha, South Africa, found that urbanization has become a driving force of

poverty, causing shifts in diets from nutrient-based foods to less nutritious food with high energy levels (Strydom & Davis, 2018; Tydeman-Edwards et al., 2018). Children growing up in deprived settings are likely to suffer from infections that arise from environmental deficiencies (Fotso et al., 2012; Mathee et al., 2018).

2.5 Theoretical framework

2.5.1 UNICEF's Conceptual Framework on the Determinants of Maternal and Child Nutrition 2020.

This study was based on UNICEF's Conceptual Framework on the Determinants of Maternal and Child Nutrition 2020, as well as the Food and Nutrition Security framework. UNICEF's Conceptual Framework on the Determinants of Maternal and Child Nutrition 2020 builds upon the 1990 framework developed by UNICEF to address undernutrition in children (UNICEF, 1990, 2021b). The 1990 framework aimed to understand the causes of child malnutrition and their interconnectedness. The 2020 conceptual framework on maternal and child nutrition analyses the various factors contributing to maternal and child malnutrition at three levels. These levels demonstrate the multidimensional nature of childhood malnutrition and provide a comprehensive approach to understanding it (UNICEF, 2021b).

At the first level, individual-level variables are identified as immediate causes of childhood malnutrition, which directly impact children's nutritional outcomes and are often the result of inadequate dietary intake and disease. In this study, the immediate factors include child and caregiver characteristics such as age, sex, birth intervals, and birth order. However, these factors are exacerbated by poverty, and lack of access to nutritious foods, poor feeding practices.

Underlying household factors influence childhood malnutrition by affecting the immediate causes. These factors encompass poor childcare practices, such as inadequate child supervision, an unhealthy household environment, poor hygiene, inadequate complementary feeding methods, lack of safe drinking water, and the risk of infections. Furthermore, environmental conceptual factors arise from food insecurity, access to resources including health and education services, socioeconomic factors, and cultural factors (Agho et al., 2019). Finally, basic societal-level factors include political, socioeconomic, and cultural factors that influence childhood malnutrition.

This framework demonstrates that a child's nutrition goes beyond access to food, as noted by Dreze and colleagues (2003). The benefits of using this model are that it elucidates the multifaceted interaction between distal and proximal factors in understanding child malnutrition.

The UNICEF 1990 conceptual framework of the causes of undernutrition has been widely applied in middle-income and developing countries such as South Africa, Kenya, Ethiopia, and India (Jamieson et al., 2017; Modjadji & Mashishi, 2020; Stanaway et al., 2018; Toma et al., 2023). However, there have been calls to revise this framework, considering broader systems that influence child health, in addition to the family and community level variables (Arriagada et al., 2018; Bain et al., 2013; Black et al., 2017; UNICEF, 2020). Black et al. (2017, 2020) argued that the original framework needs to be revised to incorporate new knowledge and address the evolving needs of children's health and dietary requirements. They further emphasized that while the SDGs have brought global recognition to prosperity and good health, children should not only survive but also thrive, which necessitates more than just good health and nutrition (Black et al., 2020).

These advancements led to an extension of the 1990 UNICEF framework, resulting in the development of the nurturing care framework in 2018. This framework highlights how services and policies can support caregivers, families, and communities in providing nurturing care to children (World Health Organization and United Children's Fund, 2018). Additionally, the 2020 UNICEF conceptual framework on Maternal and Child Nutrition was introduced. In the context of South Africa, the 2020 UNICEF conceptual framework on Maternal and Child Nutrition is relevant and applicable in understanding the social context of childhood malnutrition in the country.

2.5.2 Food and Nutrition Security (FNS) Framework

The Food and Nutrition Security Framework (FNS) was developed by the World Bank in 1986. This framework establishes the fundamental interrelationships necessary to consistently achieve adequate food and nutrition security for all individuals (K. S. Simelane & Worth, 2020). It asserts that every person should have the means to consistently access sufficient, safe, and nutritious food both socially and physically, to attain optimal food security. This encompasses the following dimensions: 1) food availability, 2) food access, 3) food utilization, 4) food stability, and 5) food governance.

The availability dimension addresses the storage and handling of food to ensure that the quality and variety of produced and processed food is accessible to all (Omachi et al., 2022). The access dimension pertains to individuals' financial capacity to physically obtain food and encompasses social protection measures, aiming to ensure equal access to food for vulnerable and marginalized populations such as the unemployed and children (Rehman et al., 2019). The utilization refers to the body's ability to absorb and metabolise the nutrients, which is influenced

by factors such as dietary diversity, feeding practices and hygiene. This aspect is critical in understanding why, even in the presence of sufficient food, malnutrition can persist due to poor dietary intake and inadequate care practices (Omachi et al., 2022). It also encompasses nutrition education related to food handling, feeding practices, and healthy eating. The stability dimension refers to the capacity to sustain food security over time, considering factors such as inflation, food price stability, and the availability of social safety nets (K. S. Simelane & Worth, 2020).

The FNS framework recognises that disruptions such as the Covid-19 pandemic can exacerbate food and nutrition insecurity, leading to increased rates of undernutrition and overnutrition (Rivera et al., 2023). The governance dimension refers to the institutions and policies that regulate, monitor, and govern the distribution of food. These policies also ensure accountability at the national and regional levels to effectively implement nutrition interventions. The FNS underscores the influence of social, institutional, political, and economic environments on food access and availability. Furthermore, this model establishes a link between these environments and household assets (FAO, 2000).

2.5.3 The relevance of the 2020 UNICEF Conceptual Framework on Maternal and child Nutrition and the FNS in South Africa

The 2020 UNICEF Conceptual Framework on Maternal and Child Nutrition, as well as the FNS framework, are relevant for studying childhood malnutrition in South Africa. Firstly, both frameworks prioritize the health, well-being, and development of children. The FNS framework acknowledges that for children to grow and develop, they require consistent access to reliable, safe, sufficient, and nutritious food always (FAO et al., 2022; Simelane & Worth, 2020).

Access to nutritious food enables children to lead active lives and prevent nutrition-related conditions such as stunting, underweight, wasting, and overweight due to inadequate nutrition. Secondly, well-nourished children grow up to be active contributors to society and can contribute to the economic development of their country. Thirdly, achieving food security indicates progress towards SDGs 1, 2, and 3, which emphasize zero hunger, poverty eradication, and good health and well-being (United Nations, 2019). This would ultimately alleviate food poverty in the country. However, achieving this requires resilience from households, including measures to promote food sustainability, such as reducing food waste and developing home gardens (Bajželj et al., 2020). These actions not only improve household food security but also help households better cope with economic shocks such as the recent COVID-19 pandemic and natural disasters (FAO et al., 2022).

While the FNS framework focuses on the importance of nutritious food, the UNICEF 1990 framework on the causes of malnutrition provides a broader understanding of children's needs. This framework helps us comprehend the nutrition transition occurring in the country, characterized by the coexistence of undernutrition and overnutrition in the same child due to shifts in dietary patterns (from locally grown foods to high-energy-dense processed foods) (Popkin, 2003). Moreover, it allows us to understand early childhood development and how undernutrition can impact growth and development.

The UNICEF 2020 framework recognizes the underlying causes of malnutrition, considering the country's historical background of social and economic inequalities, which have greatly influenced access to food (UNICEF, 2021b). Additionally, it acknowledges the role of cultural beliefs and behavioural factors as enabling factors, considering the caregiving and child-

feeding practices employed by those responsible for the child. This framework also recognizes that access to health services and living in healthy environments can impact children's nutritional outcomes, although urban-rural disparities may also contribute to this. The framework acknowledges that food intake immediately affects children's nutritional outcomes and has a direct influence on disease. Furthermore, it emphasizes the need for a multi-sectoral approach to improving children's nutritional outcomes, involving caregivers and other community services such as health, education, welfare, and environmental services (King et al., 2021; Reinhardt & Fanzo, 2014; Said-Mohamed et al., 2020).

2.6 Conceptual framework

2.6.1 Direction of relationship among variables

The framework depicted in Figure 2 below illustrates the relationship between optimal child development and the determinants that contribute to childhood malnutrition. As previously mentioned, childhood malnutrition operates at various levels.

2.6.2 Independent variables

The first level consists of micro-level variables, which can be further divided into individual caregiver variables, maternal health variables, and child-related variables. These variables represent the socio-demographic characteristics of the caregiver (such as age, marital status, level of education, and religion) and the child (age and sex). Additionally, these variables are also considered underlying causes of malnutrition, all being equally important. Caregivers have a more direct impact on the child's nutritional status compared to the household, as they are directly responsible for the child's care and nourishment. The immediate causes of malnutrition are child-related, resulting from the consumption of inadequate diets and leading to health issues like

diarrhoea. Moving on to level 2, household characteristics are presented. These factors serve as underlying causes of childhood malnutrition and are crucial for promoting and sustaining the health and survival of children within the broader societal context. Household characteristics include family composition (number of children under 5 in the household and number of people residing in the house). Finally, at level 3, the community variables that were investigated in the qualitative component of the study were presented. These variables encompass the place of residence, community norms regarding childcare practices, community norms and taboos related to food consumption, as well as community services and resources.

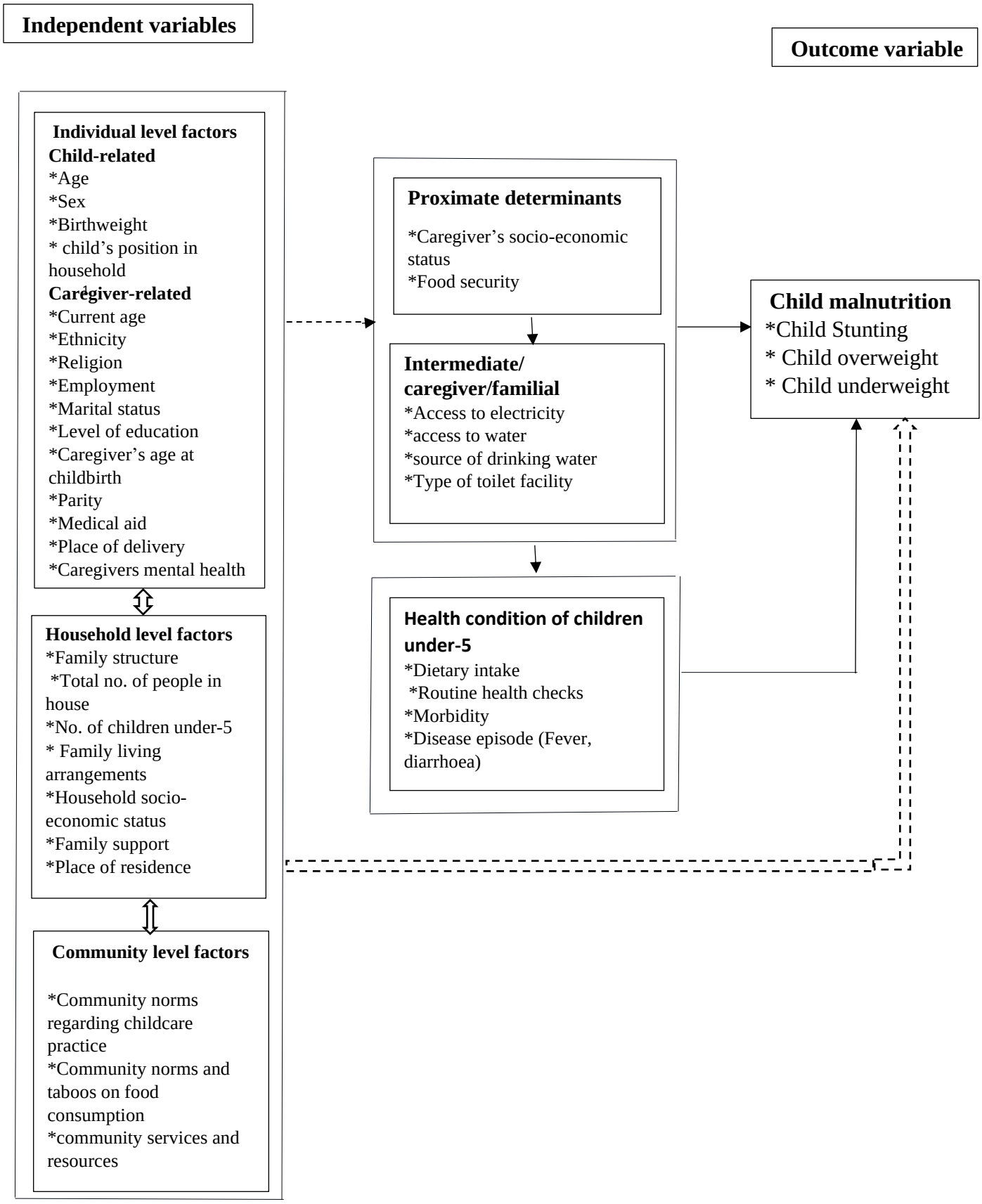
2.6.3 Intervening variables

The arrows depicted here illustrate the interconnectedness between the individual, household, and community levels. The encompassing thick box represents the broader context in which child malnutrition occurs. These arrows signify that individual, household, and community-level variables operate through the proximate factors, ultimately impacting the outcome variables. The presence of double arrows within the independent and proximate determinants denotes interactive relationships within these factors. The proximate factors can be categorized into two groups: caregiver/familial factors and child-related health conditions (morbidity and disease episodes). These proximate determinants directly influence child malnutrition and food insecurity.

2.6.4 Outcome variables

The outcome variable child malnutrition is found on the right box, and is categorised into stunting, underweight and overweight.

Figure 2. 1 Framework on the relationship of individual-level (immediate), household-level (underlying causes), and community-level (basic causes) factors associated with child malnutrition in short- and long-term periods.



[1] The community level variables as shown in this framework were interrogated in the qualitative component of the study.

2.7 Statement of hypotheses

This section presents the quantitative and qualitative study hypotheses. The qualitative hypothesis investigates the interplay between socio-cultural practices and caregivers' approaches to feeding children. This includes exploring cultural views on food, perceived effects of dietary choices, and traditional practices related to food preparation and mealtimes. While quantitative studies test hypotheses through numerical data, this research acknowledges the value of qualitative approaches. Here, evaluation of the hypothesis occurs through in-depth analysis of qualitative data like interviews or observations (Barroga & Matanguihan, 2022). The following hypotheses will be explored/evaluated in this study:

1. **Household Variations in Malnutrition**:
    - **H_0**: There are no significant variations in the prevalence of childhood malnutrition across different households.
    - **H_1**: There are significant variations in the prevalence of childhood malnutrition across different households.
2. **Individual-Level Factors**:
    - **H_0**: Individual-level factors such as child's age, birthweight, and ethnicity are not associated with childhood malnutrition.
    - **H_1**: Individual-level factors such as child's age, birthweight, and ethnicity are associated with childhood malnutrition.
3. **Geographic Influence on Malnutrition**:
    - **H_0**: There is no difference in the likelihood of childhood malnutrition between children living in rural and urban areas.

- **H_1**: There is a difference in the likelihood of childhood malnutrition between children living in rural and urban areas.

4. **Maternal Education and Nutrition Knowledge**:
    - **H_0**: There is no association between maternal education and child malnutrition.
    - **H_1**: There is an association between maternal education and child malnutrition.
5. **Socioeconomic Factors**:
    - **H_0**: Low household income status and household size do not significantly predict childhood malnutrition.
    - **H_1**: Low household income status and household size are significant predictors of childhood malnutrition.
6. **Food Insecurity and Child Malnutrition**:
    - **H_0**: There is no association between food insecurity and child malnutrition.
    - **H_1**: There is an association between food insecurity and child malnutrition.

2.8. Rationale for the Hypotheses

The research hypotheses mentioned above were based on existing knowledge found through a literature search on studies related to childhood malnutrition. Observations from this literature search, such as trends and factors contributing to this health condition, as well as statistics on the prevalence of child malnutrition, were used to formulate the research hypotheses. As mentioned earlier, biological factors such as the child's age, sex, and birth weight were important individual child-level factors in the literature on childhood malnutrition. Similarly, social, and environmental determinants affecting the household and household members included

poverty, food insecurity, lack of parental education, poor water and sanitation, and access to healthcare.

Chapter 3

Methodology

3.0 Introduction

This chapter introduces the research process, offering a comprehensive overview of the methodological decisions, data collection, and analysis techniques that have been chosen to examine the social context of childhood malnutrition in South Africa. Moreover, the objective of this chapter is to present a detailed description of the study setting, the data sources utilized, and the data analysis plan employed in this study. Additionally, this chapter provides extensive information on the study sample, the sampling procedures employed, the variables chosen to provide a thorough understanding of the issue of childhood malnutrition, as well as the measures taken to address this problem.

3.1 Study setting

Figure 3.1 presents the map of South Africa (on the left side). Two low-income settings, GaMasemola and Thulani, where qualitative data was collected, are highlighted on the right side. The quantitative data used in this study is based on the National Income Dynamics Study, which is a nationally representative survey. Further details regarding the selection of South Africa as a study setting and the rationale behind it can be found in Chapter 1.6. Thulani, also known as Doornkop or Snake Park, is a peri-urban township situated in the Gauteng Province. Soweto in the Gauteng Province, South Africa. The area is currently being subsumed by the westward expansion of Soweto and the eastward growth of Krugersdorp's Kagiso township.

GaMasemola, on the other hand, is a rural village located in the Capricorn District Sekhukhune of Limpopo Province. Limpopo has a population of 6 million people, while Sekhukhune District

Municipality accounts for a total population of 1.2 million, or 20.4% of the total population in the Limpopo Province. Gauteng's population stands at 16.1 million (STATSSA, 2022b). Thulani falls under Ward 50, region D, and is characterized by a poor living environment, consisting of traditional RDP houses, informal backyard shacks, and small sections of informal settlements (Patel et al., 2012). GaMasemola, as a poor rural community, faces challenges related to inadequate infrastructure and intermittent service delivery issues, such as water and sanitation problems. The selection of these study areas was purposeful, based on their accessibility and their demonstrated socioeconomic needs. The research was conducted from June 2022 to August 2022.

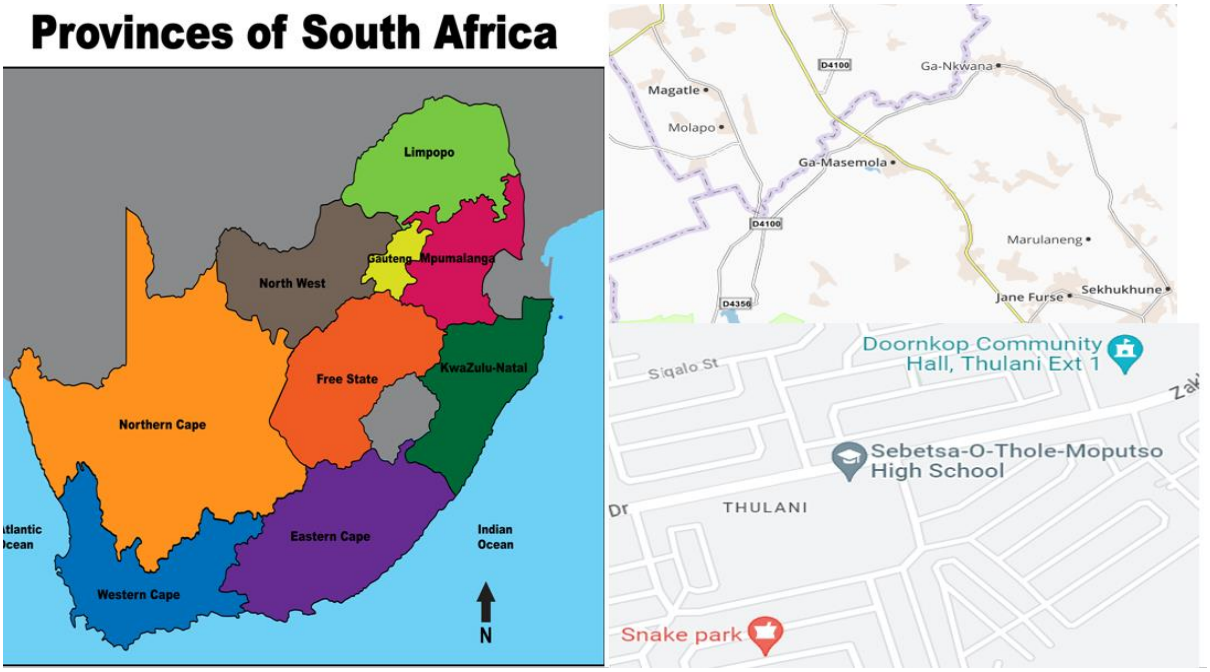


Figure 3. 1 Map depicting South African provinces, the low-income setting of GaMasemola (Limpopo) and Thulani (Gauteng) (Source: Intergate Immigration and google maps, 2023)

3.2 Data sources

The National Income Dynamics Study (NIDS) was initiated by the South African presidency to monitor representative subgroups of the population. The study began in 2008, with

a nationally representative sample of 28,000 individuals and 7,305 households in Wave One, yielding a response rate of 69% (Murray Leibbrandt et al., 2009). The data collected encompassed various areas such as age groups, the household composition of both resident and non-resident members, health, education, access to services, income, economic activity, and labour market participation (Murray Leibbrandt et al., 2009).

NIDS represents the first-panel study conducted in South Africa and was carried out by the Southern Africa Labor and Development Research Unit (SALDRU) at the University of Cape Town. Its objective was to track individuals of the same age and households over time, referred to as Continuing Sample Members (CSMs). Respondents were surveyed at two-year intervals to evaluate changes in their well-being. Four questionnaires were utilized to collect data: household, child, individual adult, and individual proxy questionnaires (Brophy et al., 2018; Woolard et al., 2020). To date, NIDS has collected data for five waves, which researchers can access freely from the DataFirst website after registering and signing the data use agreement.

3.3 Organization of the 2017 Wave 5 National Income Dynamics Survey

At the time of the interview, obtaining information regarding non-resident household members was of utmost importance to gain insight into the family dynamics and support systems that families had (Woolard et al., 2020). The advantage of collecting panel data lies in its ability to provide repeated observations within the same sample, thereby creating a larger dataset. This larger dataset becomes crucial in monitoring and evaluating programs, enabling the assessment of sudden changes in livelihoods, and identifying potential causes for these changes (Baltagi, 2014; Hsiao, 2007; Murray Leibbrandt et al., 2009). Moreover, the larger dataset allows for greater variability among variables, enabling the testing of more sophisticated behavioural

models and the ability to control for future heterogeneity (Baltagi, 2014). At Wave 5, NIDS conducted a follow-up with 10,800 households and 39,400 individuals (NIDS, 2019).

3.4 Study design

This study utilized a mixed-methods sequential analytical study design. Figure 3.2 below describes the study's methodology. According to the literature, mixed-methods research involves the collection, analysis, and integration of various research methods (Timans et al., 2019). A mixed-methods study is characterized by the combination of at least one qualitative and quantitative research method, which ensures the comprehensiveness of the study's findings and the achievement of its objectives (Chow et al., 2010; Schoonenboom & Johnson, 2017). Figure 3.2 illustrates the implementation of the study design. The quantitative research approach involved gathering, quantifying, and analysing numeric data using specific statistical techniques to address questions such as what, who, where, when, how many, and how much about the individual-level characteristics of children, caregivers, and households (Apuke, 2017). On the other hand, the qualitative research approach aims to gain a deeper understanding of the research problem by addressing the "how and why" questions (Aspers & Corte, 2019). The qualitative component also provided an in-depth understanding of caregivers' lived experiences, capturing the complexities of childcare practices, socio-cultural practices, food, and nutrition, as well as the caregivers' experiences in accessing available community resources and services.

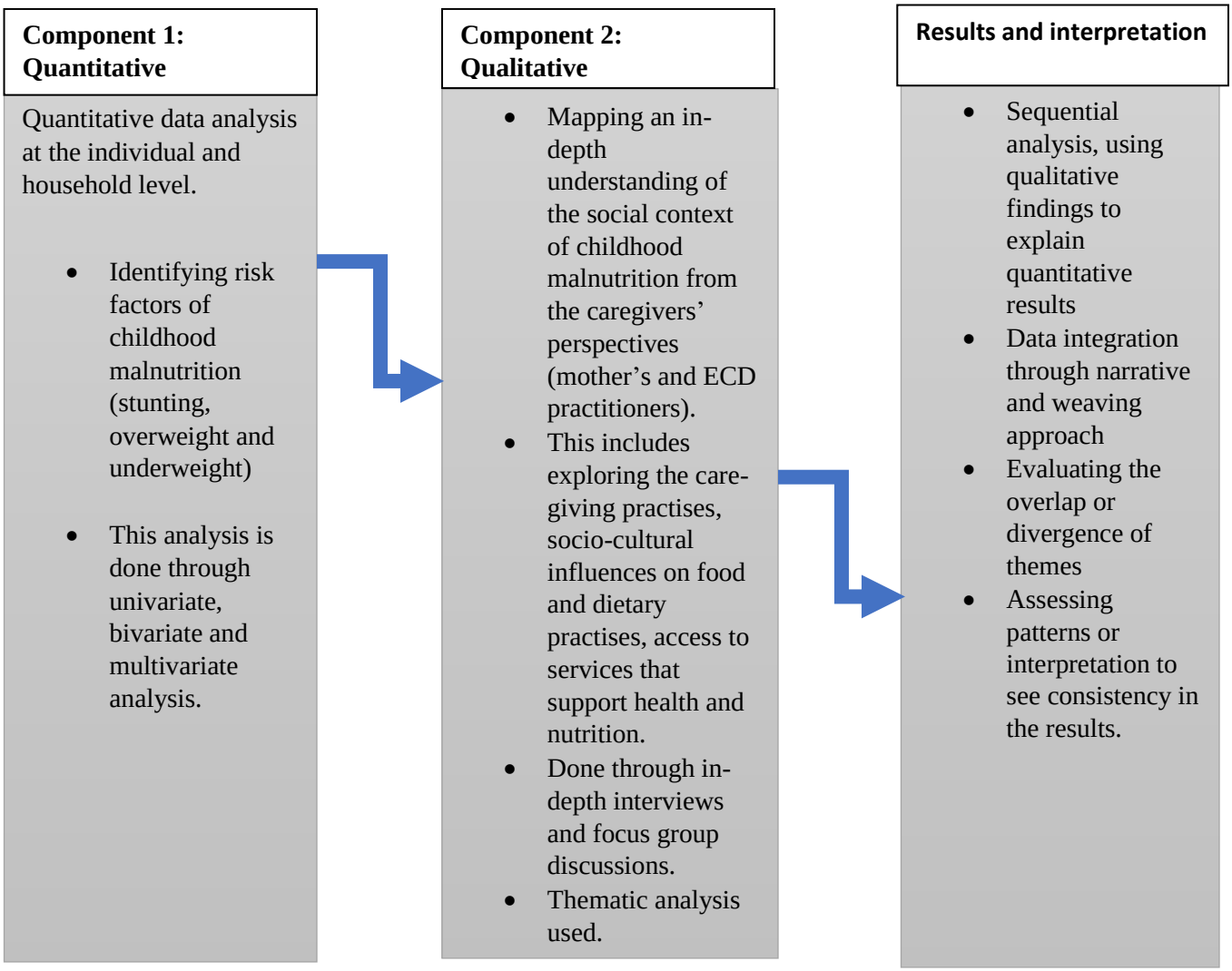


Figure 3. 2 Diagram representation of two components of data collection for this study

3.4.1 Sequential explanatory research design

A sequential mixed-methods study was conducted to investigate the social context of childhood malnutrition in selected low-income communities in South Africa. The literature supports the use of a sequential research design, which involves collecting and analysing

quantitative data in the initial stage, followed by qualitative data collection in the second stage (Creswell & Plano, 2017). This research design was chosen to provide a comprehensive understanding of the social context of child malnutrition in the study settings. By incorporating both quantitative and qualitative methods, this study can identify patterns and relationships between factors of childhood malnutrition, use a larger sample size to generalize findings and obtain richer and more comprehensive data from a smaller scale of individuals. Based on this foundation, researchers can formulate research hypotheses and further explore research questions that can be answered through qualitative research (McBride et al., 2019). This method allows for a thorough exploration of the identified factors that influence childhood malnutrition, enabling participants to express themselves and provide more details about their lived experiences and perceptions (Creswell & Plano, 2017). Additionally, data integration was achieved through narratives and a weaving approach, presenting the findings based on themes from both the quantitative and qualitative data (Fetters et al., 2013). Furthermore, in mixed methods approaches, the consideration of how the quantitative and qualitative methods are mixed in the research process should include factors such as time and priority (Creamer, 2020). While this study employed two main components - component 1, involving the analysis of quantitative data, and component 2, informed by the results from component 1 - more importance was given to component 2, considering the effort invested and the overarching objective and sub-objectives of the study.

3.5 Quantitative study

3.5.1 Study design

This study was conducted as a cross-sectional analytical study, analysing the NIDS wave 5-panel datasets of 2017. The chosen study design was deemed appropriate as it enabled the

examination of individual and household-level factors at a specific moment in time (cross-sectionally). This approach has provided a comprehensive understanding of the study findings regarding the social context of childhood malnutrition.

3.5.2 Survey questionnaires

The NIDS wave 5 study used four types of questionnaires: the household questionnaire, the adult questionnaires, the adult proxy, and the child questionnaire. This study utilized the data from these questionnaires to extract information on the children's health, the caregiver's socioeconomic status, and the household's social standing.

3.5.3 Study sample

NIDS utilized a stratified, two-stage cluster sample design to select the dwelling units that were included in the study. In the first stage, a sample of 400 Primary Sampling Units was drawn from the 2003 master sample of 3000 PSU, which was obtained from STATSSA (Woolard et al., 2020). Within each PSU, eight non-overlapping samples of ten or twelve dwelling units were systematically selected when compiling the Master Sample. The master sample consisted of 53 district councils, and the sample was allocated in a proportionally to align with these 53 districts (Murray Leibbrandt et al., 2009). The NIDS study has design weights and post-stratified weights. First, design weights were calculated based on the inverse probability of each respondent being included in the sample. Secondly, the weights were calibrated to match population estimates from Statistics South Africa mid-year data. This resulted in two sets of weights: the original design weights and the post-stratified weights. For this study, post-stratified weights were applied during the analysis to ensure that the NIDS data corresponded to the 2017 STATSSA mid-year population estimates and accurately represented the age-gender-race statistics (Brophy et al., 2018). In addition to using post-stratified weights, in our analysis we used analytical weights to

ensure that estimates from the sample are representative of the population. For example, some population groups refused to be part of the NIDS survey, therefore using analytical weights was useful to adjust for the unequal probability of selection at each stage of the sampling process.

3.5.4 Study Population

The data was extracted for mothers aged 15-49 with children under 5, specifically focusing on women who had given birth to at least one live child in the five years prior to the survey. The unit of analysis consisted of children born within the five years preceding the study, with complete anthropometric measurements including mid-upper arm circumference (MUAC), height, and weight.

3.5.5 Sample size and inclusion criteria

The study's sample size consists of 2,966 dyads consisting of mothers and their children (post-stratified weights have been applied). The analysis was conducted on data pertaining to children who were still alive at the time of the survey and were born five years prior to the survey. The focus of this data analysis was primarily child-based.

3.5.6 Variables and variable measurements

3.5.6.1 Dependent variables

The outcome variable for this research was child malnutrition, defined as stunting, overweight, or being underweight. As presented in Table 1, child malnutrition was measured using the indicator of child stunting, overweight and underweight using the WHO standards. The indicators of childhood malnutrition were measured at two levels. First, as the binary outcomes and then as the ordinal outcomes.

Table 3. 1 Indicators of childhood malnutrition (source: WHO, 2020)

S/N	Variable	Z- score	Coding in the study
1	Stunting	Below -2 (Stunted) Below -3 (Severely Stunted)	**Binary:** 0 (Not stunted), 1 (Stunted)
			Ordinal: 0 (Not stunted), 1 (Stunted), 2 (Severely stunted)
2	Overweight	Above 2 (overweight) Above 3 (Obese)	**Binary:** 0 (Not overweight), 1 (Overweight)
			Ordinal: 0 (Not overweight), 1 (Overweight), 2 (Obese)
3	Underweight	Below -2 (Underweight) Below -3 (Severely underweight)	**Binary:** 0 (Not underweight), 1 (Underweight)
			Ordinal: 0 (Not underweight), 1 (underweight), 2 (Severely underweight)

3.5.6.2 Independent variables

The study selected independent variables based on an extensive review of the literature and the theoretical framework. These variables encompassed demographic, socioeconomic, and household contextual factors. Individual-level variables comprised age, place of residence, ethnicity, religion, current activity, child's birth weight and position in the household, level of education, caregiver's parity, age at childbirth, and place of delivery.

Household factors included the gender of the household head, family structure, total household population, number of children under 5, family support, household wealth status, type of residence and province.

Community-level variables related to childcare practices, community norms and taboos surrounding food consumption, and community services and resources were assessed using the qualitative component of the study.

Table 3. 2 Independent study variables

S/N	Variable	Definition /relevant question in questionnaire	Coding
Independent variables			
Child-related variables			
1	Age	Age of the child	Continuous variable categorized as "1" 0-11 months" "2" 12-23 months "3" 24-35 months "4" 36-47 months "5" 48-49 months
2	Sex	Sex of the child	"1" Male "2" Female
3	Birth weight	Child's weight at birth	Continuous variable categorized. "1" <2.9 kg "2" 3kg -3.9 kg "3" 4kg -5kg
4	Place of delivery	Place where the child is delivered	1" Clinic "2" Hospital "3" BBA "4" At home
5	Disease episode	Was the child ill for at least three days during the past month?	"0" No "1" Yes
6	Health seeking	Was the child taken to the doctor's rooms, clinic, or hospital?	"0" No "1" Yes
7	Reason for lack of health care for the disease episode	Why was the child not taken to the health facility?	"1" Lack of time or resources "2" Already on treatment "3" Child not sick enough
8	Medical aid	Is the child covered by medical aid?	"0" No "1" Yes
Caregiver related			
9	Current age	Age of the Caregiver's	"1" 15-19 "2" 20-24 "3" 25-29 "4"30-34 "5" 35-39 "6" 40-44 "7" 45-49
10	Marital status	Caregiver's marital status	"1" Married "2" Living together with partner "3" Single (never married, divorced/widowed)
11	Religion	Caregiver's religious belief	"1" Christian "2" Muslim "3" African Tradition "4" non-religious.
12	Ethnicity	Caregiver's ethnicity	"1" Nguni "2" Sotho "3" Tsonga "4" Venda "5" Coloured "6" Immigrant
13	Caregiver's age at birth	Caregiver's age at birth	"1" 15-19 "2" 20-24 "3" 25-29 "4" 30-34 "5" 35-39 "6" 40-44 "7"45-49
14	Parity	Number of children a woman currently has	"1" 1 Child "2" 2 children "3" 3 children "4" Children "5" 5 or more than five children
15	Medical aid	Is the caregiver covered by medical aid?	"0" No "1" Yes

16	Employment	Is the caregiver currently employed?	"0" No "1" Yes
17	Depressive symptoms	The Centre for Epidemiological Studies' Depression Scale (CES-D-10) was used to measure depressive symptoms	"0" No "1'" yes
Household-level variables			
18	Number of people living in the household	Total number of people living in the household	"1" 1-2 people "2" 3-4 people "3" 5-6 people "4" 7+ people
19	Household socioeconomic status	Level of economic status in the household	"1" Low "2" Middle "3" High
20	Food availability	A proxy variable generated from whether a household owns land, livestock or poultry or if a household grew green vegetables in the last 12 months	"1" Yes 2 "No"
21	Food security	It is a proxy variable generated from food spending. The adjusted food poverty line according to STATSSA was R531 per person a month in 2017. This poverty line is used as a cut-off for the household's food expenditure.	Categorical variable regrouped as "1" less than R800 "2" R800-R1 100 "3" R1200 – R1900 "4" R2000 – R2 900 "5" R3000+
22	Number of rooms	Total number of rooms in the house	Categorical variable "1" 1 room "2" 2-3 rooms "3" 4-5 rooms "4" 6+ rooms
23	Electricity	Access to electricity	1 "Yes" 2 "No"
24	Water sources	Access to water sources	"1" Access to other sources "2" Public tap "3" Piped water at home
25	Toilet type	Type of toilet facility	"1" None/bucket "2" Chemical/Pit-latrine "3" Flush toilet
26	Toilet sharing	Toilet facility shared	"1" Yes "2" No
27	Media access	Access to media	"1" Yes "2" No
28	Dwelling unit status	Dwelling unit status	"1" Dilapidated. "2" Needs maintenance. "3" Structurally sound
29	Safety	Crime and safety	"1" No- break ins "2" Housebreak-ins sometimes Housebreak-ins
30	Type of residence	Geographic residence	"1" Rural "2" Urban formal
31	Province	Province of residence	"1" Western Cape "2" Eastern Cape "3" Northern Cape "4" Free state "5" KwaZulu Natal

			“6” Northwest “7” Gauteng “8” Mpumalanga “9” Limpopo

3.5.7 Addressing study objectives

This section presents the analysis that was conducted to address the research objectives of the study. The overall objective of this study was to examine the impact of the social context on childhood malnutrition in South Africa.

3.5.7 a) First objective

The first objective - To determine the levels and patterns of childhood malnutrition in South Africa.

To achieve this first objective, suitable descriptive statistics were used to determine the levels and patterns of childhood malnutrition in South Africa. These included frequencies, percentages, means, and standard deviations. These statistics were chosen based on their ability to provide a clear and comprehensive picture of the data.

3.5.7 b) Second objective

The second objective - To examine the individual child, caregiver, and household factors associated with childhood malnutrition in South Africa

This objective was achieved by utilizing relevant inferential statistics. Initially, cross-tabulations were performed using the chi-square test of significance to investigate the association between child stunting, child underweight, and child overweight with various individual child, caregiver, and household-level characteristics. In the subsequent phase, multivariate analyses were conducted using binary logistic regression and ordered logistic regression to determine the

factors impacting child malnutrition across different levels (individual child, caregiver, and household factors).

The chi-square test provides information about the disparity between observed and expected counts assuming no relationship exists within the population. The formula for the chi-square test is presented below:

$$x_c^2 = \sum \frac{(0_i - E_1)^2}{E_1}$$

3.5.7 c) Third objective

The third objective – Is to investigate the association between food insecurity on childhood malnutrition.

To achieve this objective, a multi-level binary logistic regression analysis was conducted, which reported the fixed and random effects. The purpose was to explore the determinants that explain the variation in childhood malnutrition across districts in South Africa.

3.5.7 d) Fourth objective

The fourth objective - To explore the extent to which the socio-cultural and childcare practices of caregivers predispose under-5 children to malnutrition in selected low-income communities in South Africa.

To achieve this objective, in-depth interviews and focus group discussions were conducted with mothers of children under 5 years old. The aim was to explore their experiences, beliefs, and challenges related to child feeding and care practices.

3.5.7 e) Fifth objective

The fifth objective - to investigate the role of a multi-sectorial approach in improving child nutritional outcomes in SA.

To achieve this objective, in-depth interviews were conducted with the ECD practitioners. The purpose was to gain their perspectives on the challenges they face in ensuring adequate nutrition for children in their centres and the barriers they encounter in service delivery.

3.5.6 Data analysis

The data analysis was conducted at multiple levels. Firstly, the household-derived, child, and adult data files were merged using a unique identifier, resulting in a comprehensive dataset that included individual-level child, caregiver, and household variables. Secondly, descriptive statistics were used to present the percentage distribution of characteristics at the univariate level, including individual child, mother, household, and community levels. Thirdly, the chi-square test of significance was employed to examine the relationship between independent variables and outcome variables through bivariate analysis. Fourthly, the selection of independent variables was based on three criteria: 1) the theoretical and conceptual framework from the literature, 2) variables showing a strong association from the bivariate chi-square test analysis, and 3) variables with a strong correlation using the Variance Inflation Factor (VIF), a test that identifies and address any potential multicollinearity issues among the independent variables . Variables exhibiting a VIF over 4 or below 0.25 were excluded from the analysis due to the possibility of multicollinearity. The specific variables excluded were child disease episodes, health seeking, alternative care arrangements and household safety. Moreover, the correlation analysis between the dependent and independent variables to confirm the strength and direction of these relationships was conducted. Additionally, binary, and multilevel logistic regression models were

employed at the fourth level to examine the association between the outcome variables (stunting, underweight, and overweight) and selected independent variables. Fifth, an ordered logistic regression model was used to assess the severity (moderate vs. severe) of child malnutrition outcomes. All analyses, including univariate, bivariate, and multivariate analyses, were conducted using STATA version 17 (64 bit). In this study, calibration weights were applied to adjust the design weights and ensure that the age, sex, and race of the marginal totals matched the population estimates produced by the country's statistical office (Branson & Wittenberg, 2019). The weighting was implemented in data management and analysis as needed.

3.5.7 Multivariate analysis

3.5.7 a) Multilevel binary logistic regression model

Several researchers employ multi-level modelling to examine the relationship between child malnutrition and other independent variables. The underlying assumption is that children are nested within households, which in turn are nested within communities. The advantage of utilizing multi-level analysis lies in its capacity to identify the social context, encompassing factors such as the child's individual home environment, the socio-economic status of the parents and family, the environmental setting, and community factors that impact children's health outcomes. This suggests that household and community-level factors play a crucial role in comprehending the diverse dynamics of child health outcomes, signifying that children with similar characteristics may experience different health outcomes based on their household environments. Therefore, this provides a strong rationale for employing multi-level analysis, as single-level regression analysis assumes independence and does not account for the effect of household and community-level characteristics on hierarchical data.

The binary multi-level model, which reports odds ratios, is well-suited for analysing binary malnutrition outcomes. This model is particularly appropriate for analysing the extensive survey data from NIDS. The hierarchical structure of the NIDS data enables practical inferences and conclusions to be drawn, given the study's implementation of a two-stage cluster sample design, which allows for the measurement of variability at different levels of hierarchy. Consequently, the use of traditional binary logistic regression, which assumes 1) independence between outcome and independent variables, 2) no requirement for normally distributed residuals, and 3) no need for homogeneity of variance, becomes inadequate due to the presence of nested structures. Thus, based on the assumptions of the traditional logistic regression method, multi-level modelling emerges as the most appropriate approach for analysing child malnutrition, given its ability to account for variability (Hasinur et al., 2011; Stoltzfus, 2011).

3.5.7 b) Multilevel binary logistic regression model: Methodological procedure

Data was analysed at two levels. At level 1 was the individual child (under-5 children) and their caregivers (caregivers 15-49 years) nested in the households (level 2). Based on this nesting, the odds of children experiencing childhood malnutrition is not independent, because children nested within the same mother-level that are likely to be exposed to the same household characteristics.

The multi-level binary logistic regression model:

The multi-level binary logistic regression procedure is a highly effective approach for analysing mutually exclusive binary outcomes, which are limited to two values: 0 or 1. In this study, the multi-level binary logistic regression method was utilized to predict indicators of

childhood malnutrition. Specifically, the model predicts whether a child is stunted (1) or not stunted (0), underweight (1) or not underweight (0), and overweight (1) or not overweight (0).

Methodological procedure

This study employed the multi-level measure of variance and clustering to determine the social context of childhood malnutrition. In so doing, the study also aimed to investigate whether the community in which the child lives has any association on child malnutrition. The following methodological steps were followed when fitting the multi-level logistic regression model.

Firstly, the empty model (model 1) was fitted with no predictor variables. This model allowed us to identify if the contextual dimension would be possible.

Model 0 is denoted by the following formula:

$Logit(pi)=M+E_A$

Where

M= is the prevalence of malnutrition indicators expressed on the logistic scale

E_A = residuals on a log scale with a mean of 0 and variance

V_A= area variance expressed on a logistic scale (Variance around M).

VI=pi (1-pi) individual variance expressed on the probability scale depending on the predicted probability pi of the outcome.

Model 1 is denoted by the following formula:

In model 1, the probability of being stunted for a child living in household A depends on M and EA.

The Equation is written as follows:

$$p1 = \frac{\exp(M + E_A)}{\exp(M + E_A)}$$

Secondly, this study added child level variables (model 2) to investigate the association between individual child-level variables on childhood malnutrition.

In model 1, the probability of being malnourished is the function of the household of the children at the individual level variables.

Logit (pi)=M +$\beta_1 sex_i$+$\beta_2 age_i$+$\beta_3 birthweight_i$……+E_A

$\beta_1, \beta_2, \beta_3$ are the regression coefficients

Thirdly, this study added caregiver level variables (Model 2) to investigate the association between mother-level variables and childhood malnutrition. In model 2, the probability of being malnourished depends on the individual child characteristics, caregiver characteristics, and on residence of the children.

Fourthly, this study included the household level variables (Model 4)

Logit (pi)=M +$\beta_1 sex_i$+$\beta_2 age_i$+$\beta_3 birthweight_i$……+E_A

Lastly, this study included all the variables to investigate their relationship to childhood malnutrition.

The measure of the household level variance and clustering in the multi-level logistic regression

In this study, the clustering in the multi-level logistic regression was also measured, the intra-class correlation and the related variance partition coefficient were employed. STATA version 17 (SE) was used to estimate the multi-level logistic regression models.

3.5.7 c) Ordered logistic regression model

Researchers have utilized ordered logistic regression to study childhood malnutrition due to its ability to handle categorical and ordered variables. In the context of childhood malnutrition, the nutritional status of children is classified into ordered levels, such as underweight, normal weight, and overweight (Yirga et al., 2019), or severity categories, such as severely undernourished, moderately undernourished, and nourished (Timerga et al., 2020). These categories possess a natural order but lack a fixed interval scale, making ordered logistic regression an appropriate statistical method for analysis. OLR models the probability of the dependent variable falling at or below a specific category, considering the ordinal nature of the data. This is especially valuable for assessing the risk factors for child malnutrition, as it enables the estimation of the effects of predictor variables across different levels of malnutrition severity (Gurmessa et al., 2022). Additionally, OLR is suitable for data obtained from complex survey designs, as it can generate accurate estimates and standard errors by considering the survey sampling design and accounting for the complex sampling structure of the NIDS (Birhan & Belay, 2021). Therefore, this model is relevant for this study, especially when looking at the order of malnutrition indicators such as stunting, which has the categories not stunted, moderately stunted and severely stunted.

3.5.7 d) Ordered logistic regression model: Methodological procedure

In the context of studying childhood malnutrition, ordered logistic regression can be used to model the likelihood of different levels of malnutrition. For example, stunting can be modelled (not stunted, stunted and severely stunted) based on predictor variables.

If malnutrition is denoted as Y, which can take on ordered categories 1,2,3,…, ,J, where J is the total number of categories. The predictor variables are shown as $X1,X2,\ldots,Xp$.

The formula for ordered logistic regression when studying malnutrition can be written as:

$$P(Y \leq j | X1, X2, \ldots, Xp) = 1 + e - (\alpha j - \beta 1 X1 - \beta 2 X2 - \ldots - \beta p Xp) 1$$

Where:

- $P(Y \leq j | X1, X2, \ldots, Xp)$ is the cumulative probability of observing a malnutrition level less than or equal to category j given predictor variables $X1,X2,\ldots,Xp$.
- αj is the threshold parameter for category j of malnutrition.
- $\beta 1, \beta 2, \ldots, \beta p$ are the coefficients for the predictor variables $X1,X2,\ldots,Xp$, respectively.
- e is the base of the natural logarithm.

The interpretation of the coefficients β1,β2,…,βp remains the same as in the general ordered logistic regression context, representing the relationship between the predictor variables on the odds of being in or below each malnutrition category, relative to the odds of being in the next higher category. The threshold parameters αj represent the thresholds at which the odds of being in or below category j change relative to the odds of being in category j+1.

The model estimates the coefficients $\beta 1, \beta 2, \ldots, \beta p$ and threshold parameters αj using maximum likelihood estimation, allowing for the assessment of the impact of predictor variables on the likelihood of different levels of malnutrition (Agresti, 2012; Scott et al., 1991).

3.6.1 Data quality assessment

This section divides the assessment of data quality into three parts. Firstly, it examines the graphical presentation of single-year and grouped data. Secondly, it evaluates the presentation of Whipple's index indices. Lastly, it considers the presentation of the Myer's index indices.

A data quality assessment was conducted on the NIDS data, specifically focusing on the age data of women of reproductive years (15-49 years). It is critical to check for the age distribution as it has the potential to affect other population characteristics. Survey and census-derived age data frequently suffers from problems including digit preference, age heaping, and age misreporting, especially for ages that finish in 0 and 5. Given that age is a crucial demographic variable required for demographic research, it is critical to assess the age data in-depth in order to find and fix any inaccuracies that can have an influence on the quality of the data.

In demographic analysis, tools such as the age ratio, Myer's index, sex ratio and the Whipple's Index are used to detect the misreporting of age.

To check the age data in the NIDS data collected in 2017, age was presented graphically using the age ratio analysis, Myer's index and the Whipple's index. The following section gives a detailed account of how the demographic methods were used to present the age data quality:

Age ratio

The age ratio is a tool used in demographic analysis to help identify potential age misreporting, particularly age heaping, in a dataset. Age heaping refers to the tendency of individuals to report their ages ending in specific digits, most commonly 0 and 5. The ratio between the number of individuals at a specific

age and the average number of individuals at the two surrounding ages is calculated. The expected values should be close to 1, however, large deviations around the ages ending in 0 and 5 indicate preference for certain terminal digits. Deviations from 1 can suggest potential age misreporting, particularly age heaping (preference for reporting ages ending in specific digits). Values above 1 might indicate an overrepresentation of individuals in that age group, potentially due to age heaping on the ending digit. Values below 1 might indicate an underrepresentation of individuals in that age group.

Whipple's Index

Is very focused on identifying age heaping tendencies. It specifically detects age heaping on numbers ending in 0 and 5. It measures the proportion of people who report ages ending in 0 or 5, with higher values suggesting a higher degree of digit preference.

Myers' Blended Index

Blends the population in a specific way so that every terminal digit (0-9) has an equal chance of being selected as the last digit of someone's age. It measures deviations from this expected distribution. More accurate at detecting age heaping on various terminal digits, not just 0 and 5.

3.6.2 Graphical presentation of age data by NIDS, 2017

Age ratio analysis

The age distribution appears to be somewhat pyramid-shaped, with a wider base at younger ages and gradually decreasing towards older ages. This is a typical characteristic of populations with high fertility rates, as seen in many developing countries. The largest number of women falls in the 20-24 age group, followed by the 25-29 age group. This suggests a recent baby boom, or a large cohort of women born around that time.

There is a sharp decrease in the number of women between the 30-34 and 35-39 age groups. This could be due to various factors, such as: Out-migration and differential mortality. Women in this age group might be more likely to migrate for education or work opportunities. Additionally, while less likely for this age range, there could be slightly higher mortality rates in this specific age group compared to others.

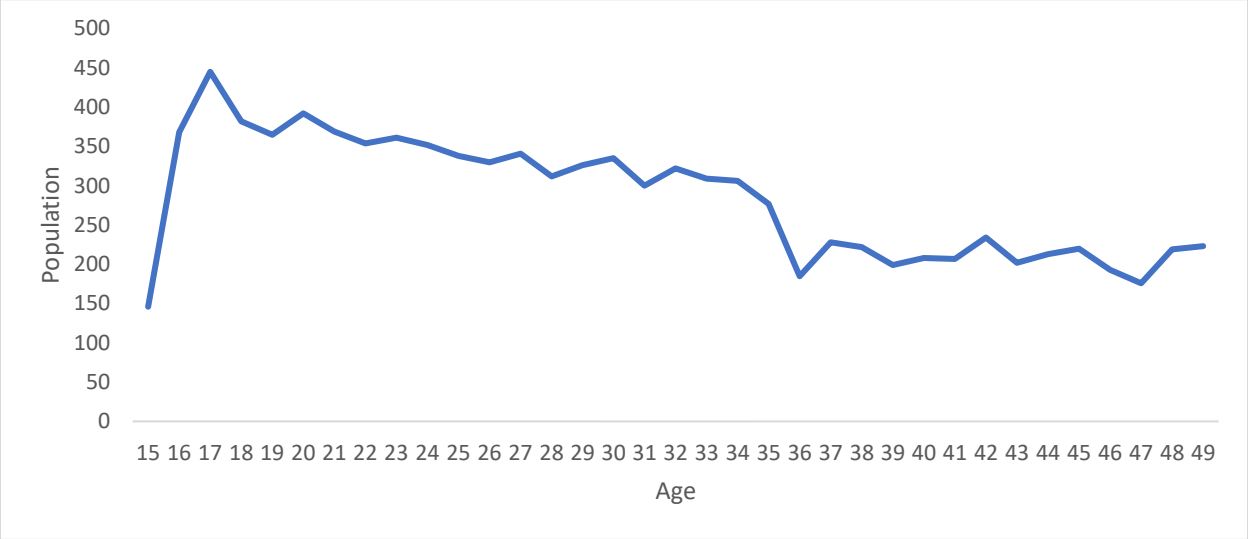


Figure 3. 3 Single age distribution of women 15-49 years, South Africa, 2017 NIDS

Figure 3.4 below presents the five-year distribution of women 15-49 years, South Africa in 2017. The age distribution exhibits a somewhat pyramid-shaped pattern, with a wider base at younger ages (15-19 and 20-24) and a gradual decrease towards older age groups (40-44 and 45-49). This is a typical characteristic of populations with high fertility rates, often seen in developing countries.

The largest number of women falls within the 20-24 age group, followed by the 25-29 age group. This suggests a large cohort of women born around that time.

A steeper decline in the number of women is observed between the 30-34 and 35-39 age groups. This decrease could be attributed to various factors, including out-migration and differential mortality. Women in this age range might be more likely to migrate for educational or employment opportunities. While less likely for this specific age range, there could be slightly higher mortality rates in this group compared to others.

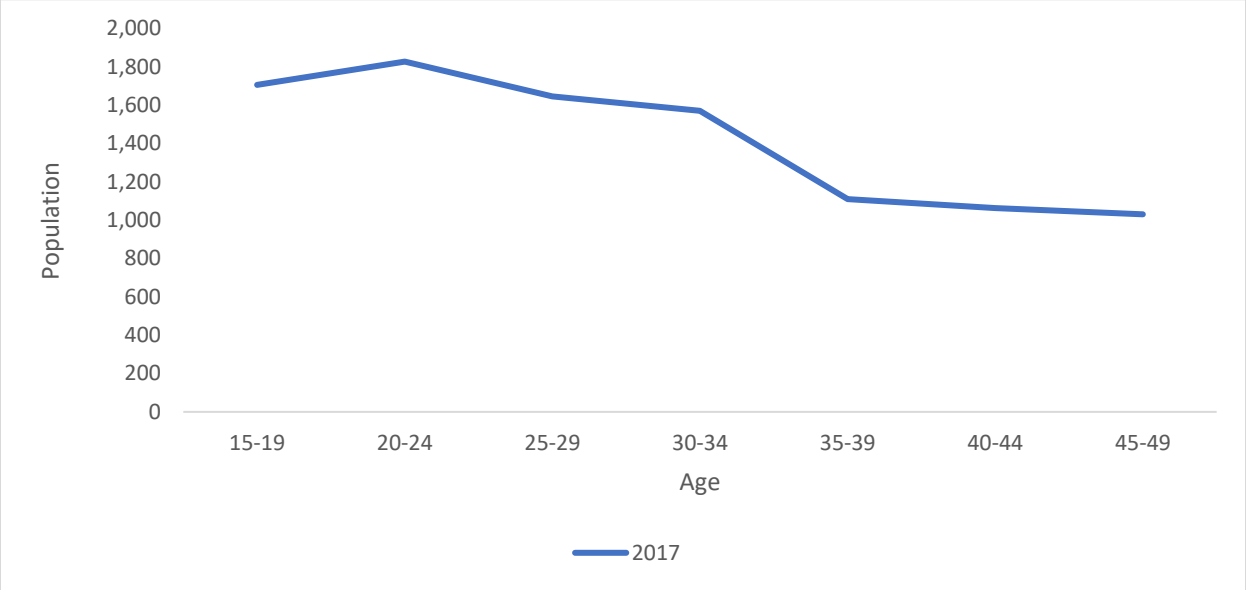


Figure 3. 4 Five-year distribution of women 15-49 years, South Africa, 2017, NIDS

Figure 3.5 below presents the age ratio analysis of women in South Africa according to the 2017 NIDS. Most age ratios are close to 1, suggesting no major age misreporting. However, there are slight deviations from 1 for some age groups. The age ratio for the 20-24 age group (1.003) is slightly above 1, which could be due to a minor preference for reporting ages ending in 0 or 5 in this group. The age ratio for the 30-34 age group (0.973) is slightly below 1, suggesting a possible underrepresentation of women in this age group.

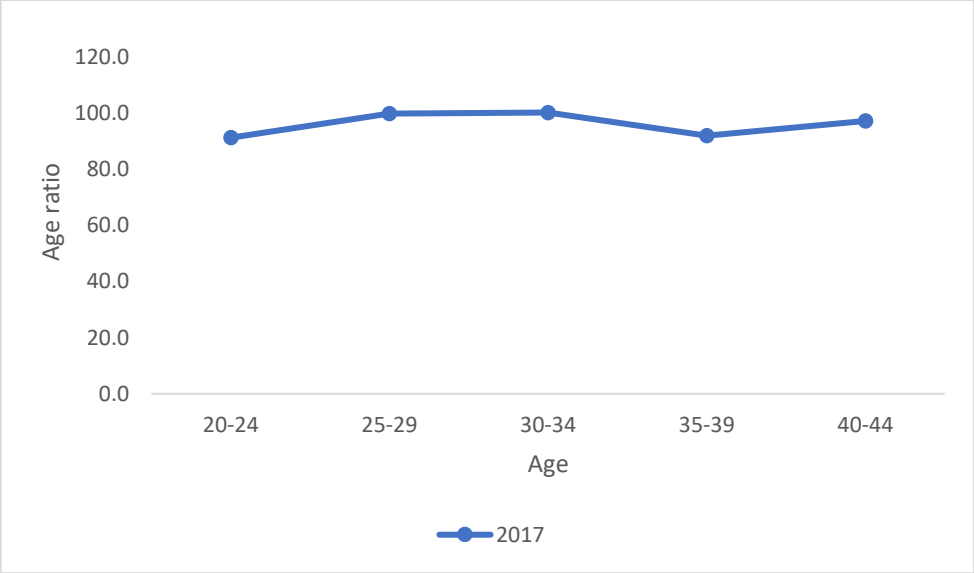


Figure 3. 5 Five-year distribution of women's age ratio, South Africa, 2017, NIDS

Whipple's Index

The extent of age misreporting in the data collected by the NIDS in 2017 was further determined using the Whipple's index. The summarized values of three indices (W 0, 5), (W0), and (W5) for all women of reproductive ages have been presented in Table 3.3. In 2017, the NIDS data indicated that the Whipple's (W0) and (W 0, 5) index values were less than 105, suggesting that the data was reliable. This implies that the data for ages ending in the digit 0 was accurate. However, the Whipple's index (W5) for the NIDS survey exceeded 175, indicating very poor data quality. Overall, the results can be interpreted as follows: in 2017, there was a strong preference for ages ending in 5, as indicated by the high index value of 193.1. There was a weaker preference for ages ending in 0, as evidenced by the index value of 76.1. The combined index value of 96.5 suggests a moderate overall preference for ages ending in 0 and 5 combined.

Table 3. 3 Whipple's index depicting preference for ages ending in 0 and 5

NIDS Year	W0	W5	W 0,5
2017	76.1	193.1	96.5

The Myers' Blended Index

Table 3.4 below reveals deviations from the expected 10% distribution for each terminal digit. Deviations are positive for digits 3, 7, 8, and 9, suggesting an overrepresentation of individuals reported with ages ending in these digits. Deviations are negative for digits 0, 1, 2, 4, 5, and 6, suggesting an underrepresentation of individuals reported with ages ending in these digits. The largest absolute deviations are observed for digits 8 and 9, indicating a stronger preference for reporting ages ending in these digits compared to others. Based on the Myers index and the observed deviations, this table suggests a potential presence of age misreporting, particularly age heaping on digits 3, 7, 8, and 9.

Table 3. 4 Myers blended index depicting preference for terminal digits.

Terminal digits	% distribution for digit preference
0	6.29
1	6.80
2	8.85
3	9.68
4	10.18
5	10.82
6	10.01
7	11.42
8	12.52
9	13.43
Sum	**100**
Index	**8.39**

3.6.3 Reporting on missing data

The sample size for our study consisted of 2,966 mother-child pairs. However, there are fewer responses for certain variables compared to the initial sample size. This is due to various factors, such as participants choosing not to answer specific questions, skipping responses due to the sensitive nature of certain questions, or being unable to recall answers. Since NIDS is a panel study with subsequent rounds of data, whenever possible, missing data for respondents were imputed from previous waves of data for unchanging variables like sex or date of birth. To address missing data at Wave 5, the last observation carried forward (LOCF) method of data imputation was used, particularly for variables that do not change significantly over time (Dimitrakopoulou et al., 2014).

In addition, not all 2,966 individuals were necessarily eligible to answer all questions. This is because the initial sample might not have included individuals who did not meet the specific criteria for certain questions in the study. Furthermore, some questions may not be relevant to all participants based on their responses to previous questions. For example, questions about health-seeking behaviour may not apply to children who have never been sick.

3.6.4 Reporting on the quality of data

The results above provide some mixed signals about the data quality of this study. The positive signs are with the age distribution analysis and the Whipple's Index. For example, the pyramid shaped age distribution with a large young population is consistent with what we expect in a developing country (Bongaarts, 2009). Additionally, the low Whipple's (W0) and (W 0, 5) index values indicate good data quality for ages ending in 0.

However, the negative signs can be associated with the age ratio analysis, Whipple index (W5) and the Myers's Blended Index. For example, the Age ratio analysis shows minor deviations from a 1:1 ratio in some age groups, suggesting potential underrepresentation (30-34 age group) or slight misreporting. Additionally, the very high Whipple's (W5) index suggests significant issues with data quality for ages ending in 5. This contradicts the positive sign from the low (W0) and (W 0, 5) values. With regards to the Myers's Blended Index, deviations from the expected distribution and positive values for digits 3, 7, 8, and 9 indicate a preference for reporting ages ending in these digits, suggesting potential age heaping.

Overall, the data quality for ages ending in 0 seems reliable based on the Whipple's (W0) and (W 0, 5) index. However, there's strong evidence of potential age heaping for other ages, particularly those ending in 5.

3.7 Qualitative study

The second component followed the first component and involved the utilization of a qualitative research method. According to Gill (2020), the objective of qualitative research is to uncover meaning derived from human experiences (Gill, 2020). This method was suitable for the present study as it facilitated the use of in-depth interviews employing structured topic guides to: 1) explore the caregivers' perceptions of childcare practices, their comprehension of child malnutrition, and the extent to which their socio-cultural practices contribute to malnutrition in children under the age of five; 2) comprehend how food insecurity affects children's dietary patterns; 3) understand the role played by Early Childhood Development (ECD) practitioners in childcare and the nutritional status of children; and 4) understand the role of a multi-sectorial approach in child care. The aim of utilizing semi-structured questionnaires was to ensure that the

primary themes of interest to the researcher were covered in the interviews, while also allowing for open-ended questions and flexibility in data collection. The focus group discussions (FGDs) were intentionally chosen as a qualitative tool to gather caregivers with similar backgrounds, enabling them to share their experiences and understandings of daily life. Their input ultimately contributes to an in-depth understanding of the social issues that impact child malnutrition. Moreover, the FGDs allowed the researcher to observe how caregivers were influenced or behaved in the presence of others in a group setting. The FGDs drew upon caregivers' attitudes, experiences, feelings, and beliefs regarding the subject matter, which the researcher would not have been able to achieve through in-depth interviews alone.

The qualitative data was utilized to complement the quantitative results and explore questions that were not addressed in the NIDS dataset. Although there was a five-year gap between the collection of quantitative and qualitative data, this should not be considered a limitation given that there have been no significant changes in childhood malnutrition rates in the country. However, the outbreak of COVID-19 has rendered more households poor and unable to afford basic social services, which is a sufficient change in the context in which children are raised. There have also been major policy announcements since then. Furthermore, policies, programs, and the context in which children are raised have remained unchanged during this period. In 2022, when the data was collected, the Covid-19 pandemic was also observed, which was not present during the collection of quantitative data in 2017. Literature has also demonstrated the adverse impacts that the pandemic has had on child health outcomes, households, communities, and the economy (Gayatri & Puspitasari, 2022; Luc et al., 2021; Nonde, 2022; van der Berg et al., 2022b). The advantage of conducting in-depth interviews was that participants had a platform to share their stories, beliefs, and values with the utmost

confidentiality and privacy. The focus group discussions captured data on community perspectives regarding child health, child malnutrition, as well as the cultural norms of childcare practices in the community. The advantage of data integration was that it enhanced the validity and dependability of the data, providing a comprehensive understanding of the subject matter (Turner et al., 2017).

Qualitative data was collected using semi-structured methods, which included in-depth interviews and focus group discussions. The purpose of using semi-structured questionnaires was to ensure a comprehensive coverage of the main themes during the interviews, while also allowing flexibility in data collection and the ability to adjust questions based on new insights. The researcher conducted five focus group discussions (FGDs) and twenty in-depth interviews (IDIs) until reaching saturation point, where enough data had been gathered and redundancy was avoided. These interviews were conducted in local languages such as IsiZulu, Sesotho, or Sepedi. Thulani is characterized by a diverse range of ethnic groups, with the Nguni and Sotho ethnic groups being the predominant ones. However, GaMasemola predominantly consists of people from the northern region, with Sepedi being their local language. The interviews conducted in Sepedi were later transcribed into English.

3.7.1 Sample selection

This study utilized both purposive and snowball sampling techniques. Purposive sampling, as defined by Gill (2020), involves deliberately selecting individuals who had knowledge or experience relevant to the phenomenon being investigated. Additionally, snowball sampling involves current participants suggesting other potential participants who may be interested in taking part in the study (Gill, 2020). In the initial phase, community leaders were identified in

both study settings. These leaders then directed the researcher to the leaders of Early Childhood Development (ECD) forums and mothers in the community who had children under the age of 5. The researcher was invited to attend ECD forum meetings where she presented the proposed study on the social context of childhood malnutrition in South Africa. ECD practitioners present at the meetings volunteered to participate and recommended other ECD practitioners who were not present. The selection of ECD practitioners was purposeful, as they served as primary caregivers for children under the age of 5 in the absence of the child's home environment. Furthermore, the quantitative findings of this study demonstrated better health outcomes among children in creches. As a result, the researcher deliberately chose creches as the source for selecting participants. The main criterion for participant selection was that they had to be mothers of children under the age of 5. Information sheets were sent to the creches, where ECD practitioners distributed them to the mothers of these children. The participant information sheet included a return slip that mothers could complete if they were interested in participating in the study. The return slip contained the participants' contact details, such as phone numbers and addresses. To assess whether the participants who volunteered to take part in the study met the interview criteria, the researcher administered a screening questionnaire. The basic criteria for participating in the interviews were being a mother, having at least one child under the age of 5, and falling within the reproductive age range of 15-49. Interviews were primarily conducted in the creches, but in cases where caregivers were unable to attend, the researcher visited their homes. To expand the sample, participants interviewed at home were asked to refer other mothers with children under the age of 5.

3.7.2 Target group and inclusion criteria

The study initially proposed conducting five focus group discussions (FGDs) and 25 in-depth interviews with mothers of children under the age of five. However, due to the nature of the study being an explanatory sequential research study, the researcher decided to analyse the quantitative findings first. This decision was based on the unexpected and important finding that revealed a limited number of children in creches, and those in creches showed better nutritional outcomes. This finding led to the inclusion of early childhood development (ECD) practitioners, as they were the primary caretakers of children in the absence of their mothers. Consequently, five in-depth interviews were conducted with ECD practitioners. Although the original target for in-depth interviews was 25, the researcher only interviewed 20 mothers due to reaching data saturation. Saunders (2018) defines saturation as the point at which newly collected data reinforces previously collected data.

Table 3.5 below presents the characteristics of the five focus group discussions that were conducted, each compromising about five caregivers of children under-5.

Table 3. 5 Characteristics of women interviewed in focus group discussions.

Category	**Age**	**Setting**	**GaMasemola**
1. Young caregivers	19-29 years	Urban	Thulani
2. Young caregivers	20- 29 years	Rural	GaMasemola
3. Older women	30-49 years	Urban	Thulani
4. Older women	30-49 years	Rural	GaMasemola

3.7.3 Pre-testing and pilot testing

The preliminary test was conducted on a limited number of selected individuals in Thulani and GaMasemola (15 individuals) in November 2021 to assess the effectiveness of the tools. These individuals represented the characteristics of the final sample that would be interviewed but were not included in the final interviews. During the preliminary test, the researcher assessed whether the respondents understood the key concepts of the study. The effectiveness of the tools was evaluated using the following pretesting elements:

1) Comprehension - participants were given the opportunity to focus on the main idea of the study by reading the interview questions and assessing their understanding of the questionnaires.

2) Acceptance - the researcher inquired about any words or concepts that the participants did not comprehend, as well as any additional explanations they needed regarding the subject matter.

3) Relevance - participants were provided with the questionnaire to review and provide feedback on the relevance of the questions for them.

4) Improvement - The researcher sought ways to enhance the material and obtain input from the participants on the study tools.

After pretesting the data collection tools, the researcher piloted the tools in Thulani in February 2022 to accommodate their ability to reach the study area. The pilot aimed to assess participants' understanding of the questions asked. The researcher then made necessary adjustments to the questionnaire. Official data collection resumed in mid-July 2022 and concluded at the end of August 2022.

3.7.4 Data analysis

All data collected were recorded using tape recorders and transcribed after the interviews. Participants were informed about the purpose of the study prior to the interviews and were made aware that the discussions would be recorded. The recording served the purpose of allowing the researcher to refer back to the conversation to ensure no information was overlooked. During transcription, the researcher made side notes to highlight critical themes that emerged from the interviews. The data were manually coded and analysed using Atlas Ti, employing a thematic approach. Deductive coding was utilized, enabling the researcher to apply pre-existing theories, frameworks, or ideas (Skjott Linneberg & Korsgaard, 2019; Williams & Moser, 2019). A code tree was established, and transcripts were analysed to determine their alignment with existing codes. If they did not fit, new codes were added during the analysis as new themes emerged.

3.7.5 Qualitative Rigour

Trustworthiness

The qualitative component of this study was grounded in Lincoln et al.'s (1986) principles of trustworthiness, which include credibility, transferability, dependability, confirmability, and reflexivity (Lincoln et al., 1985). To ensure the credibility of the study findings, the study tools (interview schedule) were pre-tested and pilot-tested with primary caregivers of children under five and early childhood development (ECD) practitioners who provide care for these children during the day. Two stages of testing were conducted on the research tools.

In stage 1, the interviewer met with six owners of ECD centres (four in Thulani and two in GaMasemola) to pre-test the research tools in November 2021. ECD practitioners tested the questionnaires for in-depth interviews and focus group discussions with mothers. However, for

the ECD practitioner questionnaire, the interview schedule was pre-tested by two other ECD practitioners who were not part of the final data collection, thus eliminating bias. ECD principals were asked to review the questionnaires and provide input on their understanding of the interview schedule's content. They raised concerns about the wording of certain questions and suggested rephrasing them to ensure participants' full comprehension. Following these discussions, the interview schedule was revised.

In stage 2, the researcher piloted the study tools in February 2022, conducting two focus group discussions with 15 participants and five in-depth interviews. All interviewed caregivers were biological mothers or caretakers of at least one child under five years old. Participants were recruited through creches, with information sheets distributed to children to pass on to their caregivers. The researcher contacted caregivers whose children returned the slips expressing interest in participating in either a focus group discussion or an individual interview. These participants were not included in the final sample selection.

To ensure dependability, interviews were recorded, transcribed, and detailed responses captured, leaving an audit trail in the data. The findings of this study can be transferable to other study settings and populations. The selected sample size allowed for generalization of caregivers' experiences and perspectives, as well as those of other ECD practitioners regarding childcare and child malnutrition outcomes. The methods and research processes described herein can serve as a guide for future studies seeking to replicate the findings in different contexts. Other researchers can confirm this study, as the interpretations were derived from unbiased data. Lastly, the research report portrays the different perspectives and realities of the study participants fairly and truthfully, demonstrating the authenticity of this study.

3.7.6 Ethical consideration

This study utilized a mixed methods approach. Ethical approval was obtained from the University of Witwatersrand Human Research Ethics Committee (Non-medical H21/04/34). For the quantitative component, data from the NIDS was used, which had received ethical clearance on December 19, 2016, from the University of Cape Town's Faculty of Health Sciences Human Research Ethics Committee. In all NIDS interviews, participants were given consent forms in their preferred language, and minors were provided with assent forms. The NIDS dataset used did not contain any personal identifying information, ensuring confidentiality and anonymity. For the qualitative component, personal information was collected through in-depth interviews and focus group discussions. Anonymity and confidentiality were maintained during data reporting by assigning codes to respondents. In focus group discussions, participants were instructed to use pseudonyms instead of their real names to protect their identity and confidentiality. Prior to the group discussions, confidentiality was thoroughly discussed with the participants. The final report does not include any participants' names. Each participant either signed an informed consent form or gave verbal consent. Caregivers under the age of 18 signed an assent informed consent form, while their parents/guardians signed the main consent form on their behalf. Participants were informed that their participation was voluntary and that the study presented no harm to them.

CHAPTER FOUR

Quantitative results and relevant qualitative findings

The demographic, socio-economic, childcare practices, cultural practices, access to services, and environmental factors surrounding the birth and upbringing of children are crucial in understanding the complex issue of child malnutrition. To effectively address childhood malnutrition, it is vital to comprehend the social context to which children are exposed. This chapter is divided into four sections that delve into the social context of childhood malnutrition. It offers a thorough analysis of the quantitative results obtained from the 2017 National Income Dynamics Wave 5 study, as well as the qualitative findings derived from in-depth interviews and focus group discussions.

Section 1 presents the demographic, socio-economic, and environmental characteristics of the study population. Section 2 provides the bivariate results and relevant qualitative findings that support the quantitative results. Section 3 presents the multivariate quantitative results and relevant qualitative findings, while Section 4 highlights other pertinent qualitative findings.

This study aimed at contributing to a more nuanced understanding of childhood malnutrition by extensively exploring these background characteristics. The outline of this section employs descriptive statistics based on the level of the characteristics, namely individual child characteristics, caregiver-level characteristics, and household-level characteristics (the unit in which children are raised). Figures 4.1 – 4.4 also offer descriptive statistics on selected child characteristics. The presentation of these results and findings serves to depict the profile of the study population.

Section 1: Description of study population

The section below outlines the individual characteristics of children and their caregivers. These background factors were selected based on the 2020 UNICEF Maternal and Child Nutrition conceptual framework, which suggests that there are interconnected immediate (individual factors), underlying (household), and basic (societal) factors that can contribute to improved child and maternal malnutrition (UNICEF, 2021b). The Food and Nutrition Security framework also highlights the importance of physical, economic, and social access to safe and nutritious food for children to achieve optimal food security at all times (FAO, 2000). Therefore, this section presents specific characteristics of children under the age of 5. Additionally, figures 4.1-4.6 provide a percentage distribution of the demographic characteristics of children[2].

Table 4.1 below illustrates the distribution of the study sample by gender. It is observed that the proportion of male children (50.14%) is slightly higher than that of females (49.86%). In terms of age, the majority of the study sample falls within the 48–59-month age group (25.80%), followed by the 36–47 months age group (23.53%). However, the smallest proportion is represented by children aged 0-11 months, accounting for only 10.31% of the total study population. Regarding race, most of the sampled children are African (76.69%), followed by Coloured children (13.69%). Analysis of birth weight reveals that over half of the children were born with a normal birth weight of 3kg (56.50%), while those with a low birth weight of 1-2 kg comprise 38.89% of the sample. Only a small percentage of children had a high birth weight of 4kg and above (4.61%). When examining ethnic groups, Nguni children constitute the largest proportion (57.07%) among the sampled children, followed by the Basotho ethnic group

[2] The selected percentage distribution children by age and sex, weight and sex, childcare during the day, and alternative care of the child.

(25.11%). It is noteworthy that facility-based delivery is prevalent in South Africa, as 87.98% of the sampled children were delivered at hospitals, while 9.69% were delivered at clinics. Approximately 10% of children under the age of 5 experienced at least one disease episode in the month prior to the survey, with a minimum duration of three days. Among children who had a disease episode, a notable percentage (30.79%) did not receive medical care. The primary reasons reported for this lack of care were that the children were not deemed sick enough (62.15%), some children were already receiving treatment for their condition (20.18%), and a percentage of caregivers (17.67%) cited a lack of time or financial resources (transportation or financial means) to seek healthcare. Most children (93.09%) did not have medical aid coverage. Furthermore, the study sample indicates that the child support grant is received by a significant proportion of children (80.59%). During the day, more than two-thirds of children under the age of 5 are cared for at home (67.22%), while 24.60% are enrolled in a creche and 8.19% attend school. In addition to the mother, other caregivers include fathers or other parents (35.94%), grandparents (20.31%), and non-familial relatives (20.31%).

Table 4. 1 Weighted percentage distribution of child level characteristics in South Africa, NIDS wave 5 (2017)

Child characteristics	N= 2 966	
	Frequency (weighted)	**Percentage**
Sex	**N= 2 966**	
Male	1,487	50.14
Female	1,479	49.86
Age	**N= 2 966**	
0-11 months	306	10.31
12-23 months	584	19.67
24-35 months	613	20.68
36-47 months	698	23.53
48-59 months	765	25.80

Birthweight	**N=2,266**[3]	
1-2.9 kg	881	38.89
3 kg	1,280	56.50
4-5 kg	104	4.61
Race		
African	2,275	76.69
Coloured	406	13.69
White/Indian/Asian	285	9.62
Ethnicity	**N= 2 966**	
English and Afrikaans	429	14.47
Tsonga and others	99	3.35
Sotho	745	25.11
Nguni	1,693	57.07
Place of delivery	**N= 2 966**	
Hospital	2,592	87.41
Clinic	287	9.69
Home	86	2.90
Disease episode[4]	**N= 2 966**	
No	2,609	87.98
Yes	357	12.02
Health seeking	**N=357**	
Yes	247	69.21
No	110	30.79
Reasons for no health-seeking	**N=110**[5]	
No time or resources	19	17.67
Already on treatment	22	20.18
Child not sick enough	68	62.15
Medical aid	**N= 2 966**	
Yes	205	6.91
No	2,761	93.09
Child support grant	**N= 2 966**	
No	576	19.41
yes	2390	80.59
Child day care	**N= 2 966**	
Gr R/1	243	8.19
Crèche/day mom	730	24.6
at home	1994	67.22
Multiple Forms of Childcare	**N= 2 966**	
Parent	1,066	35.94

[3] Details of why there are fewer responses in the reporting are given in section 3.6.2 Reporting on missing data

[4] Had been ill at least 3 days during the past month.

[5] The small sample size presents a limitation of lower statistical power

Grandparents	602	20.31
relatives/non-familial	318	10.71
no other carer	980	33.04

Results from Figure 4.1 below depict that more male children were sampled in the age groups 0-11 months (51.14), 12-23 months (51.41%), and 36-47 months (52.83%). However, more females were sampled in the ages 24-35 (51.01%) months and 48-59 months (52.74%).

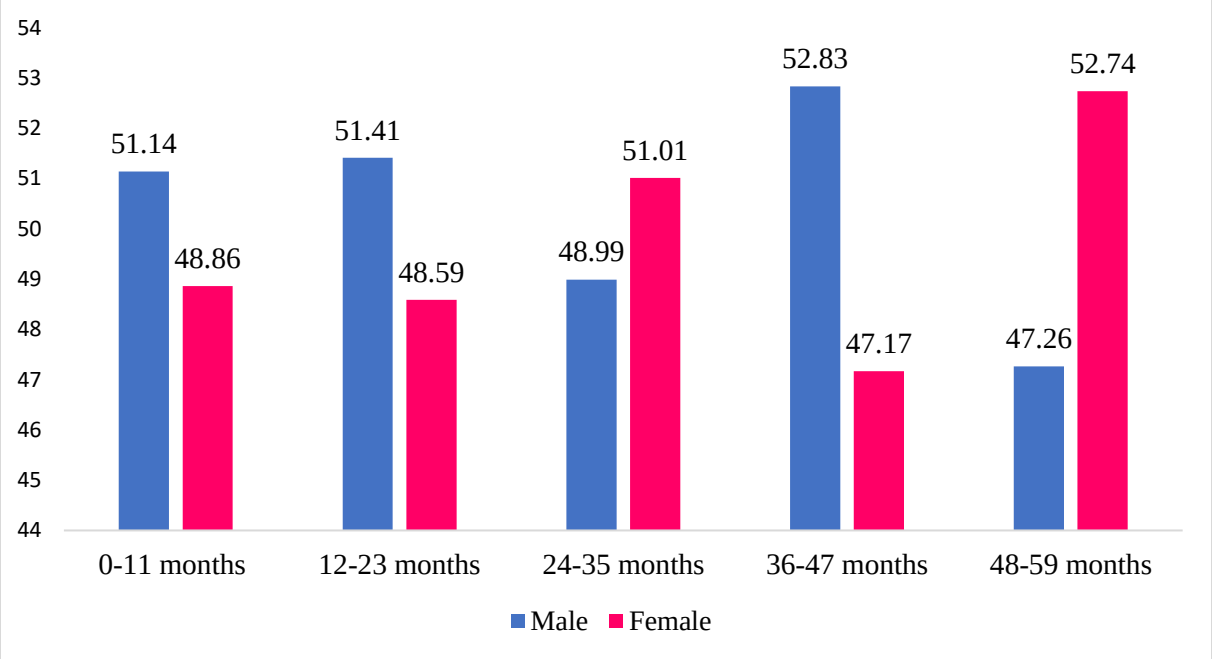


Figure 4. 1 Percentage distribution of children's age by sex

Figure 4.2 below presents an analysis of birth weight. Among babies weighing 1-2 kg, females slightly outnumber males, with a prevalence of 55.02% compared to 44.98%. However, this trend reverses for heavier babies, with males constituting the majority in the 3 kg category (52.41%) and the 4-5 kg category (62.23%).

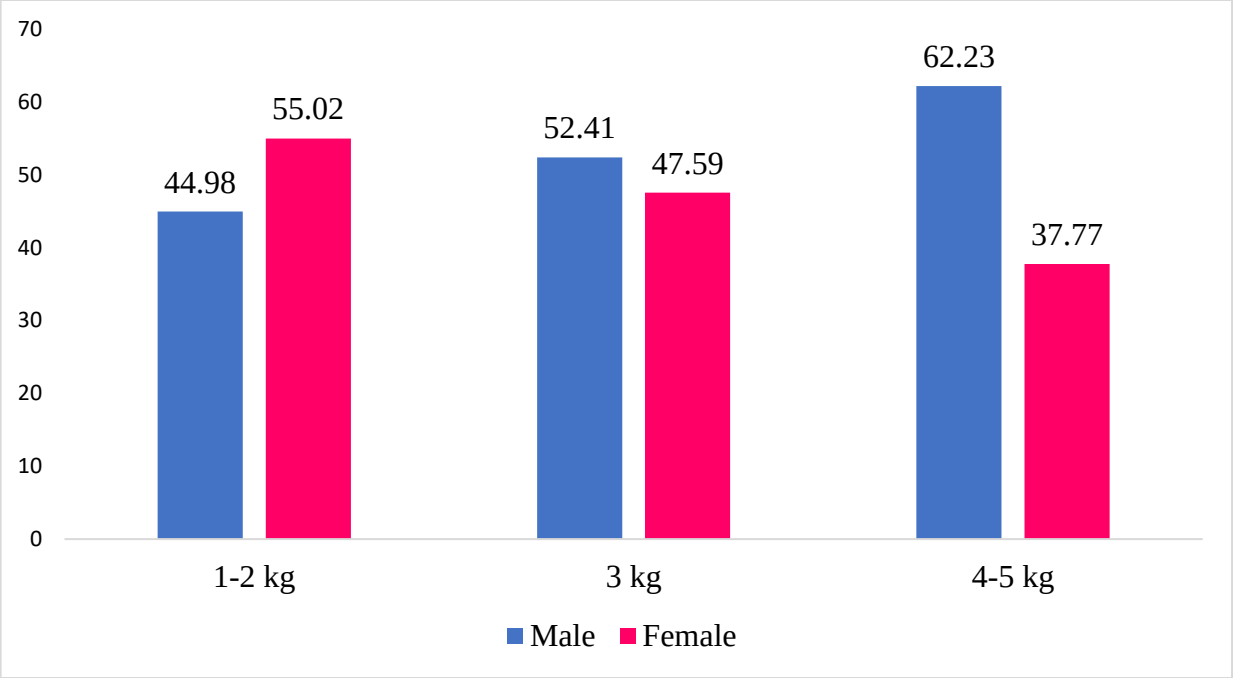


Figure 4. 2 Percentage distribution of child birthweight by sex

Figure 4.3 below presents the percentage distribution of children who are attending crèche or stay at home during the day by age. Most children cared for at home during the day were 12-23 months (26.66%), followed by those 24-35 months (24.12%) and those 36-47 months (21.16%). The highest distribution of children cared for at Crèche during the day was the children aged 36-47 (31.77%) months and those 48-59 months (37.25%).

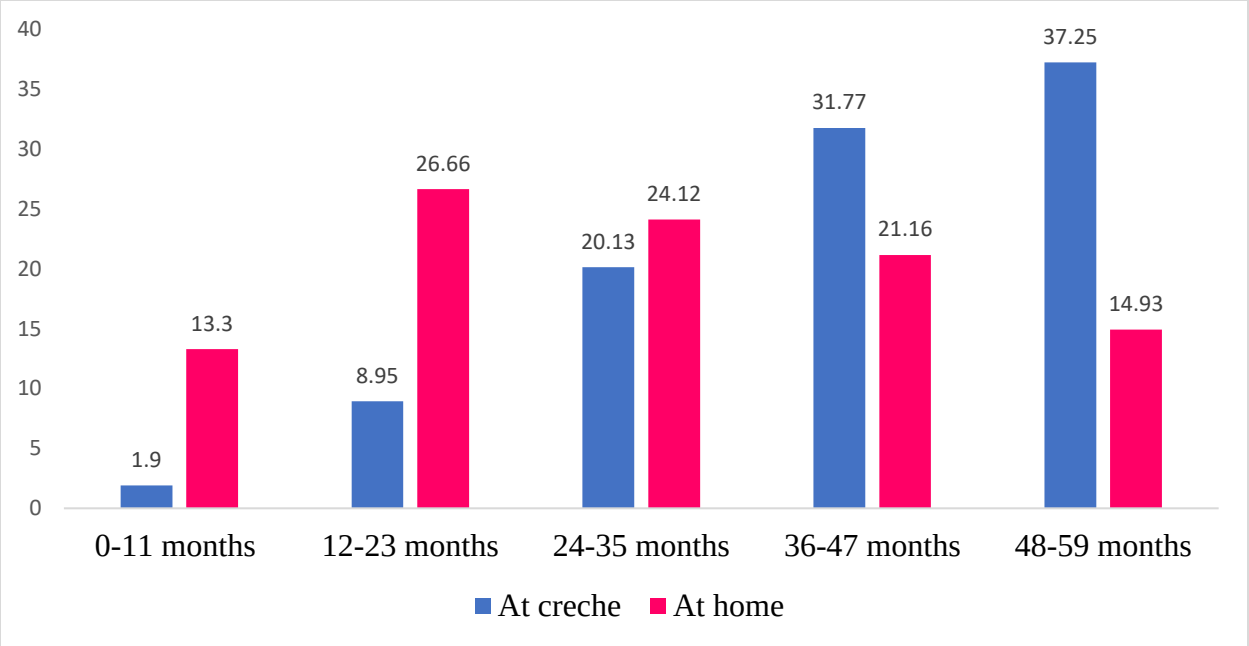


Figure 4. 3 Percentage distribution of children's ages in months and where they are cared for during the day.

Place of care during the day refers to different places where children are cared for daily. Figure 4.4. below presents the percentage distribution of place of care by sex. Overall, the table shows that a nearly equal distribution of males and females were cared for during the day. There is a slightly higher percentage of males cared for in Gr R/1 and creche/day mom, while a slightly higher percentage of females were cared for at home.

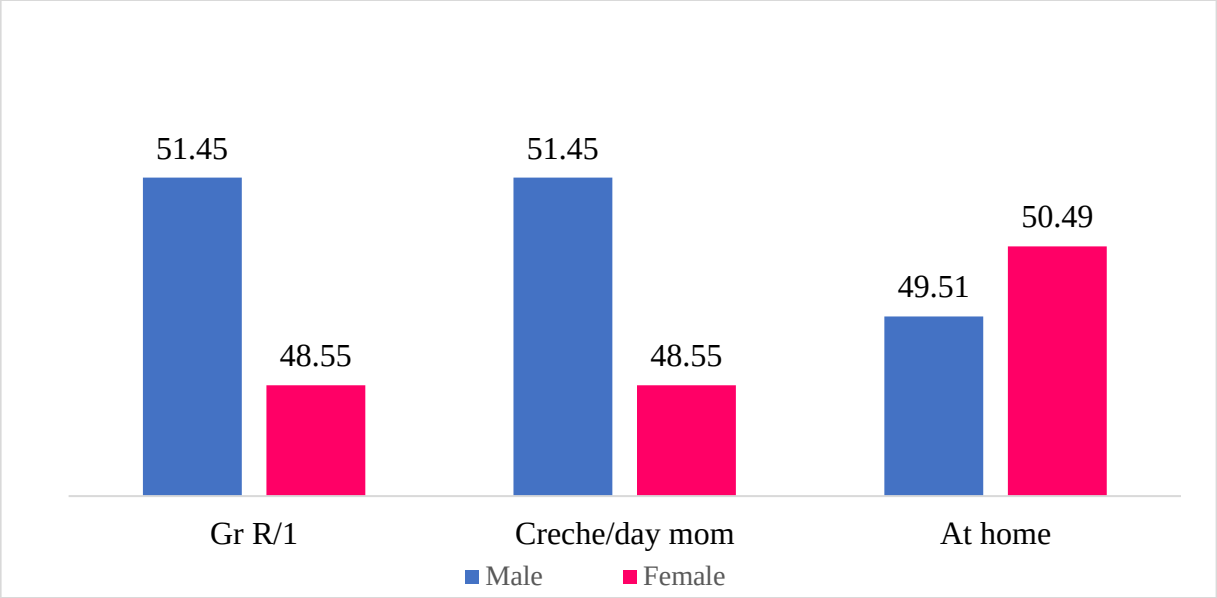


Figure 4. 4 Percentage distribution of children's sex and where they are cared for during the day.

Figure 4.5 presents the indicators of childhood malnutrition. The highest prevalence among children was for stunting at 22.16%, followed by overweight at 16.4%. Conversely, underweight had the lowest prevalence at 5.04%.

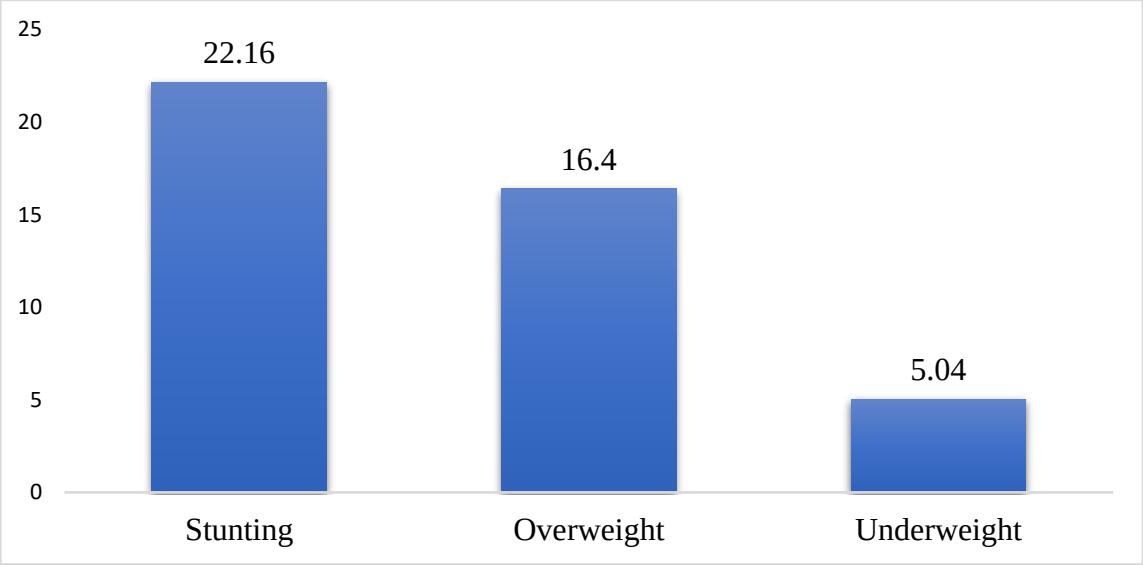


Figure 4. 5 Percentage distribution of the indicators of childhood malnutrition

Figure 4.6, shown below, showcases nutritional indicators classified into categories of stunting, overweight, and underweight, along with the respective percentages within each category. The corresponding table reveals that most children in this dataset do not exhibit signs of stunting (77.94%), overweight (83.77%), or underweight (94.98%). In terms of the severity of childhood malnutrition, stunting has the highest prevalence (7.02%), followed by obesity (6.30%) and underweight (1.65%).

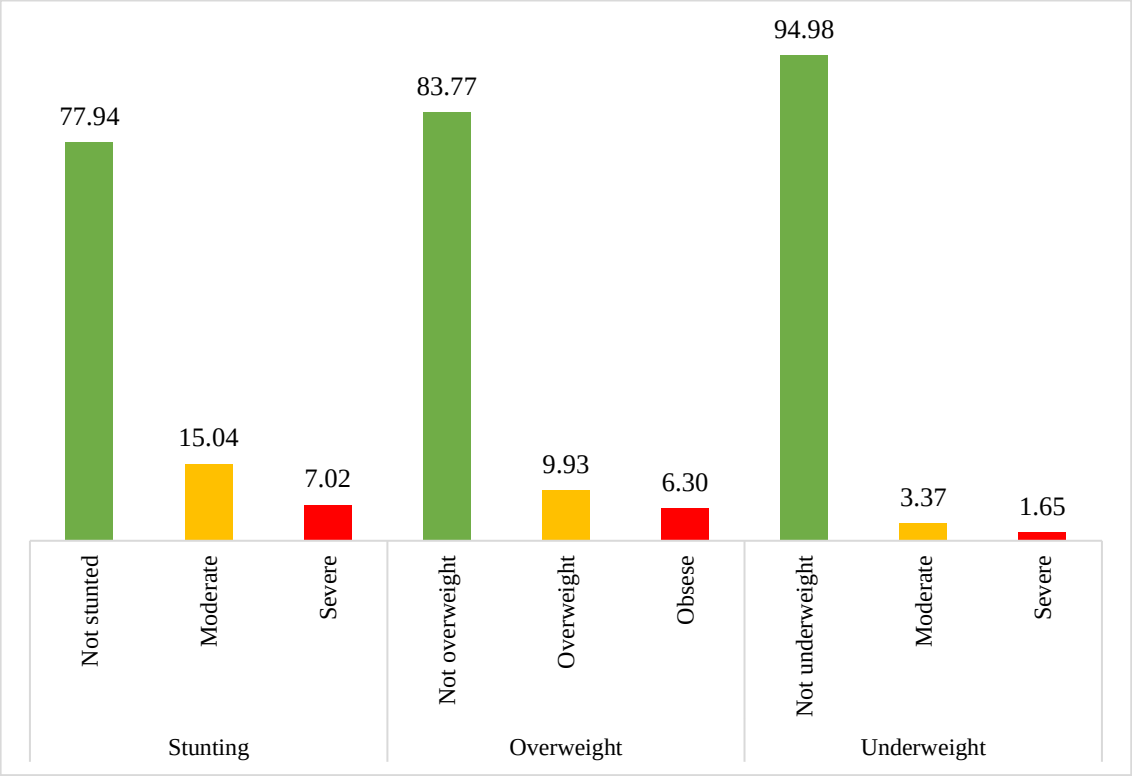


Figure 4. 6 Percentage distribution of the indicators of childhood malnutrition by severity

Table 4.2 below presents an analysis of 2,966 mothers. The findings show that almost half of the caregivers (42.22%) are unemployed, and most of them (57.78%) are single or divorced

(73.87%). The largest age group (28.55%) falls between 40-49 years old. In terms of religious affiliation, most caregivers identify as Christian (85.71%), and a significant proportion (51.35%) identify as Nguni. When it comes to family size, over two-thirds of caregivers (65.34%) had 1-2 children, indicating that many caregivers started their families at a young age. Specifically, 45.18% had their first child between 12-19 years old. Additionally, only 10.02% of caregivers had access to medical aid, and a significant majority (94.23%) experience depressive symptoms.

Table 4. 2 Weighted percentage distribution of the caregivers' characteristics.

Caregiver characteristics	N= 2 966	
	Frequency (weighted)	**Percentage**
Maternal age		
15-24	497	16.74
25-29	604	20.36
30-34	602	20.28
35-39	417	14.06
40-49	847	28.55
Marital status		
Married/living together with partner	775	26.13
single/divorced	2,191	73.87
Religion		
No religion	176	5.92
Christianity	2542	85.71
Other religions	248	8.37
Ethnicity		
English and Afrikaans	583	19.67
Tsonga and others	120	4.05
Sotho	739	24.92
Nguni	1523	51.35
Caregiver's age at first birth	**N=2,927**	
12-19	1322	45.18
20-24	1195	40.84
25-30	333	11.39
31-43	76	2.59
Children ever born		
1 child	1,093	36.86
2 children	845	28.48
3 Children	564	19.02

4 children	239	8.07
5+ children	225	7.58
Caregiver medical aid		
Yes	297.13	10.02
No	2,669	89.98
Employment		
Employed	1,252	42.22
Unemployed	1,714	57.78
Current activity		
Student/ Volunteer	207	6.97
Ill/homemaker	374	12.61
Unemployed-active	682	22.98
Unemployed - discouraged	452	15.23
Employed	1252	42.22
Depressive symptoms		
None	171	5.77
Depressive symptoms	2,795	94.23
Education level		
No schooling	81	2.74
Primary schooling	337	11.35
Secondary education	1850	62.37
Tertiary education	698	23.54

Table 4.3 below presents an analysis of the household level characteristics. Almost half (48.34%) of the households had 1-2 people living in them. Most households belong to low-income (49.21%) or middle-income (48.08%) categories. More than half (55.3%) of these households' face food insecurity, and their spending tends to be on the lower end, with almost a third (27.81%) spending less than R800 monthly on food. The housing conditions raise concerns, as over a fifth of households (21.7%) live in one-room dwellings, and a significant portion (28.76%) share toilet facilities. While the majority had access to electricity (90.48%) and piped water (80.61%), some (17.95%) live in dilapidated dwellings. It is noteworthy that two-thirds (67.41%) of these households had experienced housebreak-ins. Geographically, the distribution of households is as follows: rural (33.12%), urban formal (58.76%), and urban informal (8.13%).

Gauteng has the highest representation (29.04%) compared to Free State (4.42%) and Northern Cape (2.26%).

Table 4. 3 Weighted percentage distribution of household level characteristics in South Africa, NIDS wave 5 (2017)

Household characteristics	N= 2 966	
	Frequency (weighted)	**Percentage**
Household size	**N= 2 966**	
1-2 people	1,434	48.34
3-4 people	835	28.17
5-6 people	438	14.76
7+ people	259	8.72
Socio-economic income	**N= 2 966**	
Low income	1,459	49.21
Middle income	1,426	48.08
high income	81	2.71
Food availability	**N=2 953**	
Yes	1,320	44.7
No	1,633	55.3
Food spending	**N=2, 888**	
less than R800	803	27.81
R800-R1100	703	24.33
R1200-R1900	608	21.05
R2000-R2900	368	12.74
R3000+	407	14.08
No. of rooms	**N=2964**	
1 room	643	21.70
2-3 rooms	775	26.14
4-5 rooms	853	28.79
6+ rooms	693	23.38
Electricity	**N=2964**	
Yes	2,682	90.48
No	282	9.52
Water sources	**N=2964**	
Other water sources	186	6.27
public tap	389	13.12

piped water at home	2389	80.61
Toilet Type	**N=2964**	
None/bucket	102	3.44
chemical/Pit-latrine	851	28.72
flush toilet	2011	67.84
Toilet sharing	**N=2 883**	
Yes	829	28.76
No	2054	71.24
Media access	**N=2 962**	
Yes	1,467	49.53
No	1,495	50.47
Dwelling unit status	**N=2966**	
Dilapidated	532	17.95
Needs maintenance	633	21.35
Structurally sound	1800	60.70
Type of dwelling unit	**N=2964**	
Brick/traditional house	1,983	66.91
Flats/townhouse	254	8.57
Backroom/informal	727	24.52
Safety	**N=2964**	
No break-ins	384	12.96
Housebreak-ins sometimes	582	19.63
Housebreak-ins	1998	67.41
Type of residence	**N=2966**	
Rural	982	33.12
Urban formal	1743	58.76
Urban informal	241	8.13
Province	**N=2966**	
Western Cape	358	12.06
Eastern Cape	327	11.02
Northern Cape	67	2.26
Free State	131	4.42
KwaZulu Natal	494	16.66
North West	183	6.16
Gauteng	872	29.41
Mpumalanga	268	9.05
Limpopo	265	8.95

4.1.2 Demographic profile of participants from qualitative interviews

Table 4.4 below presents the demographic profile of participants interviewed in the qualitative interviews. The table provides information on the demographic characteristics and socioeconomic statuses of 49 participants, including their age, ethnicity, marital status, employment status, type of residence, education level, number of children, and familial support dynamics. Notably, the participants' ages range from 19 to 51 years old, with a diverse representation of ethnicities such as Pedi, Sotho, Tswana, Xhosa, and Zulu. Most participants are not married (67.35%), and a majority reside in urban areas (61.22%). Educational attainment varies among participants, with a significant portion having completed Grade 12 (46.94%), followed by incomplete secondary education (34.69%) and higher education (8.16%). Additionally, participants are primarily unemployed (63.27%), with a notable proportion being self-employed (16.33%) or employed (18.37%).

Regarding family dynamics, the distribution of children per participant ranges from 1 to 8, with a considerable proportion having 1-2 children (65.3%). The majority of participants report that the father of the child is alive (93.88%). There are variations in familial support dynamics, as over half of the participants (55.1%) report that they do not receive support from the father for their child, while only 40.82% receive financial support and 4.08% receive support sometimes.

Table 4. 4 Demographic profile of participants in GaMasemola and Thulani, South Africa (2022)

Participant Number	Age	Ethnicity	Marital status	Employment Status	Type of residence	Education	Number of children	Father alive	Father supports the child
Participant 1	46	Pedi	Married	Unemployed	Rural	No education	2	Yes	No
Participant 2	49	Pedi	Married	Employed	Rural	Higher education	3	Yes	Yes
Participant 3	44	Pedi	Married	Employed	Rural	Grade 11	4	Yes	Yes
Participant 4	44	Pedi	Married	Self-employed	Rural	Grade 12	2	Yes	Yes
Participant 5	48	Pedi	Married	Self-employed	Rural	Grade 10	8	No	Yes
Participant 6	47	Pedi	Married	Employed	Rural	Grade 12	2	Yes	Yes
Participant 7	22	Pedi	Not married	Unemployed	Rural	Grade 10	1	Yes	Yes
Participant 8	38	Pedi	Married	Unemployed	Rural	Grade 12	3	Yes	No
Participant 9	23	Sotho	Not married	Unemployed	Rural	Grade 12	1	Yes	No
Participant 10	40	Pedi	Not married	Unemployed	Rural	Grade 9	3	Yes	No
Participant 11	22	Tswana	Not married	Unemployed	Rural	Grade 12	1	Yes	No
Participant 12	30	Tswana	Not married	Unemployed	Rural	Grade 12	2	Yes	No
Participant 13	32	Tswana	Not married	Unemployed	Rural	Grade 12	2	Yes	Yes
Participant 14	29	Tswana	Not married	Employed	Rural	Grade 12	3	Yes	Yes
Participant 15	42	Pedi	Married	Unemployed	Rural	Grade 6	4	Yes	Yes
Participant 16	32	Pedi	Not married	Unemployed	Rural	Grade 11	2	Yes	Yes
Participant 17	32	Pedi	Not married	Unemployed	Rural	Grade 11	2	Yes	No
Participant 18	20	Pedi	Not married	Unemployed	Rural	Higher education	2	Yes	Sometimes
Participant 19	45	Pedi	Married	Unemployed	Rural	Grade 7	3	Yes	No
Participant 20	51	Xhosa	Married	Self-employed	Urban	Grade 12	4	Yes	Yes
Participant 21	50	Xhosa	Married	Self-employed	Urban	Grade 12	3	Yes	No
Participant 22	28	Xhosa	Not married	Employed	Urban	Higher education	1	Yes	Yes
Participant 23	23	Zulu	Not married	Unemployed	Urban	Grade 12	2	Yes	Sometimes
Participant 24	42	Zulu	Married	Self-employed	Urban	Grade 3	6	Yes	Yes
Participant 25	26	Zulu	Not married	Employed	Urban	Grade 12	1	Yes	No
Participant 26	23	Zulu	Not married	Employed	Urban	Higher education	1	Yes	No

Participant 27	32	Zulu	Not married	Unemployed	Urban	Grade 12	1	Yes	No
Participant 28	24	Zulu	Not married	Unemployed	Urban	Grade 12	1	Yes	No
Participant 29	21	Zulu	Not married	Employed	Urban	Grade 12	1	Yes	No
Participant 30	23	Zulu	Not married	Learnership	Urban	Grade 12	1	Yes	No
Participant 31	20	Zulu	Not married	Self-employed	Urban	Grade 10	1	No	No
Participant 32	30	Zulu	Not married	Unemployed	Urban	Grade 11	2	Yes	No
Participant 33	20	Xhosa	Not married	Unemployed	Urban	Grade 11	2	Yes	No
Participant 34	33	Tswana	Not married	Unemployed	Urban	Grade 10	2	Yes	Yes
Participant 35	42	Zulu	Divorced	Self-employed	Urban	Grade 12	4	Yes	No
Participant 36	26	Zulu	Not married	Unemployed	Urban	Grade 11	2	Yes	No
Participant 37	30	Zulu	Married	Unemployed	Urban	Grade 11	4	Yes	Yes
Participant 38	26	Zulu	Not married	Unemployed	Urban	Grade 11	2	Yes	No
Participant 39	23	Zulu	Not married	Unemployed	Urban	Grade 12	1	Yes	No
Participant 40	26	Xhosa	Not married	Unemployed	Urban	Grade 12	1	Yes	No
Participant 41	23	Tswana	Not married	Unemployed	Urban	Grade 12	1	No	No
Participant 42	19	Tswana	Not married	Unemployed	Urban	Grade 10	1	Yes	No
Participant 43	32	Zulu	Married	Unemployed	Urban	Grade 11	3	Yes	Yes
Participant 44	38	Zulu	Not married	Unemployed	Urban	Grade 11	3	Yes	Yes
Participant 45	23	Zulu	Not married	Unemployed	Urban	Grade 12	1	Yes	No
Participant 46	25	Zulu	Not married	Employed	Urban	Grade 12	1	Yes	No
Participant 47	33	Xhosa	Not married	Unemployed	Urban	Grade 10	4	Yes	Yes
Participant 48	39	Sotho	Not married	Self-employed	Urban	Grade 12	3	Yes	Yes
Participant 49	29	Ndau	Married	Unemployed	Urban	No education	2	Yes	Yes

4.1.3 Summary of Section

This section presents the percentage distributions of characteristics at the individual child, caregiver, and household levels. In 2022 the national prevalence of stunting in South Africa was 28.8%, underweight was 7.7% and overweight was 22.6%. These indicators increased from 2016, where stunting was 27.4%, underweight 6% and overweight 13.3% (Slemming et al., 2024).

The study found a slightly higher proportion of male children compared to females, which is consistent with previous studies (Grech & Mamo, 2020). The majority of the sampled children were Africans. Hospital deliveries were the most common, and more than half of the children had a normal birth weight. However, the majority of the children were not covered by medical aid. Nearly 70% of all children were cared for at home during the day. In addition to the primary caregiver, who is often the mother, other parents (father), grandparents, relatives, and non-family members provided alternative care to the child.

Regarding the mothers, the majority were aged 40-49 (28.55%) and were single or divorced (73.87%). Many of the mothers had their first child as teenagers (45.19%). In South Africa, statistics show that 1 in 4 girls become pregnant as teenagers, and during COVID-19, this distribution increased by a sharp 60% in provinces such as Gauteng (Barron et al., 2022). The study found that 62.37% of caregivers had secondary education. Nearly 60% of caregivers were unemployed, with 22.98% actively seeking employment. This study also found high levels of depressive symptoms among caregivers (94.23%).

Most households consisted of 1-2 people and had a perceived low socioeconomic income level. Most households spent less than R800 ($42) per month on food. It was common for households to electricity and piped water. However, nearly 30% of households still used pit-latrine toilets and shared toilets. Some households also faced structural issues, with dilapidating conditions. Among other issues observed by households were high crime rates, with nearly 70%

of households affected by house break-ins. Most households were in urban formal settings (58.76%), with representation from Gauteng (29.41%), KwaZulu Natal (16.66%), and the Western Cape (12.06%) provinces.

Section 2: Bivariate results and relevant qualitative findings

4.2.0 Introduction

This section presents the bivariate results and relevant qualitative findings. The explanatory, sequential mixed methods design adopted in this study allows for additional insights and explanations to be provided through quotes from qualitative in-depth interviews and focus group discussions. This helps to bridge the gap and address the issues that the quantitative results alone may not cover. Therefore, this section provides a comprehensive examination of the distribution, levels, and patterns of childhood malnutrition in South Africa, shedding light on this important and persistent public health challenge. The chapter draws on quantitative data from the 2017 National Income Dynamics study, wave 5, specifically focusing on the outcomes of child stunting, overweight, and underweight. To deepen understanding of the social context of childhood malnutrition in the study locations, a rigorous interpretation of the study findings is provided, incorporating evidence from the qualitative data.

4.2.1 Levels of childhood malnutrition in South Africa

Table 4. 5 Weighted percentage distribution of child malnutrition characteristics in South Africa, NIDS wave 5 (2017)

Nutritional Status	N= 2 966	
	Frequency (weighted)	**Percentage**
Child stunting		
Not stunted	2,309	77.84
Stunted	657	22.16
Child overweight		
Not overweight	2,479	83.60
overweight	487	16.40
Child underweight		
Not underweight	2,816	94.96
Underweight	150	5.04

Table 4.5 presents the prevalence of childhood malnutrition in South Africa. Most children were found to be stunted (22.16%), followed by overweight (16.40%), while only 5.04% were underweight.

However, the qualitative study revealed a lack of understanding among most participants regarding the concept of childhood malnutrition. When asked about their perception of a child's weight and height, many participants did not recognize any issues with a child being too thin, short, or overweight. Some participants attributed these characteristics to genetics, while others associated weight and stature with religious beliefs. Mothers who strongly identified as Christians believed that God had created their children with their specific weight and height. As expressed by two community women.

"If the child is too short, too tall, or overweight, I think that is how God created them. We should not try and change his purpose. Also, sometimes you must also look at other people in the family, you will see that the child looks like them. It's genetic, we can't do anything about that."

(KII/Female, 25 years, Thulani)

"Some are born thin, and some are born with a bit of weight. But from my side, my children are not born thin, they are big. Even when they grow and can-do things by themselves, they are still big. Yes, but my daughter is slim even though she is not sick. Sometimes children take their body stature from their parents or their forefathers."

(KII/Female, 45 years, GaMasemola)

Only a few participants from qualitative study attributed overweight and underweight among children as risk factors for adverse health outcomes. Some caregivers believed that children who were overweight were more at risk of childhood illnesses compared to children who were underweight, and they attributed weight gain among children to being overfed or to eating too much of the wrong foods.

4.2.2 Bivariate analysis - Patterns of childhood malnutrition in South Africa

In Table 4.6, the findings show that a slightly higher proportion of males (23.70%) were affected by stunting compared to females. The age of the child was found to be significantly associated with childhood malnutrition. The occurrence of stunting varied across different age groups, with the highest prevalence observed among children aged 12-23 months (33.43%), followed by those aged 24-35 months and 36-47 months (19.25%). Stunting was most common among children with the lowest birth weight (30.07%). It is worth noting that Black African children and those of mixed race (coloured) exhibited the highest rates of stunting, especially among the Nguni and Sotho ethnic groups. Children who had been ill for at least 3 days in the past month had a higher likelihood of being stunted (24.60%), as did those who did not seek healthcare (29.92%). Moreover, children whose caregivers did not use healthcare due to time constraints or financial limitations had the highest levels of stunting (53.56%). Additionally, children who lacked medical aid and received the child support grant had a higher prevalence of stunting compared to

those with medical aid who were not recipients of the grant. This relationship was statistically significant. Lastly, children who were primarily cared for at home during the day and did not receive multiple forms of childcare from other relatives or parents had the highest rates of stunting.

Table 4. 6 Levels of child stunting and individual child characteristics in South Africa, NIDS wave 5 (2017)

Child characteristics	Stunting		
	Not stunted (n=2 309)	Stunted (n=657)	P-value (χ^2)
Sex			
Male	76.30	23.70	0.225 (4.1)
Female	79.39	20.61	
Age			
0-11 months	83.95	16.05	0.000 (71.2)
12-23 months	66.57	33.43	
24-35 months	74.92	25.08	
36-47 months	80.75	19.25	
48-59 months	83.69	16.31	
Birthweight			
1-2.9 kg	69.93	30.07	0.001 (45.2)
3 kg	81.88	18.12	
4-5 kg	83.91	16.09	
Race			
African	77.02	22.98	0.129 (7.7)
Coloured	77.90	22.10	
White/Indian/Asian	84.28	15.72	
Ethnicity			
English and Afrikaans	80.40	19.60	0.565 (5.2)
Tsonga and others	81.65	18.35	
Sotho	75.35	24.65	
Nguni	78.06	21.94	
Place of delivery			
Hospital	78.60	21.40	0.188 (7.0)
Clinic	72.86	27.14	
Home	71.51	28.49	
Disease episode			
No	78.17	21.83	0.496 (2.4)
Yes	75.38	24.62	
Health seeking			
Yes	77.74	22.26	0.280 (2.3)
No	70.08	29.92	
Reasons for no health-seeking			

No time or resources	46.44	53.56	0.506 (5.8)
Already on treatment	72.99	27.01	
Child not sick enough	75.85	24.15	
Medical aid			
Yes	88.64	11.36	0.002 (14.9)
No	77.01	22.99	
Child support grant			
No	82.74	17.26	0.029 (10.0)
yes	76.66	23.34	
Child day care			
Gr R/1	85.71	14.29	0.005 (28.8)
Crèche/day mom	82.92	17.08	
at home	75.02	24.98	
Multiple Forms of Childcare			
Parent	77.84	22.16	0.768 (2.8)
Grandparents	79.11	20.89	
relatives/non-familial	80.12	19.88	
no other carer	76.33	23.67	

Table 4.7 presents the prevalence of stunting based on caregiver characteristics. The study found that the highest percentage of stunted children was among women aged 40-49 (24.91%), followed by women aged 30-34 and those aged 15-24 years (22.12%). Caregivers who practised religions other than Christianity had the highest proportion of stunted children (29.02%). In terms of ethnicity, Nguni mothers had the highestdistribution of stunted children. Teenage mothers had the highest proportion of stunted children for their first birth (23.67%), and mothers with more than 5 children had a higher proportion of stunted children (27.23%). Among occupation categories, mothers who were students or volunteers had the highest percentage of stunted children (29.39%), followed by unemployed and discouraged mothers (22.04%). Mothers with the highest levels of depressive symptoms had a higher proportion of stunted children (22.21%), compared to mothers without depressive symptoms (22.21%). Lastly, mothers with no schooling had the highest distribution of stunted children (34.33%), while those with secondary education (21.05%) and tertiary education (23.21%) had lower proportions.

Table 4. 7 Levels of child stunting and caregiver level characteristics in South Africa, NIDS wave 5 (2017)

Mother's characteristics	Stunting		
	Not stunted (n=2 309)	**Stunted (n=657)**	**P-value (χ^2)**
Maternal age			
15-24	77.88	22.12	0.361 (11.3)
25-29	78.43	21.57	
30-34	77.26	22.74	
35-39	83.36	16.64	
40-49	75.09	24.91	
Marital status			
Married/living together with partner	77.25	22.75	0.786 (0.21)
Single/divorced	78.05	21.95	
Religion			
No religion	74.72	25.28	0.213 (8.9)
Christianity	78.72	21.28	
Other religions	70.98	29.02	
Ethnicity			
English and Afrikaans	79.11	20.89	0.703 (3.5)
Tsonga and others	80.78	19.22	
Sotho	79.17	20.83	
Nguni	76.48	23.52	
Caregiver's age at first birth			
12-19	76.33	23.67	0.510 (4.8)
20-24	78.37	21.63	
25-30	79.41	20.59	
31-43	85.18	14.82	
Children Ever born			
1 child	76.37	23.63	0.233 (13.8)
2 children	79.55	20.45	
3 Children	77.05	22.95	
4 children	85.16	14.84	
5+ children	72.77	27.23	
Caregiver medical aid			
Yes	82.82	17.18	0.164 (4.8)
No	77.28	22.72	
Employment			
Employed	77.3	22.70	0.716 (0.4)
Unemployed	78.23	21.77	
Current activity			
Student/ other volunteer	70.61	29.39	0.535 (9.0)
Ill/homemaker	79.48	20.52	
Unemployed-active	80.03	19.97	

Unemployed-discouraged	77.96	22.04	
Employed	77.30	22.70	
Depressive symptoms			
None	78.58	21.42	0.840 (0.1)
Depressive symptoms	77.79	22.21	
Education level			
No schooling	65.67	34.33	0.318 (9.0)
Primary schooling	76.83	23.17	
Secondary education	78.95	21.05	
Tertiary education	76.79	23.21	

Table 4.8 presents the relationship between various household characteristics and stunting. Chi-square tests were used to assess associations. The results indicate that there is no significant association between stunting and household size (p = 0.434), socio-economic income (p = 0.369), food availability (p = 0.344), number of rooms (p = 0.302), electricity access (p = 0.106), water sources (p = 0.815), toilet type (p = 0.808), toilet sharing (p = 0.336), media access (p = 0.122), dwelling unit status (p = 0.432), type of dwelling unit (p = 0.489), safety (p = 0.749), province (p = 0.968), and type of residence (p = 0.129). However, there is a weak association with food spending (p = 0.057). Stunting rates remained relatively consistent across different levels of these household characteristics, suggesting that factors beyond those examined in this analysis may play a more significant role in influencing stunting prevalence.

Table 4. 8 Levels of child stunting and household level characteristics in South Africa, NIDS Wave 5 (2017)

	Stunting		
Household characteristics	**Not stunted (n=2 309)**	**Stunted (n=657)**	**P-value (χ^2)**
Household size			
1-2 people	77.83	22.17	0.434 (6.6)
3-4 people	78.19	21.81	
5-6 people	80.53	19.47	
7+ people	72.24	27.76	
Socio-economic income			
Low income	79.13	20.87	0.369 (4.7)
Middle income	76.94	23.06	
high income	70.33	29.67	
Food availability			

Yes	76.24	23.76	0.344 (24.5)
No	78.74	21.26	
Food spending			
less than R800	79.88	20.12	0.057 (2.5)
R800-R1100	75.92	24.08	
R1200-R1900	83.96	16.04	
R2000-R2900	76.02	23.98	
R3000+	72.34	27.66	
No. of rooms			
1 room	78.89	21.11	0.3021 (10.2)
2-3 rooms	79.02	20.98	
4-5 rooms	79.48	20.52	
6+ rooms	73.43	26.57	
Electricity			
Yes	77.29	22.71	0.106 (4.5)
No	82.83	17.17	
Water sources			
Other water sources	78.89	21.11	0.815 (0.8)
Public tap	79.31	20.69	
Piped water at home	77.49	22.51	
Toilet Type			
None/bucket	79.99	20.01	0.808 (1.0)
Chemical/Pit-latrine	76.75	23.25	
Flush toilet	78.16	21.84	
Toilet sharing			
Yes	79.58	20.42	0.336 (2.8)
No	76.71	23.29	
Media access			
Yes	79.73	20.27	0.122 (6.2)
No	75.92	24.08	
Dwelling unit status			
Dilapidated	81.17	18.83	0.432 (4.3)
Needs maintenance	76.75	23.25	
Structurally sound	77.24	22.76	
Type of dwelling unit			
Brick/traditional house	76.93	23.07	0.489 (3.9)
Flats/townhouse	77.23	22.77	
Backroom/informal	80.44	19.56	
Safety			
No break-ins	78.03	21.97	0.749 (1.4)
Housebreak-ins sometimes	76.00	24.00	
Housebreak-ins	78.31	21.69	
Type of residence			
Rural	78.27	21.73	0.129 (9.3)
Urban formal	76.58	23.42	
Urban informal	85.20	14.80	
Province			

Western Cape	76.57	23.43	
Eastern Cape	79.50	20.50	
Northern Cape	74.68	25.32	
Free State	76.17	23.83	
KwaZulu Natal	78.40	21.60	0.968 (5.2)
North West	82.20	17.80	
Gauteng	78.27	21.73	
Mpumalanga	74.99	25.01	
Limpopo	76.53	23.47	

Table 4.9 below presents the analysis which examined the relationship between various child characteristics and overweight status using chi-square tests. Results indicate a significant association between age and overweight status ($p < 0.001$), with overweight rates varying significantly across different age groups, peaking in younger age categories (0-11 months: 22.26%, 12-23 months: 32.69%, 24-35 months: 20.29%). Ethnicity also shows a significant association with overweight status ($p = 0.017$), indicating variations in overweight rates among different ethnic groups (English and Afrikaans: 9.74%, Tsonga and others: 7.89%, Sotho: 18.01%, Nguni: 17.89%). Additionally, reasons for not seeking health care exhibit a weak s association with overweight status ($p = 0.063$), particularly with higher overweight rates observed among children whose caregivers cite "child is already on treatment (25.77%) and child not sick enough (18.38%)" as the reason. Furthermore, the type of child day care demonstrates a significant association with overweight status ($p = 0.002$), with children cared for at home during the day exhibiting higher overweight rates (18.99%) compared to other types of day care. However, factors such as sex, birthweight, race, place of delivery, disease episode, health seeking behaviour, medical aid, child support grant, and multiple forms of childcare do not show significant associations with overweight status. These findings suggest that age, ethnicity, reasons for no health-seeking, and type of child day care are important factors associated with overweight status among children.

Table 4. 9 Levels of child overweight and individual child characteristics in South Africa, NIDS Wave 5 (2017)

Child characteristics	Overweight		
	Not overweight (n=2 479)	**overweight (n=487)**	**P-value (χ^2)**
Sex			
Male	83.16	16.84	
Female	84.04	15.96	0.698 (0.4)
Age			
0-11 months	77.74	22.26	
12-23 months	67.31	32.69	
24-35 months	79.71	20.29	0.000 (223)
36-47 months	91.37	8.63	
48-59 months	94.38	5.62	
Birthweight			
1-2 kg	84.24	15.76	
3 kg	81.61	18.39	0.362 (5.9)
4-5 kg	75.67	24.33	
Race			
African	83.13	16.87	
Coloured	84.89	15.11	0.675 (1.6)
White/Indian/Asian	85.45	14.55	
Ethnicity			
English and Afrikaans	90.26	9.74	
Tsonga and others	92.11	7.89	0.017 (23.3)
Sotho	81.99	18.01	
Nguni	82.11	17.89	
Place of delivery			
Hospital	82.93	17.07	
Clinic	89.53	10.47	0.122 (8.2)
Home	83.93	16.07	
Disease episode			
No	83.40	16.60	0.651 (0.6)
Yes	84.99	15.01	
Health seeking			
Yes	85.81	14.19	0.668 (0.4)
No	83.15	16.85	
Reasons for no health-seeking			
No time or resources	98.7	1.30	
Already on treatment	74.23	25.77	0.063 (4.3)
Child not sick enough	81.62	18.38	
Medical aid			
Yes	83.11	16.89	0.878 (3.8)
No	83.61	16.39	

Child support grant			
No	83.71	16.29	0.951 (2.6)
yes	83.57	16.43	
Child day care			
Gr R/1	94.21	5.79	0.002 (36.3)
Crèche/day mom	87.12	12.88	
at home	81.01	18.99	
Multiple Forms of Childcare			
Parent	83.65	16.35	0.539 (5.7)
Grandparents	86.03	13.97	
Relatives/non-familial	79.97	20.03	
No other carer	83.22	16.78	

Table 4.10 below presents the relationship between various maternal characteristics and the overweight status of the child, which was assessed using chi-square tests. The results indicate that most maternal characteristics, such as maternal age, marital status, ethnicity, caregiver's age at first birth, number of children ever born, caregiver medical aid, employment status, current activity, depressive symptoms, and education level, are not significantly associated with children being overweight. Although not statistically significant, there is a trend suggesting a slight increase in the prevalence of overweight children as mothers' age increases (30-34 years: 22.74%, 40-49 years: 24.91%). Furthermore, although not statistically significant, the data suggests that mothers with more children (5+ children) had the highest prevalence of overweight children (27.23%) compared to mothers with 2 or 3 children (20.45% and 22.95%) respectively. While not statistically significant, mothers who are students/volunteers seem to have a slightly higher prevalence of overweight children (29.39%) compared to those employed (22.70%) or engaged in other activities such as being ill/homemakers (20.52%). However, a significant association was found between religion and child overweight status, with mothers who identified as Christians (21.28%) having a significantly lower prevalence of overweight children compared to those with no religious affiliation (25.28%) or those belonging to other religious groups (29.0%) ($p = 0.007$). These findings suggest that religion may influence the overweight status of mothers, but further investigation is needed to understand the underlying factors contributing to this association.

Overall, while certain maternal characteristics may be linked to overweight status, most of the variables analysed in the study do not show significant associations. This emphasizes the complexity of the factors influencing overweight among mothers.

Table 4. 10 Levels of child overweight and mother characteristics

Mother's characteristics	Overweight		
	Not overweight (n=2 479)	**overweight (n=487)**	**P-value (χ^2)**
Maternal age			
15-24	85.95	14.05	0.463 (9.2)
25-29	84.55	15.45	
30-34	85.48	14.52	
35-39	82.32	17.68	
40-49	80.82	19.18	
Marital status			
Married/living together with partner	83.70	16.30	0.957 (0.1)
Single/divorced	83.56	16.44	
Religion			
No religion	88.45	11.55	0.007 (25.6)
Christianity	84.33	15.67	
Other religions	72.67	27.33	
Ethnicity			
English and Afrikaans	82.36	17.64	0.162 (12.2)
Tsonga and others	85.51	14.49	
Sotho	79.91	20.09	
Nguni	85.70	14.30	
Caregiver's age at first birth			
12-19	84.9	15.1	0.689 (3.4)
20-24	82.22	17.78	
25-30	84.29	15.71	
31-43	83.46	16.54	
Children ever born			
1 child	82.61	17.39	0.883 (3.0)
2 children	83.62	16.38	
3 Children	83.84	16.16	
4 children	87.15	12.85	
5+ children	83.88	16.12	
Caregiver medical aid			
Yes	83.16	16.84	0.902 (0.1)
No	83.64	16.36	

Employment			
Employed	82.42	17.58	0.373 (2.2)
Unemployed	84.45	15.55	
Current activity			
Student/ other volunteer	79.61	20.39	0.621 (7.1)
Ill/homemaker	84.45	15.55	
Unemployed-active	84.56	15.44	
Unemployed discouraged	86.50	13.50	
Employed	82.42	17.58	
Depressive symptoms			
None	81.05	18.95	0.497 (7.2)
Depressive symptoms	83.75	16.25	
Education level			
No schooling	87.77	12.23	0.339 (0.9)
Primary schooling	88.04	11.96	
Secondary education	83.14	16.86	
Tertiary education	82.17	17.83	

Table 10.11 presents the association between various household characteristics and child overweight status, alongside corresponding percentages and p-values from chi-square tests. Findings indicate that most household characteristics, including household size, food availability, food spending, number of rooms, electricity access, water sources, toilet type, toilet sharing, media access, dwelling unit status, safety, type of residence, and province, are not significantly associated with child overweight status (all p-values > 0.05). Overweight rates ranged from 11.21% to 21.43% across different provinces but did not show significant variations based on other household characteristics. However, the proportion of overweight children is similar across households with different sizes (1-2 people: 16.46% and 3-4 people: 16.38%). Notably, socio-economic income demonstrated a trend of higher overweight rates among high-income households (24.04%) compared to low (14.62) and middle-income (17.80%) households (p = 0.165), although this association was not statistically significant. While not statistically significant, there's a suggestive trend showing that households spending less than R800 -R1100 monthly on food might have a slightly higher prevalence of overweight children (19.16%) compared to those spending slightly more (R1 200 – R1 900) (11.93%).

Table 4. 11 Levels of child overweight and household characteristics

Household characteristics	Overweight		
	Not overweight (n=2 479)	**overweight (n=487)**	**P-value (χ^2)**
Household size			
1-2 people	83.54	16.46	0.371 (6.7)
3-4 people	83.62	16.38	
5-6 people	80.88	19.12	
7+ people	88.4	11.6	
Socio-economic income			
Low income	85.38	14.62	0.165 (8.9)
Middle income	82.20	17.80	
high income	75.96	24.04	
Food availability			
Yes	84.12	15.88	0.711 (16.0)
No	83.27	16.73	
Food spending			
less than R800	81.21	18.79	0.168 (0.4)
R800-R1100	80.84	19.16	
R1200-R1900	88.07	11.93	
R2000-R2900	84.47	15.53	
R3000+	83.88	16.12	
No. of rooms			
1 room	82.45	17.55	0.621 (4.9)
2-3 rooms	86.11	13.89	
4-5 rooms	82.92	17.08	
6+ rooms	82.62	17.38	
Electricity			
Yes	83.64	16.36	0.832 (0.8)
No	82.99	17.01	
Water sources			
Other water sources	87.29	12.71	0.521 (2.1)
Public tap	82.67	17.33	
Piped water at home	83.44	16.56	
Toilet Type			
None/bucket	81.3	18.7	0.439 (4.1)
Chemical/Pit-latrine	81.62	18.38	
Flush toilet	84.52	15.48	
Toilet sharing			
Yes	83.71	16.29	0.915 (0.1)
No	83.44	16.56	
Media access			
Yes	83.84	16.16	0.812 (0.05)
No	83.31	16.69	

Dwelling unit status			
Dilapidated	85.64	14.36	0.688 (0.2)
Needs maintenance	82.76	17.24	
Structurally sound	83.29	16.71	
Type of dwelling unit			
Brick/traditional house	83.19	16.81	0.578 (2.1)
Flats/townhouse	87.23	12.77	
Backroom/informal	83.36	16.64	
Safety			
No break-ins	84.08	15.92	0.632 (2.2)
Housebreak-ins sometimes	81.52	18.48	
Housebreak-ins	84.08	15.92	
Type of residence			
Rural	81.94	18.06	0.325 (5.2)
Urban formal	83.95	16.05	
Urban informal	87.79	12.21	
Province			
Western Cape	85.83	14.17	0.519 (17.8)
Eastern Cape	80.50	19.50	
Northern Cape	80.20	19.80	
Free State	80.56	19.44	
KwaZulu Natal	85.42	14.58	
North West	88.79	11.21	
Gauteng	84.93	15.07	
Mpumalanga	80.45	19.55	
Limpopo	78.57	21.43	

Table 4.12 presents associations between individual child characteristics and underweight status, revealing notable patterns. While no significant associations were found between sex (4.49% for males, 5.60% for females) and age groups (ranging from 3.40% to 6.90% across different age ranges) with underweight status, birthweight demonstrated a significant association (7.05% for 1-2 kg, 3.61% for 3 kg, and 1.02% for 4-5 kg). Ethnicity also showed a significant association, with underweight rates varying notably across groups (20.69% for Tsonga and others, 3.09% for Nguni). Moreover, a weak association was observed between place of delivery and underweight status (11.31% for home births, 4.99% for hospital births), indicating higher underweight rates among home-born children. Children attending Gr R/1 programs had a slightly higher prevalence of underweight (11.24%) compared to those cared for at creche/day mom

(2.98%). However, other characteristics such as race, disease episode, health-seeking behaviour, reasons for no health-seeking, medical aid, child support grant, and multiple forms of childcare did not exhibit significant associations with underweight status.

Table 4. 12 Levels of child underweight and individual child characteristics

Child characteristics	Underweight		
	Not underweight (n=2 816)	**Underweight (n=150)**	**P-value (χ^2)**
Sex			
Male	95.51	4.49	0.381 (10.7)
Female	94.40	5.60	
Age			
0-11 months	93.86	6.14	0.326 (1.9)
12-23 months	96.60	3.40	
24-35 months	95.83	4.17	
36-47 months	95.34	4.66	
48-59 months	93.10	6.90	
Birthweight			
1-2 kg	92.95	7.05	0.026 (16.9)
3 kg	96.39	3.61	
4-5 kg	98.99	1.02	
Race			
African	94.81	5.19	0.866 (0.5)
Coloured	95.66	4.34	
White/Indian/Asian	95.11	4.89	
Ethnicity			
English and Afrikaans	94.24	5.76	0.000 (70.7)
Tsonga and others	79.31	20.69	
Sotho	93.02	6.98	
Nguni	96.91	3.09	
Place of delivery			
Hospital	95.01	4.99	0.057 (8.3)
Clinic	96.36	3.64	
Home	88.69	11.31	
Disease episode			
No	94.95	5.05	0.964 (0.2)
Yes	95.02	4.98	
Health seeking			
Yes	95.09	4.91	0.336 (0.9)
No	94.86	5.14	
Reasons for no health-seeking			
No time or resources	100.00	0.00	0.272 (4.0)
Already on treatment	86.63	13.37	
Child not sick enough	96.07	3.93	
Medical aid			
Yes	97.30	2.70	0.144 (2.5)
No	94.78	5.22	
Child support grant			

No	95.93	4.07	
yes	94.72	5.28	0.448 (1.4)
Child day care			
Gr R/1	88.76	11.24	
Crèche/day mom	97.02	2.98	0.012 (26.0)
At home	94.96	5.04	
Multiple Forms of Childcare			
Parent	94.76	5.24	
Grandparents	95.00	5.00	
Relatives/non-familial	92.65	7.36	0.599 (5.4)
No other care	95.89	4.11	

Table 4.13 presents associations between various maternal characteristics and child underweight status, shedding light on potential factors influencing childhood undernutrition. While maternal age and marital status did not show significant associations with child underweight status, there was a notable trend suggesting higher rates of underweight among children of mothers aged 25-29 (8.44%) compared to other age groups. Similarly, although no significant association was found for religion overall, children of mothers with no religion exhibited slightly elevated underweight rates (10.59%) compared to Christian mothers (4.44%). However, ethnicity demonstrated a significant association, with notably lower underweight rates observed among children of Sotho mothers (2.15%) compared to Tsonga and others (7.30%). While not statistically significant, mothers who gave birth at a later age (31-43 years old) had significantly fewer underweight children (0.51%) compared to younger mothers (12-19 years old) 5.69%. While not statistically significant, mothers who are ill/homemakers had a slightly lower prevalence of underweight children (1.67%) compared to other categories like students/volunteers (4.64%), unemployed-active (6.30%), unemployed-discouraged (5.59%), and employed (5.24%). Conversely, no significant associations were found on the number of children ever born, caregiver medical aid, employment status, depressive symptoms, and education level. These findings underscore the intricate interplay of maternal characteristics in shaping child underweight status

and emphasize the importance of considering cultural and socio-demographic factors, particularly ethnicity, in addressing childhood undernutrition.

Table 4. 13 Levels of child underweight and mother characteristics

Mother's characteristics	Underweight		
	Not underweight (n=2 816)	**Underweight (n=150)**	**P-value (χ^2)**
Maternal age			
15-24	96.23	3.77	0.063 (20.3)
25-29	91.56	8.44	
30-34	95.14	4.86	
35-39	96.95	3.05	
40-49	95.52	4.48	
Marital status			
Married/living together with partner	96.09	3.91	0.243 (2.8)
Single/divorced	94.56	5.44	
Religion			
No religion	89.41	10.59	0.151 (15.7)
Christianity	95.56	4.44	
Other religions	92.76	7.24	
Ethnicity			
English and Afrikaans	94.75	5.25	0.024 (18.4)
Tsonga and others	92.70	7.30	
Sotho	97.85	2.15	
Nguni	93.81	6.19	
Caregiver's age at first birth			
12-19	94.31	5.69	0.331 (4.7)
20-24	95.04	4.96	
25-30	95.71	4.29	
31-43	99.49	0.51	
Children ever born			
1 child	95.38	4.62	0.818 (3.6)
2 children	94.75	5.25	
3 Children	93.62	6.38	
4 children	96.08	3.92	
5+ children	95.84	4.16	
Caregiver medical aid			
Yes	96.87	3.13	0.153 (2.5)
No	94.75	5.25	
Employment			
Employed	94.77	5.24	0.803 (0.2)
Unemployed	95.10	4.90	
Current activity			
Student/ Other volunteer	95.36	4.64	0.204 (11.6)

Ill/homemaker	98.33	1.67	
Unemployed-active	93.70	6.30	
Unemployed-discouraged	94.41	5.59	
Employed	94.77	5.24	
Depressive symptoms			
None	93.97	6.03	0.626 (0.7)
Depressive symptoms	95.02	4.98	
Education level			
No schooling	96.80	3.20	0.955 (0.4)
Primary schooling	94.90	5.10	
Secondary education	94.82	5.18	
Tertiary education	95.13	4.87	

Table 4.14 presents associations between various household characteristics and child underweight status, providing insights into potential factors influencing childhood undernutrition. Across different household sizes, income levels, food availability, and spending categories, no significant associations were found with child underweight status (all p-values > 0.05). Despite that, the proportion of underweight children is similar across households with different sizes (1-2 people: 5.06%, 7+ people: 4.17%) Similarly, household infrastructure indicators such as the number of rooms, presence of electricity, water sources, toilet type, toilet sharing, dwelling unit status, and type of dwelling unit did not exhibit significant associations with child underweight status (all p-values > 0.05). Underweight rates varied slightly across these household characteristics but did not show statistically significant patterns. Additionally, no significant associations were found between media access, safety measures, type of residence, province, and child underweight status (all p-values > 0.05).

Table 4. 14 Levels of child underweight and household characteristics

Household characteristics	**Underweight**		
	Not underweight (n=2 816)	**Underweight (n=150)**	**P-value (χ^2)**
Household size			
1-2 people	94.94	5.06	0.379 (5.0)
3-4 people	93.86	6.14	

5-6 people	96.6	3.4	
7+ people	95.83	4.17	
Socio-economic income			
Low income	95.35	4.65	0.624 (1.8)
Middle income	94.70	5.30	
high income	92.33	7.67	
Food availability			
Yes	95.32	4.69	0.61 (14.1)
No	94.70	5.30	
Food spending			
less than R800	95.72	4.27	0.184 (0.5)
R800-R1100	94.49	5.51	
R1200-R1900	96.32	3.68	
R2000-R2900	97.07	2.93	
R3000+	92.15	7.85	
No. of rooms			
1 room	94.49	5.51	0.404 (7.7)
2-3 rooms	94.89	5.11	
4-5 rooms	96.52	3.48	
6+ rooms	93.52	6.48	
Electricity			
Yes	94.89	5.12	0.704 (0.3)
No	95.60	4.40	
Water sources			
Other Water sources	95.83	4.17	0.855 (0.4)
Public tap	94.60	5.40	
Piped water at home	94.94	5.06	
Toilet Type			
None/bucket	94.11	5.9	0.939 (0.2)
chemical/Pit-latrine	94.89	5.11	
flush toilet	95.03	4.98	
Toilet sharing			
Yes	94.79	5.21	0.913 (0.4)
No	94.97	5.03	
Media access			
Yes	95.4	4.6	0.122 (1.2)
No	94.51	5.49	
Dwelling unit status			
Dilapidated	95.56	4.44	0.273 (4.5)
Needs maintenance	96.33	3.67	
Structurally sound	94.30	5.70	
Type of dwelling unit			
Brick/traditional house	95.45	4.55	0.521 (4.4)
Flats/townhouse	92.61	7.39	

Backroom/informal	94.41	5.59	
Safety			
No break-ins	95.26	4.74	0.761 (1.0)
Housebreak-ins sometimes	94.13	5.88	
Housebreak-ins	95.13	4.87	
Type of residence			
Rural	95.16	4.85	0.687 (1.6)
Urban formal	94.64	5.36	
Urban informal	96.46	3.54	
Province			
Western Cape	92.4	7.6	0.255 (19.8)
Eastern Cape	96.10	3.90	
Northern Cape	92.96	7.04	
Free State	96.29	3.71	
KwaZulu Natal	94.44	5.56	
North West	97.06	2.94	
Gauteng	95.68	4.32	
Mpumalanga	91.53	8.47	
Limpopo	97.46	2.54	

Relevant qualitative findings addressing objective 2

Theme: Childcare and socio-cultural practises

The interpretation of the qualitative findings is meant to complement the quantitative findings, but it should be noted that the qualitative and quantitative data were not collected from the same sample. Looking at the quantitative findings, it was found that stunting and overweight were more common among male children compared to female children. On the other hand, underweight episodes were more commonly reported among girl children than boys. An "underweight episode" was defined as a period when a child's weight-for-age was below the 3rd percentile according to the World Health Organization growth standards. Children were weighed up to three times

The qualitative component of the study involved questioning mothers about any cultural practices that affect their children's diet, such as whether certain foods are withheld from girls or if the quantity of food served differs based on the child's sex. Mothers expressed how socio-cultural practices had influenced their parenting. Some mothers mentioned that there were differences in how boys and girls were treated, especially in rural areas. Others mentioned that boys were favoured over girls because they were seen as future heirs who would continue the family lineage after marriage. Overall, mothers believed that boys were stronger than girls and therefore needed more protection. However, some mothers disagreed with the idea of treating boys differently. Some participants felt that boys tend to eat more than girls, although they didn't provide any specific reasons for this belief. Participants 3 and 21 shared their views as shown below:

"Children eat everything these days and they must be treated the same. You cannot discriminate. If you find boys being more valued than girls, those are old customs, that is outdated. We have never done such things here" *(KII/Female, age 44, GaMasemola)*

"There is no favouritism in giving children foods. We give children the same food based on what is available at home and on what is enough for them to eat. But you know, boys eat a lot"

(KII/Female, age 23, Thulani).

Key theme: Knowledge on feeding practises

The quantitative findings indicated differences in levels and patterns of child malnutrition based on age. These differences were particularly significant for stunting and overweight, with children aged 12-23 and 24-35 months being the most affected. In terms of underweight, children aged 0-11 months and 48-49 months were the most affected. The key qualitative findings provide explanations for the higher percentage of stunting and overweight among children aged 12-23 months. Within this age group, there is a variation in breastfeeding practices. Some mothers may have stopped breastfeeding entirely, while others continue breastfeeding alongside complementary foods. However, the exact timing of complementary feeding varied among parents. The key theme that emerged from the qualitative findings was the knowledge of child feeding practices.

While all mothers understood the importance of breastfeeding, many were uncertain about the recommended duration and timing of complementary feeding. Participants also admitted to not following the guideline of exclusively breastfeeding for the first six months, as they felt their children were hungry and crying excessively. Consequently, they introduced complementary feeding earlier, with some even starting at two months of age. There was also a lack of clarity among participants regarding when breastfeeding should be stopped, with responses ranging from six months to three years. The participant shared her views as shown below:

"I breastfed my child until he was two years old, and only started giving him solids after one month because the child was crying a lot, and her grandmother told me that the child was crying because he was not full from the breast milk"

(KII, age 29, GaMasemola)

Parents were asked where they obtained information and knowledge about child feeding. Many mothers shared that they first learned about feeding practices and how to feed a child at antenatal care clinics while they were still pregnant. They were informed that breast milk is best. Others mentioned that they received guidance on what to feed their children based on the feedback they received from healthcare practitioners during their children's vaccination visits. Several participants noted that nutrition advice was provided only if the child's anthropometric measurements indicated unsatisfactory progress, such as low or high weight or height. They also received dietary information from healthcare practitioners when their child was ill, particularly during episodes of diarrhoea. The participant shared her views as shown below:

"Breastfeeding is important and healthy, plus you get to save. When the child is breastfed, they grow well, and they don't get sick."

(KII/Female, age 25, Thulani, Gauteng)

Besides receiving advice from healthcare practitioners, some respondents mentioned that they obtained information about child feeding practices from those around them, particularly elderly family members like grandmothers or mothers. These family members would often offer advice based on their own experiences and what they were taught by their mothers. For example, Participant 13 stated that their mother had used a certain method to raise them when they were a child and they turned out fine. Therefore, Participant 13 follows the same advice given to them by their mother or grandmother, believing that it will help their own child grow up well-nourished.

Participant 20 mentioned another source of information on childcare, such as momConnect, which is a platform that provides information about the child's developmental milestones and nutrition. Participant 20 further argued that they were recruited to join this platform during their pregnancy.

Key theme: socio-cultural practices

The caregivers' socio-cultural practices include a diverse range of activities, traditions and behaviours that are shaped by our society. Caregivers were asked about how the childcare practices affected children's nutritional status and the extent to which socio-cultural practices of caregivers predispose under-5 children to malnutrition.

The quantitative results showed that among underweight children, those younger than 12 months were most likely to be underweight. Some caregivers believed that among reasons responsible for their children being underweight, was the late initiation of antenatal care. Some expressed that they sought antenatal care late during their pregnancy. Some believed had they gone to seek antenatal care earlier, they would have been made aware of their children's growth patterns and corrected their eating patterns. Others attributed their late care seeking to cultural believes and the fear of spiritual attacks that people could bewitch them if enemies knew how far along they were during their pregnancy. The participant shared her views as shown below:

"When I found out that I was pregnant, I did not tell people immediately. I only told my husband and mother. People are not supposed to know that you are pregnant or how far along you are, until the belly start showing. That is when I normally start going to the clinic, when I start showing. Pregnancy is a critical time, even your enemies will have an opportunity to harm you because you are weak. They (the enemies) will tie you and you will not deliver even when you are due. Your baby could die or be born with disabilities".

(KII/Female, 42, Thulani)

"My first child was very slim. When I found out I was pregnant, I went to the traditional doctor so that she can protect my baby from evil spirits. You know when you are pregnant, bad things can happen to you. People can tie your womb… mmhh. I drank di pitsa (traditional concoction) to make the baby strong and to make sure I have an easy labour, but at the clinic they shouted at me for coming for pregnancy treatment late"

(KII/Female, age 44, GaMasemola)

Table 4. 15 Participants socio-cultural practices shaping childhood malnutrition in South Africa, Thulani and GaMasemola (2022)

Participants' perceptions about childhood malnutrition in selected communities		*GaMasemola*	*Thulani*
Category	**Specific issues/findings**		
Malnutrition	Late initiation of antenatal care	+	+
	Poor eating habits, diets high on staple foods	-	+
	Traditional medicine consumption during pregnancy	+	+
	Food taboos	+	+
	Child overfeeding	+	-
	Early initiation of foods before 6 months	+	+
	Food sharing	+	+
	Traditions of food serving	+	-

Note: The positive sign (+) showed the presence of the particular issue in the particular location, while the negative sign (-) showed otherwise.

Table 4.15 above presents the specific socio-cultural issues that emerged in the qualitative findings. The positive signs indicate the mentioning of different issues in the location, while the negative signs mean otherwise. Delayed antenatal health seeking can exacerbate childhood malnutrition as foetal growth outcomes are not monitored in a timely manner. Mothers in Thulani expressed how they always ate what was available, attributing their poor diets to financial constraints. However, in GaMasemola, mothers had a diverse diet due to the availability of food. In both areas, some mothers expressed how they sought traditional care out of fear of losing their children to witchcraft. In GaMasemola, caregivers mainly expressed that certain foods could not be

consumed by pregnant women and children, believing that it would impede children's developmental milestones. As mentioned above, the early initiation of foods among children under 6 months was mainly based on the belief that children were not getting enough to eat. In both settings, food sharing was common; however, there was an unequal distribution that affected children's access to nutritious foods. For example, some mothers in both settings expressed that they would give the father more meat compared to the child because the man was considered the head of the household.

Key theme: Health care utilization

From the quantitative findings, the study discovered that children whose mothers did not seek medical care during episodes of illness had higher rates of stunting (29.92%), overweight (16.85%), and underweight (5.14%), compared to those whose mothers sought care. It was also observed that stunting was especially prevalent among children whose caregivers cited lack of time or financial resources as reasons for not being able to visit the clinic.

The qualitative interviews revealed a significant demand for health services in both urban and rural areas, which was not being met. ECD practitioners acknowledged that health practitioners occasionally visited the ECD centres for growth monitoring, nutrition assessment, and vaccine administration, but these procedures were only conducted once a year. According to the ECD practitioners, continuous monitoring, and follow-up of children with nutritional deficiencies were necessary. This was because follow-up could result in referrals that could address issues such as child stunting, underweight, or overweight.

The ECD practitioners also mentioned that the decisions regarding healthcare utilization were influenced by the quality of service that the child's caregivers had previously received from the clinic. Caregivers in Thulani reported that barriers to accessing healthcare services in urban areas included the clinic staff's negative attitude, long waiting times, medication shortages, and mistreatment by staff. As one participant expressed:

We do not wait for the nurses to come to the crèche to do assessments. When we see that something is not right with the child, we advise the mother to take them to the clinic. Sometimes when the child's parents get to the clinic, they do not get help for their children, or they are just given Panado [brand name for a Paracetamol]. *The problem is the same even for us as practitioners, when there is an emergency, sometimes you are not attended to immediately, you are told to join the long queue just like everyone else, or* [to] *take the child to Bara* [Chris Hani Baragwanath Hospital in Soweto]. *Where is Bara when you are here?*

(KII/Female, age 40, Thulani)

There were also general complaints received from mothers about the service delivery in health facilities, particularly government clinics. Mothers expressed how poor service delivery has discouraged them from seeking healthcare. In the focus group discussions, mothers bemoaned the poor services and lack of medications most of the time. Caregivers also expressed that it was better to stay at home with a child who is not seriously ill than to take the child to the clinic. The following participants express their feelings regarding the treatment received at the clinic. In their own words,

"Here in Snake Park [Thulani], we are the same as the people who do not have clinics. The staff here do not want to work. The clinic opens at 7 am, the staff starts working at 9 am or at 10 am, they are going for tea break which lasts 1 hour. Again, at 1 o'clock, they go for lunch and come back at 2 pm. Is that how a clinic is supposed to operate?"

(KII/Female, age 33, Thulani, Gauteng)

"They always have a shortage of medication. They always give you panado or multivitamin. Nothing else – it's a one size fit all" *(KII/Female, age 42, Thulani)*

"There's too many of us needing medical help. We all stand in long queues to seek medical care. Even the old people [referring to the grand parents]. Unless it is really necessary for you to go to the clinic, then you stay at home and use the natural remedies. The aloe plant is very good with a lot of things. It is better than walking a long distance only to be turned away or to be told there is no medication."

(KII/female, age 38, GaMasemola)

"We are used to the long queues and poor services given to us. What can you do? If you don't have money, you are forced to accept what is given to you. We can't even afford private health care, anyway you have to go to town to see a doctor. It becomes more expensive".

(KII/female,22, GaMasemola)

"Serious, we have challenges with this clinic. For example, when you want to go get the contraceptive injection, you are told to bring your own pregnancy test. Imagine, you have to go buy a pregnancy test. We go to the clinic because we do not have money, if you don't come with a new test, then they don't give you contraceptives. They turn you back".

(KII/female, age 26, Thulani)

While these quotes may not directly address the specific topic of childhood malnutrition, they provide valuable insights into the broader healthcare context within which these issues occur. Regarding the aloe plant mentioned by the participant, it is important to note that the use of traditional medicines, such as aloe vera, can vary significantly across different communities and cultures. It was mostly used for medicinal purposes and a remedy for improved health conditions.

Key theme: child caregiving arrangements

In the quantitative findings, it was discovered that children who were cared for at home had high rates of stunting and overweight. Additionally, a significant percentage of stunting was found among children who were cared for by relatives or non-family members. The role of childcare in children's nutritional outcomes was clearly articulated by mothers. Some participants expressed concerns about what their children were being fed and how they were being cared for in their absence. In certain cases, some participants mentioned that they were not overly worried about what their children would eat if they were not present because they trusted their loved ones, such as family and relatives, to take care of them. Some mothers expressed confidence that their family members would not mistreat their children and expected them to provide proper care. However, single mothers without additional support expressed anxiety and fear about what their children were being fed and how they were treated. Participant 39 shared her fear of leaving her children with neighbours, worrying that they would not provide the same level of care or feeding. Furthermore, participants also expressed concerns about the ongoing crimes in their communities, such as child trafficking, murders, and rapes of young children. As a result, some mothers prefer taking their children to daycare centres for care, as they feel reassured that the service is paid for and that their children will be safe and well cared for.

Participants also emphasized the significance of family structure in child caregiving arrangements. The family structure emerged as a crucial aspect in understanding children's nutritional outcomes and their overall care and wellbeing. When family relationships are disrupted among mothers and those involved in child caregiving within the household, it can lead to various challenges such as stress, breakdown in communication, financial difficulties, and inconsistencies in caregiving practices. This, in turn, can create a stressful environment for children, as mothers may become emotionally preoccupied with relationship conflicts with siblings and extended relatives. As a result, there may be inconsistencies in caregiving practices, including meal planning

and food preparation. Unconsciously, mothers may not prioritize their children's nutritional needs, which can potentially lead to stress among children, resulting in appetite loss, eating disorders, and overall poor eating habits. The following example illustrates how disrupted family relationships can impact children's welfare:

"I live with my sister here and my child, however, my sister and I do not get along well. This is a family home; we are 5 household members, and my sister has decided to bring her boyfriend and stay with him here. It is affecting me and the child. I am part-time employed at a call centre. My mother helps with caring for my child- she does the laundry, cooks food and prepares for him for creche every day because I work long hours and no not earn enough. It is tough because the father of my child does not do anything for the child anyway".

(KII, age 25, Thulani)

4.2.3 Summary of section 2

The summary of this study findings addresses the study's objectives by providing a comprehensive analysis of childhood malnutrition levels and patterns, and by examining individual, caregiver, and household characteristics associated with malnutrition. Examining variables related to children and indicators of malnutrition, including stunting, overweight, and underweight, revealed significant associations. Males exhibited higher rates of stunting (23.70%) and overweight (16.84%), while females were slightly more likely to be underweight (5.60%). Child age, particularly between 12-23 months, showed the highest percentages of stunting (33.43%) and overweight (32.69%). Birth weight significantly influenced stunting and underweight, with low-birth-weight children showing the highest rates. African children displayed the highest malnutrition indicators, and home care was associated with higher rates of stunting and overweight compared to other caregiving settings. Analysis of caregiver-level variables highlighted associations between older mothers, single/divorced caregivers, and specific

malnutrition outcomes. Household-level characteristics, such as size and food spending, also showed associations with malnutrition indicators.

Based on the quantitative results, several themes were drawn to show the factors associated with childhood malnutrition. These themes included childcare and socio-cultural practices, knowledge on feeding practices, health-seeking behaviour, and child caregiving arrangements. This study also found that socio-cultural practices and gender bias were identified as factors affecting children's diets and care. The knowledge on feeding practices varied among caregivers, impacting child nutrition. This study also found health-seeking behaviour to be influenced by healthcare access, service quality, and attitudes of healthcare providers. Finally, child caregiving arrangements, especially family dynamics, played a significant role in child malnutrition.

Section 3: Multivariate quantitative results and relevant qualitative findings

To comprehensively understand the social context of childhood malnutrition, this section integrates the quantitative results from multivariable analysis with some qualitative findings. The previous section provided a quantitative lens through which statistical associations and relationships among various child, mother, and household level characteristics, as well as childhood malnutrition indicators such as stunting, overweight, and underweight were observed. These empirical results form the foundation of our understanding of child malnutrition. Therefore, this section will examine the individual and household level factors associated with childhood malnutrition using multivariate quantitative results and relevant qualitative findings. The purpose of this multivariate analysis is to shed light on the complex relationship between multiple variables and childhood malnutrition.

Table 4.16 below presents the results of a binary logistic regression model that examined the relationship between various child characteristics and the likelihood of child stunting. The table

includes two models: Model 1, which provides unadjusted odds ratios, and Model 2, which presents adjusted odds ratios after controlling for other variables.

When looking at the age of the children in months, Model 1 (Unadjusted) shows that children aged 12-23 months had 3.50 times higher odds of being stunted compared to children aged 0-11 months. This relationship is statistically significant. As children get older, the odds of stunting decrease. For instance, in Model 1, children aged 24-35 months had 2.22 times higher odds of being stunted compared to the reference group (0-11 months). These relationships remain consistent in Model 2 (Adjusted) after controlling for other variables. Regarding the child's sex, males serve as the reference category. Model 1 shows that females had 0.78 times lower odds of being stunted compared to males. This difference is statistically significant. In Model 2, after adjusting for other variables, females had even lower odds (0.63 times) of being stunted compared to males. This relationship remains statistically significant. Examining the children's birth weight, Model 1 and Model 2 both demonstrate that children with birth weights of 3 kg (AOR = 0.45) had significantly lower odds of being stunted compared to children with birth weights of 1-2 kg. Similar relationships exist for children with birth weights of 4-5 kg, which had even lower odds (AOR = 0.38) of stunting.

In both Model 1 and Model 2, the place of delivery (clinic and home) is associated with higher odds of stunting compared to hospital delivery. Home delivery has the highest odds of stunting, even after adjusting for other variables in Model 2. Experiencing a disease episode is not significantly associated with stunting in both Model 1 and Model 2. However, not having medical aid is associated with significantly higher odds of stunting in both models.

The child's care arrangements during the day are important for their safety, care, and nutrition. In Model 1, children cared for at home have the highest odds of stunting compared to children in Grade R/1 or in creches/daycare. This relationship remains significant in Model 2. Interestingly, in Model 2, children in creches/daycare have lower odds of stunting compared to

those in Grade R/1. None of the other childcare arrangements (the other parent, grandparents, relatives/non-familial, no other carer) show significant differences in stunting in both Model 1 and Model 2.

Table 4. 16 Unadjusted and adjusted individual child level factors associated with childhood stunting.

	Stunting	
Child characteristics	Model 1	Model 2
Child stunting	(Unadjusted Odds Ratio)	(Adjusted odds Ratio)[6]
Age		
0-11 months	1.00	1.00
12-23 months	3.50***[7]	3.53***
24-35 months	2.22***	2.11**
36-47 months	1.62*	1.61*
48-59 months	0.95	1.02
Sex		
Male	1.00	1.00
Female	0.78*	0.63***
Birthweight		
1-2 kg	1.00	1.00
3 kg	0.48***	0.45***
4-5 kg	0.43***	0.38**
Race		
African	1.00	1.00
Coloured	1.10	1.07
White/Indian/Asian	0.99	0.97
Ethnicity		
English and Afrikaans	1.00	1. 00
Tsonga and others	0.77	0.77
Sotho	1.33	1.33
Nguni	0.93	0.93
Place of delivery		
Hospital	1.00	1.00
Clinic	1.15	1.14
Home	1.47	1.52
Disease episode		
No	1.00	1. 00
Yes	1.01	1.09
Medical aid		
Yes	1.00	1. 00

[6] Odds ratios (OR) less than 1 indicate a decreased risk of stunting, while values greater than 1 indicate an increased risk

[7] Statistical significance is indicated by asterisks (*** for $p < 0.001$, ** for $p < 0.01$, * for $p < 0.05$).

No	2.08***	1.68
Child support grant		
No	1.00	1.00
yes	1.29*	1.21
Child day care		
Gr R/1	1.00	1. 00
Crèche/day mom	1.59*	0.92*
at home	2.69***	1.49***
Multiple Forms of Childcare		
Parent	1.00	1. 00
Grandparents	0.96	0.93
Relatives/non-familial	1.08	1.12
No other carer	1.13	1.07

Table 4.17 below presents the results of a binary logistic regression model that examines the relationship between various mother characteristics and the likelihood of child stunting. The table includes two models: Model 1, which displays unadjusted odds ratios, and Model 2, which shows adjusted odds ratios after controlling for other variables.

In Model 2, caregivers in the age group 35-39 had a higher likelihood (AOR of 1.28) of having stunted children compared to those aged 15-24 (the reference category). Regarding marital status, single/divorced caregivers had a slightly higher likelihood of having stunted children (AOR of 1.05) compared to those who are married or living together with a partner. Caregivers with other religions also had a higher likelihood of having stunted children (AOR of 1.32) compared to those with no religion. Caregivers who had their first child between the ages of 31-43 had a lower likelihood (AOR of 0.70) of having stunted children compared to those who had their first child between the ages of 12-19. Caregivers without medical aid had a slightly higher likelihood (AOR of 1.16) of having stunted children compared to those with medical aid. In terms of employment, unemployed caregivers had a slightly higher likelihood (AOR of 1.06) of having stunted children compared to employed caregivers. Caregivers with primary schooling had a lower likelihood of having stunted children compared to those with secondary education schooling (AOR of 0.90 and 0.65, respectively). Lastly, caregivers with depressive symptoms do not show a significant

difference in the likelihood of having stunted children when compared to those without depressive symptoms in Model 2.

Table 4. 17 Unadjusted and adjusted mother factors associated with childhood stunting.

Caregiver characteristics	Stunting	
	Model 1	Model 2
Maternal age	(UOR)	(AOR)
15-24	1.00	1.00
25-29	0.95	1.12
30-34	0.99	1.20
35-39	1.00	1.28
40-49	0.96	1.20
Marital status		
Married/living together with partner	1.00	1.00
Single/divorced	1.05	1.05
Religion		
No religion	1.00	1.00
Christianity	0.98	1.05
Other religions	1.25	1.32
Ethnicity		
English and Afrikaans	1.00	1.00
Tsonga and others	0.89	0.9
Sotho	0.68**	0.69*
Nguni	0.76*	0.74*
Caregiver's age at first birth		
12-19	1.00	1.00
20-24	0.87	0.84
25-30	0.99	0.91
31-43	0.81	0.7
Children ever born		
1 child	1.00	1.00
2 children	0.94	0.86
3 Children	1	0.89
4 children	0.81	0.68
5+ children	0.94	0.71
Caregiver medical aid		
Yes	1.00	1.00
No	1.17	1.16
Employment		
Employed	1.00	1.00
Unemployed	1.08	1.06
Current activity		
Student/ other volunteer	1.00	1.00
Ill/homemaker	1.12	1.06

Unemployed-active	1.05	1.02
Unemployed-discouraged	1.14	1.11
Employed	1.00	1.00
Education level		
No schooling	1.00	1.00
Primary schooling	0.96	0.9
Secondary education	0.71	0.65
Tertiary education	0.7	0.68
Depressive symptoms		
None	1.00	1.00
Depressive symptoms	0.92	1.00

Goodness of fit indicators

1. Wald Chi-Squared Test
   - Wald $Chi^2(26)$: 27.58
   - Prob > Chi^2: 0.3796
2. Log Likelihood: -1999.1948
3. AIC: 4052.39
4. BIC: 4220.085
5. Intraclass Correlation Coefficient (ICC)
   - ICC (cluster): 2.96e-34
   - Std. err.: 1.55e-18

Table 4.18 below presents results from the binary logistic regression, illustrating household characteristics that are associated with child stunting. Larger household sizes (7+ people) had a 35% higher likelihood of stunting compared to households with 1-2 people (AOR = 1.35). Children in high-income households had a 69% higher likelihood of stunting compared to those in low-income households (AOR = 1.69).

Likewise, different spending categories on food display varying odds ratios. For instance, households spending “R3000+” on food had significantly higher odds of child stunting compared to those spending less than “R800”, and this finding remains consistent in the adjusted model. Moreover, households with no food availability had higher odds of child stunting compared to those with food availability, and this association is statistically significant. Children in households spending R3000 or more monthly on food are 25% more likely to be stunted compared to those spending less than R800 (AOR = 1.25). Children in households with no access to electricity are 22% more likely to be stunted compared to those with electricity (AOR = 0.78). Children in

households that require maintenance are 23% more likely to be stunted compared to those in structurally sound dwellings (AOR = 1.23). Furthermore, children in Limpopo province are 46% less likely to be stunted compared to those in Western Cape (AOR = 0.54).

Both models yield similar results, indicating the robustness of the findings. No statistically significant associations were found between stunting and other factors such as the number of rooms, water source, toilet sharing, media access, type of dwelling unit, safety concerns, or type of residence (rural/urban).

Table 4. 18 Unadjusted and adjusted household characteristics in South Africa, NIDS wave 5 (2017)

Household characteristics	Stunting	
	Model 1	Model 2
Household size	(UOR)	(AOR)
1-2 people	1.00	1.00
3-4 people	1.01	1.04
5-6 people	1.08	1.07
7+ people	1.34	1.35
Socio-economic income		
Low income	1.00	1.00
Middle income	1.02	1.10
high income	1.33	1.69
Food spending		
less than R800	1.00	1.00
R800-R1100	1.19	1.09
R1200-R1900	0.93	0.77
R2000-R2900	1.36	1.17
R3000+	1.49*	1.25
Food availability		
Yes	1.00	1.00
No	1.13	1.19
No. of rooms		
1 room	1.00	1.00
2-3 rooms	0.97	1.06
4-5 rooms	1.06	1.10
6+ rooms	1.28	1.29
Electricity		
Yes	1.00	1.00
No	0.70*	0.78
Water sources		
Other Water sources	1.00	1.00

Public tap	0.93	0.93
Piped water at home	1.09	0.97
Toilet Type		
None/bucket	1.00	1.00
Chemical/Pit-latrine	1.61	1.06
Flush toilet	1.74*	0.97
Toilet sharing		
Yes	1.00	1.00
No	1.07	0.94
Media access		
Yes	1.00	1.00
No	0.98	1.11
Dwelling unit status		
Dilapidated	1.00	1.00
Needs maintenance	1.26	1.23
Structurally sound	1.20	1.13
Type of dwelling unit		
Brick/traditional house	1.00	1.00
Flats/townhouse	0.91	0.87
Backroom/informal	0.97	1.08
Safety		
No break-ins	1.00	1.00
Housebreak-ins sometimes	1.02	1.02
Housebreak-ins	0.95	0.93
Type of residence		
Rural	1.00	1.00
Urban formal	1.19	1.24
Urban informal	1.04	0.94
Province		
Western Cape	1.00	1.00
Eastern Cape	0.73	0.85
Northern Cape	0.94	0.89
Free State	1.05	0.92
KwaZulu Natal	0.91	1.00
North West	0.77	0.67
Gauteng	0.83	0.73
Mpumalanga	1.11	1.13
Limpopo	0.69	0.54*

Table 4.19 presented below illustrates the connection between different individual characteristics of children and the probability of being overweight. Children aged 12-23 months face a 60% higher risk of being overweight than those aged 0-11 months (AOR = 1.6). However, the risk of overweight declines steadily as age increases. In the age group of 48-59 months,

children are 83% less likely to be overweight compared to the youngest group (AOR = 0.17). Children with a birthweight of 4-5 kg are nearly twice as likely to be overweight as those weighing 1-2 kg at birth (AOR = 1.92). White/Indian/Asian children had an almost twofold increased risk of overweight compared to African children (AOR = 1.92). Children delivered at clinics are 33% less likely to be overweight compared to those delivered in hospitals (AOR = 0.67). Compared to children attending Grade R/1, those cared for at home had a fourfold increased risk of overweight (AOR = 1.45). However, the adjusted odds ratio suggests that this association might not be statistically significant. Children attending creches/day moms had a 58% higher likelihood of being overweight compared to those in Grade R/1 (AOR = 1.58). Overall, this analysis suggests that several individual child factors are associated with overweight, including age (12-23 months), higher birthweight, specific racial and ethnic groups, delivery at clinics, and care at home or in creches/day moms compared to formal schooling.

Table 4. 19 Unadjusted and adjusted individual child level factors associated with childhood overweight in South Africa, NIDS wave 5 (2017)

	Overweight	
Child characteristics	Model 1	Model 2
Child overweight	(Unadjusted Odds Ratio)	(Adjusted odds Ratio)
Age		
0-11 months	1.00	1.00
12-23 months	1.57*	1.6*
24-35 months	0.76	0.67
36-37 months	0.32***	0.25 ***
48-59 months	0.15***	0.17 ***
Sex		
Male	1.00	1.00
Female	1.03	1.03
Birthweight		
1-2 kg	1.00	1.00
3 kg	1.20	1.23
4-5 kg	1.66	1.92*
Race		
African	1.00	1.00
Coloured	0.91	1.23
White/Indian/Asian	0.98	1.92
Ethnicity		
English and Afrikaans	1.00	1.00
Tsonga and others	0.81	0.85
Sotho	1.15	1.45
Nguni	2.07***	2.63***
Place of delivery		
Hospital	1.00	1.00
Clinic	0.68*	0.67
Home	0.8	0.87
Disease episode		
No	1.00	1.00
Yes	1.06	1.00
Medical aid		
Yes	1.00	1.00
No	0.7	0.85
Child support grant		
No	1.00	1.00
yes	0.81	0.8*
Child day care		
Gr R/1	1.00	1.00

Creche/day mom	2.6**	1.58
At home	4.53***	1.45
Multiple Forms of Childcare		
Parent	1.00	1.00
Grandparents	1.00	0.98
Relatives/non-familial	0.96	1.15
No other carer	0.96	0.91

Table 4.20 below examines the association between various caregiver characteristics and the likelihood of their children being overweight. According to the study, mothers aged 31-43 years had a nearly twofold increased risk of having overweight children compared to those aged 15-24 years (AOR = 1.89). Additionally, children of caregivers with religions other than Christianity or no religion are more than twice as likely to be overweight compared to those with Christian caregivers (AOR = 2.04). Moreover, children of caregivers from Tsonga and other ethnicities had a 50% higher risk of being overweight compared to those with English and Afrikaans caregivers (AOR = 1.50). Furthermore, children of caregivers with primary schooling had a 30% higher risk of being overweight compared to those with no schooling. On the other hand, marital status, number of children, caregiver medical aid, employment status, and depressive symptoms did not show statistically significant associations with childhood overweight in the adjusted model (AOR close to 1).

Table 4. 20 Adjusted and unadjusted maternal factors associated with being overweight.

	Overweight	
Caregiver characteristics	(Un adjusted Odds Ratio)	(Adjusted odds Ratio)
Maternal age	(UOR)	(AOR)
15-24	1.00	1.00
25-29	1.06	1.12
30-34	1.07	1.10
35-39	1.12	1.10
40-49	1.07	1.01
Marital status		

Married/living together with partner	1.00	1.00
Single/divorced	1.02	1.11
Religion		
No religion	1.00	1.00
Christianity	1.15	1.21
Other religions	1.87*	2.04*
Ethnicity		
English and Afrikaans	1.00	1.00
Tsonga and others	1.41	1.50
Sotho	1.00	1.04
Nguni	0.89	0.87
Caregiver's age at first birth		
12-19	1.00	1.00
20-24	1.08	1.10
25-30	1.08	1.14
31-43	1.69	1.89
Children ever born		
1 child	1.00	1.00
2 children	1.07	1.07
3 Children	1.02	1.08
4 children	1.03	1.07
5+ children	1.00	1.00
Caregiver medical aid		
Yes	1.00	1.00
No	0.98	0.98
Employment		
Employed	1.00	1.00
Unemployed	0.93	1.21
Current activity		
Student/ other volunteer	1.00	1.00
Ill/homemaker	0.87	0.75
Unemployed-active	0.84	0.75
Unemployed-discouraged	0.86	0.77
Employed	0.94	1.00
Education level		
No schooling	1.00	1.00
Primary schooling	1.14	1.30
Secondary education	0.97	1.03
Tertiary education	0.92	0.90
Depressive symptoms		
None	1.00	1.00
Depressive symptoms	0.85	0.91

Table 4.21 presents the association between different household characteristics and the risk of children being overweight. The data shows that children in middle and high-income households had a 35% and 83% higher likelihood of being overweight compared to those in low-income households (AOR = 1.35, AOR = 1.83). Furthermore, children in households with reported lack of food availability are 25% more likely to be overweight compared to those with sufficient food (AOR = 1.25). Additionally, children in households that require maintenance or are structurally unsound have a 62% and 54% higher chance of being overweight compared to those in well-maintained dwellings (AOR = 1.62, AOR = 1.54). However, the adjusted model reveals no statistically significant association between household size and the risk of overweight. Moreover, no significant associations were found with food spending, number of rooms, access to electricity, water source, type of toilet, toilet sharing, media access, type of dwelling unit, safety concerns, type of residence, or province.

Table 4. 21 Unadjusted and adjusted household characteristics and child overweight in South Africa, NIDS wave 5 (2017).

	overweight	
Household characteristics	Model 1	Model 2
Household size	(Unadjusted Odds Ratio)	(Adjusted odds Ratio)
1-2 people	1.00	1.00
3-4 people	0.87	0.86
5-6 people	0.99	0.94
7+ people	0.91	0.95
Socio-economic income		
Low income	1.00	1.00
Middle income	1.07	1.35*
high income	1.72*	1.83
Food spending		
less than R800	1.00	1.00
R800-R1100	1.14	1.15
R1200-R1900	0.89	0.88
R2000-R2900	1.14	1.03
R3000+	1.02	0.91
Food availability		
Yes	1.00	1.00
No	1.18	1.25
No. of rooms		

1 room	1.00	1.00
2-3 rooms	0.94	0.90
4-5 rooms	1.12	1.03
6+ rooms	1.01	0.93
Electricity		
Yes	1.00	1.00
No	1.06	1.31
Water sources		
other water sources	1.00	1.00
public tap	0.82	0.87
piped water at home	1.03	0.98
Toilet Type		
None/bucket	1.00	1.00
chemical/Pit-latrine	1.08	0.87
flush toilet	1.21	0.88
Toilet sharing		
Yes	1.00	1.00
No	1.06	1.03
Media access		
Yes	1.00	1.00
No	0.96	0.96
Dwelling unit status		
Dilapidated	1.00	1.00
Needs maintenance	1.56*	1.62*
Structurally sound	1.60	1.54*
Type of dwelling unit		
Brick/traditional house	1.00	1.00
Flats/townhouse	0.82	0.69
Backroom/informal	0.82	0.78
Safety		
No break-ins	1.00	1.00
Housebreak-ins sometimes	1.12	1.08
Housebreak-ins	1.05	1.01
Type of residence		
Rural	1.00	1.00
Urban formal	1.08	1.10
Urban informal	1.16	1.12
Province		
Western Cape	1.00	1.00
Eastern Cape	1.08	1.08
Northern Cape	1.23	1.42
Free State	0.98	1.02
KwaZulu Natal	0.96	0.99
North West	0.76	0.89
Gauteng	1.06	1.14
Mpumalanga	1.25	1.42
Limpopo	1.11	1.08

Table 4.23 below presents the association between various characteristics of children and the likelihood of being underweight. Children aged 12-23 months are 29% less likely to be underweight compared to those aged 0-11 months (AOR = 0.71). However, this association weakens with increasing age, and by 48-59 months, the difference becomes statistically insignificant (AOR = 1.05). Children with a birthweight of 3 kg are 63% less likely to be underweight compared to those weighing 1-2 kg at birth (AOR = 0.37). Children with a birthweight of 4-5 kg are 81% less likely to be underweight compared to those weighing 1-2 kg at birth (AOR = 0.19). White/Indian/Asian children have a 41% lower risk of being underweight compared to African children (AOR = 0.59). Nguni children are 65% less likely to be underweight compared to English and Afrikaans children (AOR = 0.35). Children delivered at home are two and a half times more likely to be underweight compared to those delivered in hospitals (AOR = 2.63). Children receiving the child support grant are 44% more likely to be underweight compared to those who don't (AOR = 1.44). Children attending crèches/day moms are 69% less likely to be underweight compared to those cared for at home (AOR = 0.31). No significant associations were found with sex, presence of a disease episode, having medical aid, care by grandparents/relatives, or having no other carer.

Table 4. 22 Unadjusted and adjusted child level characteristics and underweight in South Africa, NIDS wave 5 (2017)

Child characteristics	**Underweight**	
	Model 1	Model 2
Child underweight	(Unadjusted Odds Ratio)	(Adjusted odds Ratio)
Age		
0-11 months	1.00	1.00
12-23 months	0.64*	0.71
24-35 months	0.59	0.78
36-37 months	0.87	1.15
48-59 months	0.93	1.05
Sex		
Male	1.00	1.00

Female	1.04	0.84
Birthweight		
1-2 kg	1.00	1.00
3 kg	0.36***	0.37***
4-5 kg	0.18*	0.19*
Race		
African	1.00	1.00
Coloured	0.76	0.76
White/Indian/Asian	0.87	0.59
Ethnicity		
English and Afrikaans	1.00	1.00
Tsonga and others	1.05	0.83
Sotho	0.70	0.82
Nguni	0.34***	0.35***
Place of delivery		
Hospital	1.00	1.00
Clinic	0.92	0.95
Home	2.57*	2.63*
Disease episode		
No	1.00	1.00
Yes	1.00	1.17
Medical aid		
Yes	1.00	1.00
No	1.49	1.14
Child support grant		
No	1.00	1.00
yes	1.53*	1.44
Child day care		
Gr R/1	1.00	1.00
Crèche/day mom	0.45*	0.31**
at home	0.64	0.73
Multiple Forms of Childcare		
Parent	1.00	1.00
Grandparents	1.05	1.16
Relatives/non-familial	1.66*	1.75
No other carer	0.97	1.00

Table 4.23 presents the association between various caregiver characteristics and the likelihood of their children being underweight. Mothers aged 40-49 years have a 28% increased risk of having underweight children compared to mothers aged 15-24 years (AOR = 1.28). Single/divorced mothers have a 9% increased risk of having underweight children compared to

married mothers (AOR = 1.09). Children of caregivers with no religion or religions other than Christianity have 40% and 41% lower risks, respectively, of being underweight compared to those with Christian caregivers (AOR = 0.60, AOR = 0.59). Children of caregivers from Tsonga and other ethnicities have a 63% increased risk of being underweight compared to those with English and Afrikaans caregivers (AOR = 1.63). Mothers who had their first child at 31-43 years old have a 74% lower risk of having underweight children compared to those who had their first child at 12-19 years old (AOR = 0.26). Having 4 or more children is associated with a 45% and 36% lower risk of underweight compared to having 1 child (AOR = 0.55, AOR = 0.64). Children of caregivers with no medical aid have a 26% increased risk of being underweight compared to those with medical aid (AOR = 1.26). Children of caregivers with depressive symptoms have a 26% lower risk of being underweight compared to those without such symptoms (AOR = 0.74). Overall, this analysis suggests that several caregiver characteristics are associated with an increased or decreased risk of underweight in their children. Increased risk factors include older maternal age, being single/divorced, specific ethnicities (Tsonga and others), having a first child later in life, having no medical aid, and lower education levels. Decreased risk factors include having more children (4 or more), being a homemaker/ill, having access to medical aid, and having a caregiver with depressive symptoms.

Table 4. 23 Unadjusted and adjusted factors associated with child underweight and women's characteristics in South Africa, NIDS wave 5 (2017)

	underweight	
Caregiver characteristics	Model 5	Model 6
Maternal age	(UOR)	(AOR)
15-24	1.00	1.00
25-29	1.11	1.31
30-34	0.79	1.02
35-39	0.78	1.11
40-49	0.75	1.28
Marital status		
Married/living together with partner	1.00	1.00

Single/divorced	1.27	1.09
Religion		
No religion	1.00	1.00
Christianity	0.64	0.60
Other religions	0.62	0.59
Ethnicity		
English and Afrikaans	1.00	1.00
Tsonga and others	1.70	1.63
Sotho	0.76	0.69
Nguni	1.12	1.04
Caregiver's age at first birth		
12-19	1.00	1.00
20-24	0.91	0.89
25-30	0.94	0.93
31-43	0.28	0.26
Children ever born		
1 child	1.00	1.00
2 children	0.82	0.82
3 Children	0.86	0.90
4 children	0.53	0.55
5+ children	0.59	0.64
Caregiver medical aid		
Yes	1.00	1.00
No	1.39	1.26
Employment		
Employed	1.00	1.00
Unemployed	1.19	1.19
Current activity		
Student/ other volunteer	1.00	1.00
Ill/homemaker	0.56	0.71
Unemployed-active	0.89	1.02
Unemployed-discouraged	0.96	1.16
Employed	0.71	1.00
Education level		
No schooling	1.00	1.00
Primary schooling	1.68	1.54
Secondary education	2.05	1.79
Tertiary education	2.04	1.99
Depressive symptoms		
None	1.00	1.00
Depressive symptoms	0.75	0.74

Table 4.24 presents the unadjusted and adjusted odds ratios (UOR and AOR) for the relationship between household characteristics and the risk of underweight in children. Compared to households with 1-2 people, households with 3-4 people and 7+ people had a 32% and 21%

increased risk of undernutrition, respectively (AOR = 1.32, AOR = 1.21). Children in high-income households are nearly twice as likely to be undernourished compared to those in low-income households (AOR = 1.87). Higher food spending (between R800-R1900) is associated with a 32-34% decreased risk of undernutrition compared to spending less than R800 (AOR = 0.68, AOR = 0.66). Children in households with reported lack of food availability are 25% less likely to be undernourished compared to those with reported food availability (AOR = 0.75). Having 4-5 rooms is associated with a 37% lower risk of undernutrition compared to having only 1 room (AOR = 0.63). Children in households relying on public taps are 43% more likely to be undernourished compared to those with piped water at home (AOR = 1.43). Children in flats/townhouses are 34% more likely to be undernourished compared to those in brick/traditional houses (AOR = 1.34). Children in urban informal settlements are 56% less likely to be undernourished compared to those in rural areas (AOR = 0.44). Children in Limpopo province are 71% less likely to be undernourished compared to those in the Western Cape (AOR = 0.29).

Table 4. 24 Unadjusted and adjusted household level characteristics and undernutrition.

Household characteristics	underweight	
	Model 1	**Model 2**
Household size	(UOR)	(AOR)
1-2 people	1.00	1.00
3-4 people	1.21	1.32
5-6 people	1.08	1.24
7+ people	1.13	1.21
Socio-economic income		
Low income	1.00	1.00
Middle income	0.93	0.91
high income	1.21	1.87
Food spending		
less than R800	1.00	1.00
R800-R1100	0.75	0.68
R1200-R1900	0.77	0.66
R2000-R2900	0.86	0.83
R3000+	1.18	1.15
Food availability		
Yes	1.00	1.00

No	0.85	0.75
No. of rooms		
1 room	1.00	1.00
2-3 rooms	0.84	0.96
4-5 rooms	0.65	0.63
6+ rooms	0.96	0.86
Electricity		
Yes	1.00	1.00
No	0.67	0.59
Water sources		
other water sources	1.00	1.00
public tap	1.47	1.43
piped water at home	1.13	1.00
Toilet Type		
None/bucket	1.00	1.00
chemical/Pit-latrine	0.79	0.52
flush toilet	0.71	0.43
Toilet sharing		
Yes	1.00	1.00
No	0.99	0.89
Media access		
Yes	1.00	1.00
No	1.27	1.47
Dwelling unit status		
Dilapidated	1.00	1.00
Needs maintenance	1.10	1.21
Structurally sound	1.28	1.55
Type of dwelling unit		
Brick/traditional house	1.00	1.00
Flats/townhouse	1.36	1.34
Backroom/informal	1.00	1.05
Safety		
No break-ins	1.00	1.00
Housebreak-ins sometimes	0.94	1.04
Housebreak-ins	0.73	0.86
Type of residence		
Rural	1.00	1.00
Urban formal	0.93	0.95
Urban informal	0.54	0.44
Province		
Western Cape	1.00	1.00
Eastern Cape	0.64	0.56
Northern Cape	0.76	0.67
Free State	0.83	0.77
KwaZulu Natal	1.10	0.90
Northwest	0.76	0.39
Gauteng	0.87	0.67

Mpumalanga	1.26	0.90
Limpopo	0.57	0.29*

Relevant qualitative findings that address objective 2, 3 and 4

Key theme: Family care systems, parental involvement in the care of their children

The quantitative results highlight the importance of maternal weight, age, marital status, and employment in relation to child stunting, overweight, and underweight. Additionally, these results emphasize the issue of employment. From the qualitative findings, the key theme that emerges is the significance of family systems, particularly within households where parents are involved in the care of their children.

The child's home environment plays a crucial role in determining their nutritional status. Children reside in diverse home settings with complex family dynamics. These dynamics range from multidimensional households to single-parent-led homes with absent fathers, skipped generations due to orphanhood, parental absenteeism due to labour or educational migration, multiple nuclear families in one yard, and the occurrence of teenage motherhood. Absent fathers are more prevalent in urban areas, while in rural areas, fathers are often absent due to labour migration. The socioeconomic status (income), size, and knowledge of child feeding practices within the household significantly impact the quality of care, health, and nutrition provided to children. Although it is evident that children live with multiple family members, it is clear that in the absence of a biological mother, the grandmother is typically the next most available person to care for the child. Participant 15 gave her view as shown below:

"*You see, it is very rare for you to see a child being dropped off or being picked up by a father. In the morning, most of the children are dropped off at the crèche by their mothers. In the afternoon, you will see the children being picked up by their older siblings on their way back from school. Even just for fetching them, they can send anyone to fetch the child, and we fight the parents*

every time. And you'll see with the time they fetch the child that there's no one at home. This child is 10 or 8, has the key. Imagine that if someone is watching, who wants to do something to these kids, what would happen?"

(KII, female, age 50, Thulani)

Key theme: Family size

During our interviews, the mothers' perspectives on how the size of their family or household could impact the health and nutrition of their children was asked. Mothers expressed concerns that a large family size could hinder the growth and development of their children. They highlighted various challenges such as limited resources, food scarcity, decreased parental attention and time, and compromised hygiene practices. Participant 14 shared the following reflection on their family's lifestyle:

"We migrated from KZN (KwaZulu Natal) before coming to live here. We are a large family with 6 household members. It's nice to have a large family but sometimes it is a huge problem. Sometimes the relationship we have is not too healthy, there are constant fights or disagreements about who is supposed to do what and when. Sometimes we fight about who finished bread or who did not flush the toilet. This is affecting the children".

(KII/female, age 23, Thulani)

Similarly, during the focus group discussion, Participant 2 described how family problems can affect children. She pointed out that domestic violence within households and favouritism towards certain children can make them vulnerable and expose them to higher risks in terms of their behaviour. Participants own words are shown below:

"If as parents we do not treat each other well in the home... The children are watching us. They also see if you have favourites among your children. It's a problem."

(KII/female, age 49, GaMasemola)

"Look at the young girls that just go and stay with their boyfriends, a lot of them are pushed by the problems in the homes. It's not because they like it."

(KII/female, age 51, GaMasemola)

"It's like peer pressure, you understand? A lot of them are pushed by the problems in the homes."

(KII/female, age 47, GaMasemola)

In conversations with participant 31, she further explains that although having a large family size can present challenges, it also has its advantages due to the social support provided by family members. She emphasizes the pivotal role her mother plays in assisting her with childcare, without which she would struggle. Additionally, she highlights that even when she is not present, her children feel supported as there is always someone looking after them. This underscores the significance of a supportive and harmonious home environment for a child's overall health and well-being.

"Sometimes when you are many in the house it comes with problems, especially when most of us are not working because all of us must share the little that we have at home… mmmh, but sometimes it also helps. I don't know what I would have done without my mom. It's difficult caring for a child. At least when you have someone to help you. It makes things easier. Sometimes I am even able to go look for a job and I don't have to worry because I know there will be someone at home watching my child"

(KII/Female, age 20, Thulani)

The quotes presented under the “Key theme: Family size” provide additional insights into how family dynamics can influence childhood nutrition. For example, larger family sizes may be associated with increased competition for resources, including food, which could contribute to malnutrition. Additionally, family conflict can disrupt mealtimes, leading to irregular eating patterns and inadequate nutrient intake. The impact of parental conflict on children’s nutritional health can be multifaceted. Exposure to conflict can lead to stress and emotional distress, affecting children’s appetite and eating habits. Disrupted feeding routines, reduced caregiver sensitivity, and economic consequences of conflict can also contribute to malnutrition.

It’s important to note that the relationship between family dynamics, including quarrels over toilet flushing, and childhood malnutrition is complex and may vary depending on specific cultural, social, and economic contexts. However, the evidence suggests that creating a supportive and nurturing family environment is essential for promoting children’s optimal growth and development, including their nutritional health.

Key theme: Changes in family structure

In the quantitative findings, maternal age and marital status were identified as important factors to consider when examining children’s nutritional outcomes. The qualitative findings supported the quantitative results and revealed that single parenthood posed challenges to childcare and nutrition status.

The study’s narratives shed light on the gap in father involvement, particularly in urban areas, and how this negatively affects the lives of children. Participants shared their frustrations with fathers not supporting their children, while a few caregivers mentioned that some fathers remained actively involved in their children’s lives despite not living together. In the rural setting, women attributed father absenteeism to labour migration, with many men seeking better

employment opportunities in Johannesburg or other towns. Despite physical absence, mothers maintained that fathers still supported their children by sending remittances home. Participants' recognition of the importance of paternal support underscores its role in the child's upbringing. Below is the participants own reflection:

"The father of my child is alive although we are not living in the same house. However, the father of my child supports the child, both physically and financially. We separated because he got a job in the Free State. Sometimes we also visit the father of my children, where we will spend time together and he plays with the children. The father of my children is actively involved in their lives."

(KII/female, age 30, GaMasemola)

Participant 20 shares the same sentiment as participant 41 regarding the involvement of the father of her children in their lives. She further explains the challenges faced by men when it comes to fatherhood, particularly in situations of high poverty rates, where income is insufficient to support a large family size.

"I am currently employed as a cleaner at a workshop and I do not earn much since I only work a few hours in a day. While the father of my child is alive and supports the children, sometimes I feel like this is taking a toll on him and that he is under a lot of pressure since we have three children and spends a lot of money on the things that the children need."

(KII/Female, age 26, Thulani)

Changes in family structure resulting from internal migration can lead to disruptions, as children move between households and experience changes in their living arrangements. These changes have a direct impact on the day-to-day lives of the children, affecting their established

routines. Parent's caregiving practices may also be disrupted. This includes routines such as meal planning, food preparation and feeding routines. The following narratives describe how the movement of caregivers has disrupted their caregiving practices:

"I moved from Germiston to come stay with my husband here at Snake Park. My daughter used to be closest to my mother (her grandmother). She used to do everything for her, cook, bath her and take her to school. Now that we have moved, things have changed, and she needs to adjust. I know it's not easy, but I am also learning to take full responsibility in caring for her. We now live together as a family with my husband".

(KII/female, age 32, Thulani)

"When my partner passed away, we were forced to move from Jane Furse [another rural town] to my home here in GaMasemola. His passing has caused nothing but stress. Sometimes I forget that I have children that I need to take care of. Luckily, they are a little older. At least they remind me when they are hungry so that I can prepare food for them."

(KII/female, age 38, Masemola)

Key themes: Multiple forms of childcare

Based on the quantitative findings, it was discovered that children who were cared for by their grandparents in the absence of their primary caregiver (usually the mother) had slightly higher chances of being underweight or overweight. This relationship also holds true for non-family members. The qualitative findings revealed that some caregivers expressed concerns regarding who would be taking care of their child, what kind of food the child would be given, and whether the child would be safe. Table 4.24 below presents the specific concerns that caregivers highlighted regarding children having multiple caregivers. Through the interviews, the significance of family support in child caregiving was evident, particularly in multi-generational households where

grandparents play a critical role in managing household tasks and providing care and support to children.

Table 4. 25 Participants' perceptions about children's nutritional outcomes and having multiple caregivers, GaMasemola and Limpopo (2022)

Participants' perceptions about children's nutritional outcomes and having multiple caregivers		*GaMasemola*	*Thulani*
Categories	**Specific issues/findings**		
Child malnutrition	Inconsistency in feeding patterns	-	+
	Meal food choices	-	+
	Varying levels of nutritional knowledge and practices	-	+
	Child's emotional wellbeing stress and nutrition intake	+	+
	Food availability and access	+	+

Note: Positive signs indicate the mentioning of the different issues in the location, while negative sign means otherwise.

Key theme: Food security and nutrition

Some findings were unforeseen; this study expected that households with higher incomes would have better nutritional outcomes. However, our study found that children from high-income households were stunted. It was also discovered that the Covid-19 pandemic from 2020 to 2021 had affected caregivers' livelihood strategies and their ability to purchase nutritious foods. The qualitative narratives below provide insight into how participants' lives have changed.

The narratives in this section generally express the adverse outcomes that the COVID-19 pandemic had on household food security. Most participants reported that they had to reduce their preferred food intake and cut down on food expenses to save money. They shared their experiences of not always having enough food to eat, especially towards the end of the month. Additionally, they discussed the challenges of affording certain preferred foods due to financial constraints. Participant 40 below indicates that Covid-19 brought uncertainty and prompted adjustments in participants' food choices.

"When the pandemic started, we did not have to cutdown because food was available, and my sister was also working. However, a year later after covid started, my sister got retrenched. We then had cutdown on the things we normally used to do so that we could adjust to the new life and a new way of doing things."

(KII/female, age 22, GaMasemola)

Participants mentioned that their households did not receive any form of help during the Covid-19 pandemic. They also did not view the Social Relief of Distress Grant provided by the government as a form of assistance during the pandemic, but rather as the government's social responsibility. The following participant reflects on the need to strategize monthly to ensure that their food supply lasts for the entire month. In the words of two community women:

"We just make do with what we have. On a monthly basis we patch things here and there to keep going and to ensure that there is enough food in the house."

(KII/female, age 44, GaMasemola)

"The way things are so expensive; we only buy what we need with the grant money. As long as we have mealie meal – that is the basic and most important grocery item. You can make pap and you can also make soft porridge. We eat and our tummies get full. Who will see that we ate mealie meal? The R350 grant money is too little, what can you do with so little money? We voted for ANC [current ruling party and government], it is supposed to help us!?"

(KII/female, age 30, Thulani)

Participants also shared their perspectives on food adequacy and insecurity. It was clear that the concept of not having enough to eat and not having a balanced diet was prevalent. Participants

mentioned that individuals who are food secure can afford to buy the necessary items without worrying about money.

"Food here at home is not enough, we cannot always afford to eat veggies and fruits. People who are food secure eat a balanced diet, with fruits, vegetables, and meat. Well, I eat the rest, but I do not prefer to eat meat."

(KII/Female, age 23, GaMasemola)

However, a few participants reported that the Covid-19 pandemic did not have much impact on their access to food. They mentioned that the situation in their homes remained the same even prior to the pandemic, and some families continued to eat the same food as before. To illustrate this, participant 4 from GaMasemola stated that there was no change in their food intake. They had enough food to eat in their household and never went to bed hungry. However, another participant mentioned that although their routine remained unchanged, food became more expensive due to higher demand. Participant 44 from Gauteng reflected on the difficulty of physically accessing food during the Covid-19 pandemic. She explained that sometimes there were urgent items, such as milk or children's cereals, that she needed to buy for her child. However, the long queues resulting from social distancing regulations imposed by the government made it challenging. Here are her reflections on how the pandemic affected her household's food security:

"*We did not cut down on food because we were not working anyway, so there was no change in our expenditure. The only thing was that the Covid 19 grant was an extra income in addition to the Child support grant that we get from the government for the things we buy for the children. The only thing that was discouraging was the long queues at the shops. Sometimes we needed to get something urgent from the shop like the child's milk and food, but the queues were too long that sometimes we have to turn back home. It was also discouraging to go to the stores especially*

when it was winter since we would queue outside to buy the things we need, you will end up catching a flue."

(KII/female, age 23, Thulani)

Key Theme: Food affordability and availability

Food insecurity, specifically focusing on the affordability and availability of food, was identified as one of the key themes. Both urban and rural interviewees highlighted the disparity in food consumption between wealthy individuals and those with a lower socio-economic status. Participants emphasized the impact of rising food prices, particularly due to job losses during the Covid-19 pandemic. They also expressed that their livelihoods depended on government social security programs, such as the child support grant (CSG) and the Social Relief of Distress grant (SRD), but the income received was insufficient to cover the high cost of food. In households with multiple generations, where grandparents were present, the old age grant also served as the primary source of income for purchasing food.

> *"No one is working here, we depend on the grant. The food is never enough to cover us until month end – currently, there isn't any food left in this house, we are hungry. The grant money is too little, it does nothing".*
>
> *(KII/female, age 45, GaMasemola)*

> *"Prior to the pandemic, I was working at the car wash as a temporary staff member. When the pandemic hit, the business got affected, people were no longer bringing their cars for a wash, therefore, I lost my income. That has impacted my ability to buy the things that I need especially things that the child needs."*
>
> *(KII/female, Age 23, Thulani)*

Participants generally reported that they ate whatever food was available to them, rather than what they wanted or what they knew was healthy. They also connected nutrition status to socio-economic status, stating that individuals with lower socio-economic status often couldn't afford nutritious foods like fruits, vegetables, and sufficient meat. They also mentioned that rising petrol prices were causing food prices to increase, making it difficult for them to keep up. In most cases, participants said they would feed their children whatever food was available in their homes. Participants from both study sites understood what constituted a healthy diet and the types of diets their children should be following for optimal growth. However, due to limited income and the inability to afford healthy foods, they would give their children whatever was available at home. Participants also mentioned that food would typically run out before the end of the month, forcing them to stretch their resources until the month's end. In urban areas, some participants devised strategies such as bulk buying to ensure their food lasted longer, while others created food gardens to grow their own food. The quotes below highlight the challenges of food affordability and food insecurity, as well as the resilience strategies employed by participants.

"We struggle, sometimes the food finishes before month end but we will still have a bit of maize meal, a bit of morogo [spinach], dinawa [beans] and chicken feet. You know that chicken feet are our village food, right?"

(KII/female, age 32, GaMasemola)

"We do not eat anything here! The food is never enough to cover us until month end. By the time it is month end, we have long run out of food. There isn't any food left in this house and by food, I mean pap and maize meal, that's it!"

(KII, female, age 45, GaMasemola)

The participants described their household as struggling to make ends meet, highlighting the pervasive nature of poverty in rural areas. This also sheds light on the challenges faced by

families in meeting their basic needs, particularly in terms of food security. Below is the voice of a participant giving an account of their experience.

"*Food is expensive, it is not always possible to buy the things that the child needs. What I do is bulk buying – so it helps you save when you are buying things that are on sale. You know that even if you don't use it this month, you can still use it next month*".

(KII/female, age 32, Thulani)

Summary of Section 3

This section provides a summary of the study's second, third, and fourth objectives. First, the findings from a regression model that examines the relationship between individual child, caregiver, and household characteristics and children's nutritional status was presented. Secondly, the food security challenges faced by households in the study area, including job losses and rising food prices that impact the affordability and availability of food was explored.

The qualitative findings emphasize the importance of family systems, particularly in households where parents actively participate in the care of their children. It is common for parents, especially mothers, to be involved in childcare routines such as dropping off and picking up children. However, the absence of fathers, whether due to labour migration in rural areas or urban settings, poses a challenge. In the absence of biological mothers, grandmothers often step in to care for the children. Participants have mixed feelings about family size. While some appreciate the support and social network that larger families provide, others highlight challenges such as limited resources, competition for food, and conflicts within the family. Family dynamics, especially in larger households, significantly impact children's well-being. The study also observes the challenges of single parenthood in terms of childcare and nutrition. In urban areas, father absenteeism is common, while in rural areas, it is often due to labour migration. However, some fathers remain actively involved in their children's lives, even when not living with them.

Regarding food security and nutrition, the COVID-19 pandemic has had a significant impact. Many households faced challenges due to job losses, rising food prices, and inadequate government support. Participants reported reducing food consumption, especially towards the end of the month, and struggling to afford nutritious foods. Food affordability and availability were associated with socio-economic status, with lower-income families unable to afford a balanced diet. Participants often fed their children whatever was available at home, even if it was not ideal.

Section 4: Variations in child malnutrition in South Africa

4.0 Introduction

This section presents a statistical analysis of factors associated with child stunting, overweight, and underweight. It includes various models that use different sets of independent variables, such as those related to the child, caregiver, and household. These models aim to predict child stunting, underweight, and overweight, as well as the full models that incorporate all of these variables. Additionally, this section will provide information regarding the variance, intra-class correlation, and percentage change in variance (PCV). These statistics are helpful in assessing the extent to which the variation in child stunting can be attributed to differences between groups (random effects) and how much can be explained by the variables in the models. Furthermore, this study presented the model fitness.

Table 4.25 presents a statistical analysis of child, mother, and household factors associated with household variations in child malnutrition in South Africa, 2017. Model 0 is an empty model. For Model 1, the child's age is a significant factor. Children aged 12-23 months have a significantly higher odds ratio (OR) of stunting compared to children aged 0-11 months. This risk decreases for older age groups. Female children have lower odds of stunting compared to males. Children with birthweights of 3 kg have lower odds of stunting compared to those with birthweights of 1-2 kg. Regarding race, Coloured children have slightly higher odds of stunting compared to African children.

Model 2 presents the caregiver-level variables. Maternal age is a significant factor. Teenage mothers (15-24 years) have the lowest odds of child stunting compared to other age groups. Single/divorced caregivers have higher odds of child stunting compared to those who are married or living together with a partner. Caregivers following Christianity and other religions have higher odds of child stunting compared to those with no religion. Household size seems to be a significant factor. Larger households (7+ people) have higher odds of child stunting. Socio-economic income also plays a role. High-income households have higher odds of child stunting compared to low-income households. Food spending shows variation. Children in households with food spending between R1200-R1900 have lower odds of stunting compared to those with less than R800. Children in households with no food availability have higher odds of stunting compared to households with available food. The number of rooms in the household and the type of toilet are also associated with child stunting.

Looking at the ICC, in Model 1, the ICC is 24.7%, which means that approximately 24.7% of the variation in child stunting is due to differences between groups or clusters (e.g., households) in the dataset. This positive PCV value indicates that the inclusion of explanatory variables (fixed effects) in the full model has reduced the between-group variation (random effects) by approximately 5.5%. (The PCV is calculated as the difference between these two ICC values: PCV = ICC (Model 4) - ICC (Model 1), which in this case is approximately 5.5%) compared to the empty model. In other words, the fixed effects explain a portion of the variation in child stunting that was initially attributed to differences between groups or clusters.

Table 4. 26 Child, mother and household factors associated with child stunting in South Africa, NIDS wave 5 (2017)

Child stunting	**Empty model (OR)**	**Model 1 Child-level variables**	**Model 2 caregiver level variables**	**Model 3 Household level variables**	**Model 4 full model**
Age					

0-11 months		1			1
12-23 months		3.53***			3.14***
24-35 months		2.11***			1.83*
36-37 months		1.61*			1.49
48-59 months		1.02			0.01
Sex					
Male		1			1
Female		0.63***			0.71*
Birthweight					
1-2 kg		1			1
3 kg		0.45***			0.45***
4-5 kg		0.38**			0.42*
Race					
African		1			1
Coloured		1.07			1.02
White/Indian/Asian		0.97			1.04
Ethnicity					
English and Afrikaans		1			1
Tsonga and others		0.77			0.52
Sotho		1.33			1.36
Nguni		0.93			1.07
Place of delivery					
Hospital		1			1
Clinic		1.14			1.43
Home		1.52			1.12
Disease episode					
No		1			1
Yes		1.09			1.21
Medical aid					
Yes		1			1
No		1.68*			1.69
Child support grant					
No		1			1
yes		1.21			1.16
Child day care					
Gr R/1		1			1
Crèche/day mom		0.92			1.35
at home		1.49			2.23
Multiple Forms of Childcare					
Parent		1			1
Grandparents		0.92			0.89
relatives/non-familial		1.12			1.01
No other carer		1.07			0.95
Maternal age					
15-24 years			1		1
25-29 years			1.13		1.29

30-34 years			1.20		1.46
35-39 years			1.28		1.34
40-49 years			1.20		1.14
Marital status					
married/living together with partner			1		1
single/divorced			1.05		0.83
Religion					
No religion			1		1
Christianity			1.05		1.13
Other religions			1.32		1.52
Caregiver Ethnicity					
English and Afrikaans			1		1
Tsonga and others			0.90		0.77
Sotho			0.69*		0.61
Nguni			0.73*		0.64
Caregiver's age at first birth					
12-19			1		1
20-24			0.84		0.69
25-30			0.91		0.97
31-43			0.70		0.53
Children ever born					
1 child			1		1
2 children			0.86		0.98
3 Children			0.89		0.99
4 children			0.68		0.59
5+ children			0.71		0.84
Caregiver medical aid					
Yes			1		1
No			1.16		1.47
Employment					
Employed			1		1
Unemployed			1.06		1.24
Current activity					
Student/ other volunteer			1		1
Ill/homemaker			1.06		0.57
Unemployed-active			1.02		0.76
Unemployed-discouraged			1.11		0.7
Education level					
No schooling			1		1
Primary schooling			0.9		1.04
Secondary education			0.65		0.83
Tertiary education			0.68		0.96
Depressive symptoms					
None			1		1

Depressive symptoms					1.17
Household size					
1-2 people				1	1
3-4 people				1.04	1.07
5-6 people				1.07	1.09
7+ people				1.35	1.29
Socio-economic income					
Low income				1	1
Middle income				1.10	0.95
high income				1.69	1.28
Food spending					
less than R800				1	1
R800-R1100				1.09	0.95
R1200-R1900				0.77	0.76
R2000-R2900				1.17	1.35
R3000+				1.25	1.56
Food availability					
Yes				1	1
No				1.19	1.35
No. of rooms					
1 room				1	1
2-3 rooms				1.06	1.07
4-5 rooms				1.1	1.09
6+ rooms				1.29	1.44
Electricity					
Yes				1	1
No				0.78	0.81
Water sources					
other water sources				1	1
public tap				0.93	0.78
piped water at home				0.97	0.73
Toilet Type					
None/bucket				1	1
chemical/Pit-latrine				1.06	1.81
flush toilet				0.97	1.64
Toilet sharing					
Yes				1	1
No				0.94	0.91
Media access					
Yes				1	1
No				1.11	1.22
Dwelling unit status					
Dilapidated				1	1
Needs maintenance				0.87	1.23
Structurally sound				1.08	1.14
Type of dwelling unit					
Brick/traditional house				1	1

Flats/townhouse				1.02	0.96
Backroom/informal				0.93	1.2
Safety					
No break-ins				1	1
Housebreak-ins sometimes				1.24	0.99
Housebreak-ins				0.94	0.85
Type of residence					
Rural				1	1
Urban formal				1.24	1.34
Urban informal				0.94	1.07
Province					
Western Cape				1	1
Eastern Cape				0.85	1.08
Northern Cape				0.89	0.83
Free State				0.92	0.92
KwaZulu Natal				1.00	1.07
North West				0.67	0.99
Gauteng				0.73	0.87
Mpumalanga				1.13	1.41
Limpopo				0.54	0.56
Random effects					
Variance (CI)	1.08 [0.62 - 1.87]	1.27 [0.17 - 0.43]	1.09 [0.62- 1.91]	1.29 [0.64 - 2.60]	1.43 [0.58 - 3.52]
ICC (%)	24.7	27.9	24.9	28.1	30.2
PCV (%)	Ref	-17.6	10.8	-18.3	-10.85
Wald Chi-square	Ref	121.04***	25.4	34.3	95.86
Model Fitness					
Log-likelihood	-2023.2	-1449.8	-1987.2	-1509.03	-1054.4
AIC	4050.4	2947.6	4030.5	3094.1	2280.8
BIC	4062.9	3090.4	4204.3	3319.7	2767.3

Table 4.26 presents results from a multi-level binary logistic regression analysis which examined the odds of child overweight based on various factors at different levels: child-level, mother-level, household-level, and a full model that includes all variables. Model 0 is the empty model, while Model 1 focuses on child-level variables. The results show that children aged 12-23 months had 1.6 times higher odds of being overweight compared to those aged 0-11 months. Moreover, older age groups exhibit progressively lower odds of being overweight. Females have slightly higher odds (1.03 times) of being overweight compared to males. Birthweight does not

significantly influence the odds of being overweight, and the child's race does not show significant differences in these odds.

Model 2 examines the mother-level variables and indicates that children with caregivers of Nguni ethnicity have significantly higher odds (2.63 times) of being overweight compared to English and Afrikaans caregivers. Other ethnicities also display varying relationships. Maternal age, however, does not seem to significantly affect the odds of child overweight. Conversely, children of single/divorced caregivers have slightly higher odds (1.11 times) of being overweight compared to those with married or partnered caregivers. Additionally, children of caregivers with religions other than Christianity have higher odds (2.04 times) of being overweight.

In Model 3,children from high-income households were significantly more likely to be overweight than those from low-income households, with an odds ratio of 1.83. Children from middle-income households also exhibited a higher likelihood of overweight, although the relationship was less pronounced.. Food spending is associated with increased odds of child overweight, particularly in the R2000-R2900 spending category. The lack of food availability (No) is associated with higher odds (1.25 times) of children being overweight. The number of rooms in the household does not significantly influence the odds of child overweight. Lastly, Model 4 incorporates all variables from child-level, mother-level, and household-level to provide a more comprehensive understanding of the factors influencing child overweight, considering all variables simultaneously.

Variance, ICC (%), and PCV (%) are used to assess the influence of random effects (unexplained variability) in the model. Variance components, intra-class correlation (ICC), and percent change in variance (PCV) indicate the proportion of total variance attributed to between-group variation and the percentage reduction in random effect variance from the empty model (OR), respectively.

Table 4. 27 Child, mother and household factors associated with child overweight in South Africa, NIDS wave 5 (2017)

Child overweight	Empty model (OR)	Model 1 Child-level variables	Model 2 caregiver level variables	Model 3 Household level variables	Model 4 full model
Age					
0-11 months		1			1
12-23 months		1.6*			1.55
24-35 months		0.67			0.61
36-37 months		0.25***			0.23
48-59 months		0.17***			0.16
Sex					
Male		1			1
Female		1.03			1.05
Birthweight					
1-2 kg		1			1
3 kg		1.23			1.10
4-5 kg		1.92*			1.83
Race					
African		1			1
Coloured		0.94			1.06
White/Indian/Asian		0.8			0.83
Ethnicity					
English and Afrikaans		1			1
Tsonga and others		0.86			1.39
Sotho		1.45			1.55
Nguni		2.63***			3.42
Place of delivery					
Hospital		1			1
Clinic		0.67			0.52
Home		0.88			0.67
Disease episode					
No		1			1
Yes		1.00			0.97
Medical aid					
Yes		1			1
No		0.85			1.05
Child support grant					
No		1			1
yes		0.80			0.74
Child day care					
Gr R/1		1			1
Crèche/day mom		1.58			1.17
at home		1.45			1.21
Multiple Forms of Childcare					

Parent		1			1
Grandparents		0.98			1.04
relatives/non-familial		1.15			1.31
No other care		0.91			0.87
Maternal age					
15-24 years			1		1
25-29 years			1.12		1.28
30-34 years			1.10		1.61
35-39 years			1.10		1.35
40-49 years			1.01		1.2
Marital status					
married/living together with partner			1		1
single/divorced			1.11		0.95
Religion					
No religion			1		1
Christianity			1.21		1.02
Other religions			2.04		1.7
Caregiver Ethnicity					
English and Afrikaans			1		1
Tsonga and others			1.50		2.09
Sotho			1.04		0.92
Nguni			0.87		0.75
Caregiver's age at first birth					
12-19			1		1
20-24			1.10		1.02
25-30			1.14		0.76
31-43			1.89		1.21
Children ever born					
1 child			1		1
2 children			1.07		1.05
3 Children			1.08		0.92
4 children			1.07		0.48
5+ children			1.00		0.84
Caregiver medical aid					
Yes			1		1
No			0.98		1.3
Employment					
Employed			1		1
Unemployed			1.21		1.47
Current activity					
Student/ other volunteer			1		1
Ill/homemaker			0.75		0.65
Unemployed-active			0.75		0.56
Unemployed-discouraged			0.77		0.74

Education level					
No schooling			1		1
Primary schooling			1.3		0.93
Secondary education			1.03		0.96
Tertiary education			0.9		0.96
Depressive symptoms					
None			1		1
Depressive symptoms			0.91		1.04
Household size					
1-2 people				1	1
3-4 people				0.86	0.76
5-6 people				0.94	0.88
7+ people				0.95	0.87
Socio-economic income					
Low income				1	1
Middle income				1.35	1.28
high income				1.83	2.11
Food spending					
less than R800				1	1
R800-R1100				1.15	1.13
R1200-R1900				0.88	0.89
R2000-R2900				1.03	0.84
R3000+				0.91	0.67
Food availability					
Yes				1	1
No				1.25	1.3
No. of rooms					
1 room				1	1
2-3 rooms				0.9	1.00
4-5 rooms				1.03	1.16
6+ rooms				0.93	0.83
Electricity					
Yes				1	1
No				1.31	1.39
Water sources					
Other water sources				1	1
public tap				0.87	0.75
piped water at home				0.98	0.82
Toilet Type					
None/bucket				1	1
chemical/Pit-latrine				0.87	0.94
flush toilet				0.88	1.01
Toilet sharing					
Yes				1	1
No				1.03	1.23
Media access					
Yes				1	1

No				0.96	0.94
Dwelling unit status					
Dilapidated				1	1
Needs maintenance				1.62	1.79
Structurally sound				1.54	1.57
Type of dwelling unit					
Brick/traditional house				1	1
Flats/townhouse				0.69	0.68
Backroom/informal				0.78	0.59
Safety					
No break-ins				1	1
Housebreak-ins sometimes				1.08	1.02
Housebreak-ins				1.01	0.9
Type of residence					
Rural				1	1
Urban formal				1.1	1.04
Urban informal				1.12	1.09
Province					
Western Cape				1	1
Eastern Cape				1.08	1.39
Northern Cape				1.42	1.69
Free State				1.02	1.05
KwaZulu Natal				0.99	1.05
Northwest				0.89	0.94
Gauteng				1.14	1.31
Mpumalanga				1.42	1.8
Limpopo				1.08	0.98
Random effects					
Variance (CI)	1.23 [0.61 - 2.46]	1.72 [0.76 - 3.90]	1.32 [0.66-2.65]	1.15 [0.44-3.03]	2.04 [0.67 - 6.22]
ICC (%)	27.2	34.3	28.7	26	38.3
PCV (%)	Ref	-39.83	23.3	12.88	-43.6
Wald Chi-square	Ref	107.2***	21.73	29	68.48
Model Fitness					
Log-likelihood	-1655.11	-1199.4	-1622.65	-1248.3	-879.24
AIC	3314.2	2446.9	3301.3	2572.7	1930.5
BIC	3326.7	2589.7	3475.2	2798.4	2416.9

Table 4.27 presents a statistical model that analyses the factors associated with child underweight. The model includes three levels of variables: child-level variables, mother-level variables, and household-level variables. Model 0 is an empty model with no predictors. In this

model, there is a certain level of variation in child underweight that cannot be explained by the variables included. The variance is 1.18, with a confidence interval (CI) ranging from 0.42 to 3.32.

Model 1 includes child-level characteristics. As children age, the odds of being underweight change. For example, in Model 1, children aged 12-23 months have 0.71 times the odds of being underweight compared to those aged 0-11 months. Female children have lower odds (0.84), indicating that they are less likely to be underweight than males. Birthweight is divided into different categories. For instance, children with birthweights of 1-2 kg have the same odds as the reference group in the empty model (OR=1). In Model 1, children with birthweights of 3 kg have lower odds (0.37) of being underweight compared to the reference group. The place of delivery shows that children born at home have significantly higher odds (2.63) of being underweight compared to those born in hospitals. However, even after adding child-level variables, there is still some unexplained variation. The variance decreases to 0.8, with a wider CI ranging from 0.12 to 5.48.

In Model 2, when caregiver-level variables are included, there is a slight increase in the variance to 1.15, with a CI ranging from 0.39 to 3.41. This suggests that caregiver-level factors contribute to some of the variation in child underweight, but there is still unexplained variation. When household-level variables are added in Model 3, the variance remains relatively similar at 1.17, with a CI ranging from 0.24 to 5.73. This indicates that household-level factors also contribute to explaining some of the variation in child underweight. In the final full model, which includes all child-level, caregiver-level, and household-level variables, the variance increases to 1.69, with a CI ranging from 0.15 to 19.18. This increase in variance suggests that the addition of all these variables has a more complex impact on explaining child underweight, and there is still substantial unexplained variation.

Table 4. 28 Child, mother and household factors associated with child underweight in South Africa, NIDS wave 5 (2017).

Child underweight	Empty model (OR)	Model 1 Child-level variables	Model 2 caregiver level variables	Model 3 Household level variables	Model 4 full model
Age					
0-11 months		1			1
12-23 months		0.71*			0.87
24-35 months		0.78			1.06
36-37 months		1.15			1.45
48-59 months		1.05			1.22
Sex					
Male		1			1
Female		0.84			0.80
Birthweight					
1-2 kg		1			1
3 kg		0.37*			0.35
4-5 kg		0.19*			0.20
Race					
African		1			1
Coloured		0.76			0.68
White/Indian/Asian		0.59			0.32
Ethnicity					
English and Afrikaans		1			1
Tsonga and others		0.83			0.68
Sotho		0.82			0.84
Nguni		0.35*			0.34
Place of delivery					
Hospital		1			1
Clinic		0.95			1.10
Home		2.63*			3.05
Disease episode					
No		1			1
Yes		1.17			1.41
Medical aid					
Yes		1			1
No		1.17			1.42
Child support grant					
No		1			1
yes		1.14			1.49
Child day care					
Gr R/1		1			1
Crèche/day mom		0.31*			0.16
at home		0.73			0.51
Multiple Forms of Childcare					

Parent		1			1
Grandparents		1.16			0.96
relatives/non-familial		1.75			2.2
No other carer		1.00			1.17
Maternal age					
15-24 years			1		1
25-29 years			1.31		1.43
30-34 years			1.02		0.86
35-39 years			1.11		0.72
40-49 years			1.28		1.02
Marital status					
married/living together with partner			1		1
single/divorced			1.09		0.87
Religion					
No religion			1		1
Christianity			0.60		0.63
Other religions			0.59		0.59
Caregiver Ethnicity					
English and Afrikaans			1		1
Tsonga and others			1.63		3.00
Sotho			0.69		0.50
Nguni			1.04		0.93
Caregiver's age at first birth					
12-19			1		1
20-24			0.89		0.93
25-30			0.93		1.48
31-43			0.26		0.55
Children ever born					
1 child			1		1
2 children			0.82		1.12
3 Children			0.90		1.54
4 children			0.55		0.7
5+ children			0.64		0.75
Caregiver medical aid					
Yes			1		1
No			1.26		2.01
Employment					
Employed			1		1
Unemployed			1.19		1.48
Current activity					
Student/ other volunteer			1		1
Ill/homemaker			0.71		0.2
Unemployed-active			1.02		0.57
Unemployed-discouraged			1.16		0.49
Education level					

No schooling			1		1
Primary schooling			1.54		1.01
Secondary education			1.79		1.12
Tertiary education			1.99		1
Depressive symptoms					
None			1		1
Depressive symptoms			0.74		0.56
Household size					
1-2 people				1	1
3-4 people				1.32	1.75
5-6 people				1.24	2.02
7+ people				1.21	1.36
Socio-economic income					
Low income				1	1
Middle income				0.91	0.69
high income				1.87	2.4
Food spending					
less than R800				1	1
R800-R1100				0.68	0.55
R1200-R1900				0.66	0.7
R2000-R2900				0.83	0.6
R3000+				1.15	1.2
Food availability					
Yes				1	1
No				0.75	1.21
No. of rooms					
1 room				1	1
2-3 rooms				0.96	1.09
4-5 rooms				0.63	0.86
6+ rooms				0.85	1.09
Electricity					
Yes				1	1
No				0.59	0.57
Water sources					
Other water sources				1	1
public tap				1.43	1.16
piped water at home				1	0.59
Toilet Type					
None/bucket				1	1
chemical/Pit-latrine				0.52	0.87
flush toilet				0.43	0.69
Toilet sharing					
Yes				1	1
No				0.89	0.66
Media access					
Yes				1	1
No				1.47	1.38

Dwelling unit status					
Dilapidated				1	1
Needs maintenance				1.21	1.57
Structurally sound				1.55	1.69
Type of dwelling unit					
Brick/traditional house				1	1
Flats/townhouse				1.34	0.91
Backroom/informal				1.05	1.07
Safety					
No break-ins				1	1
Housebreak-ins sometimes				1.04	1.07
Housebreak-ins				0.86	0.57
Type of residence					
Rural				1	1
Urban formal				0.95	1.23
Urban informal				0.44	0.66
Province					
Western Cape				1	1
Eastern Cape				0.56	0.51
Northern Cape				0.67	0.75
Free State				0.77	0.53
KwaZulu Natal				0.90	0.75
Northwest				0.39	0.4
Gauteng				0.67	0.66
Mpumalanga				0.90	0.69
Limpopo				0.29	0.21
Random effects					
Variance (CI)	1.18 [0.42 - 3.32]	0.8 [0.12-5.48]	1.15 [0.39 - 3.41]	1.17 [0.24 - 5.73]	1.69 [0.15 - 19.18]
ICC (%)	26.4	19.6	26.00	26.2	33.9
PCV (%)	Ref	25.8	-32.7	-1.7	-44.4
Wald Chi-square	Ref	62.61	24.06	30.45	40.79
Model Fitness					
Log-likelihood	-788.4	-533.2	-772.4	-553.7	-342.5183
AIC	1580.7	1114.6	1600.7	1183.3	855.03
BIC	1593.2	1257.4	1774.6	1408.9	1333.6

Table 4.28 presents the adjusted proportional odds ratios from the ordered logistic regression models, comparing factors associated with the risk of moderate or severe stunting, overweight, and underweight. The study identified several factors associated with the risk of moderate or severe stunting among children. For a one-unit increase in age in months, the odds of a child being in a higher category of stunting (i.e., more severely stunted) are 2.51 times higher among children

aged 12-23 months compared to children under one year, while holding other variables constant. Female children had lower odds of being in a higher category of stunting compared to males (OR = 0.74). Children with a high birthweight had lower odds of being in a higher category of stunting compared to children with a lower birthweight (3 kg: OR = 0.54, 4-5 kg: OR = 0.50), and children with "Sotho" or "Nguni" ethnicity were less likely to be in a higher category of stunting compared to those with "English and Afrikaans" ethnicity (Sotho: OR = 1.41, Nguni: OR = 1.09). Children cared for at home were more likely to be in a higher category of stunting compared to those in crèches/daycare (OR = 2.16). Additionally, children from higher-income families were less likely to be in a higher category of stunting compared to those from low-income families (middle income: OR = 0.97, high income: OR = 1.39), and factors such as food availability and higher food spending were associated with a lower risk of stunting (food availability: OR = 1.29, food spending above R2000: ORs between 1.25 and 1.38). Household characteristics such as access to electricity, piped water, and flush toilets were associated with a lower risk of stunting. Among other factors examined, only Limpopo province showed a statistically significant association with stunting risk, with children there being less likely to be in a higher category of stunting compared to the Western Cape (OR = 0.60).

The study identified various factors associated with an increased risk of being in a higher category of overweight (i.e., more severely overweight) compared to normal weight in children. Older children, particularly those aged 12-23 months, were less likely to be in a higher category of overweight compared to those aged 0-11 months (OR = 1.34). Children with "Nguni" ethnicity were more likely to be in a higher category of overweight compared to "English and Afrikaans" ethnicity (OR = 2.72), and delivery at a clinic or home was associated with a lower risk of being in a higher category of overweight compared to hospital delivery (clinic: OR = 0.63, home: OR = 0.72). Children cared for at home or in crèches/daycare were more likely to be in a higher category of overweight compared to those receiving no other care (at home: OR = 1.22, creche/daycare: OR

= 1.15). Maternal age also played a role, with older mothers having a slightly higher likelihood of having children in a higher category of overweight (30-34 years: OR = 1.28). Moreover, children from higher-income families were more likely to be in a higher category of overweight compared to those from low-income families (middle income: OR = 1.15, high income: OR = 1.70), and lack of food availability was associated with a higher risk of children being in a higher category of overweight (OR = 1.25). Additionally, needing maintenance on the dwelling unit was associated with a higher risk of being in a higher category of overweight compared to a structurally sound unit (OR = 1.48), and children in certain provinces such as Eastern Cape, Northern Cape, Mpumalanga, and Gauteng were more likely to be in a higher category of overweight compared to those in the Western Cape (Eastern Cape: OR = 1.34, Northern Cape: OR = 1.69, Mpumalanga: OR = 1.62, Gauteng: OR = 1.39). Other factors such as sex, birthweight, race, marital status, and caregiver depression did not show significant associations with overweight risk. Additionally, multiple forms of childcare, caregiver employment, household size larger than 4 people, electricity access, toilet type, toilet sharing, media access, type of dwelling unit, safety, and type of residence did not have a significant effect relationship on overweight risk.

The study identified several factors associated with an increased risk of being in a higher category of underweight (i.e., more severely underweight) compared to normal weight in children. Children aged 36-37 months were more likely to be in a higher category of underweight compared to those aged 0-11 months (OR = 1.21). Notably, higher birthweights were associated with a lower risk of being in a higher category of underweight (3 kg: OR = 0.41, 4-5 kg: OR = 0.25). Additionally, children with “Nguni” ethnicity were more likely to be in a higher category of underweight compared to “English and Afrikaans” ethnicity (OR = 0.37). Delivery at home was associated with a higher risk of being in a higher category of underweight compared to hospital delivery (OR = 2.60), and having a recent disease episode (OR = 1.37) and not having access to medical aid (OR = 1.45) were also associated with higher risks. Moreover, larger household sizes (3-4 people: OR

= 1.71, 5-6 people: OR = 1.51) and higher socioeconomic status (OR = 2.39) increased the likelihood of being in a higher category of underweight, while receiving a child support grant (OR = 0.62) and living in urban informal settlements (OR = 0.51) were associated with lower risks. Additionally, factors such as maternal age, caregiver's age at first birth, number of children ever born, caregiver's employment status, caregiver depression, food spending, food availability, water source, access to electricity, and type of residence were also identified as significant contributors to the risk of being in a higher category of underweight. Children in Eastern Cape, Free State, KwaZulu Natal, North West, and Gauteng provinces were more likely to be in a higher category of underweight compared to those in other provinces. Table 4. 29 Ordered logistic regression [8]showing adjusted odds of factors associated with increased risk of moderate and severe stunting, overweight and underweight in South Africa, NIDS wave 5 (2017)

	Stunting	**Overweight**	**Underweight**
Characteristics	**Adjusted odds ratio**	**Adjusted odds ratio**	**Adjusted odds ratio**
Age			
0-11 months	1.00	1.00	1.00
12-23 months	2.51***	1.34	0.83
24-35 months	1.47	0.60**	0.79
36-37 months	1.36	0.28***	1.21
48-59 months	0.85	0.21***	1.07
Sex			
Male	1.00	1.00	1.00
Female	0.74 **	1.03	0.83
Birthweight			
1-2 kg	1.00	1.00	1.00
3 kg	0.54***	1.08	0.41***
4-5 kg	0.50**	1.72*	0.25
Race			
African	1.00	1.00	1.00
Coloured	1.03	0.98	0.77
White/Indian/Asian	0.99	0.95	0.38
Ethnicity			
English and Afrikaans	1.00	1.00	1.00
Tsonga and others	0.59	1.21	0.71
Sotho	1.41	1.42	0.85

[8] The comparison is made against moderately and severely stunted compared to children who are not stunted

Nguni	1.09	2.72***	0.37***
Place of delivery			
Hospital	1.00	1.00	1.00
Clinic	1.31	0.63	0.94
Home	1.01	0.72	2.60
Disease episode			
No	1.00	1.00	1.00
yes	1.30	0.98	1.37
Medical aid			
Yes	1.00	1.00	1.00
No	1.54	1.02	1.45
Child support grant			
No	1.00	1.00	1.00
yes	1.11	0.81	0.62
Child day care			
Gr R/1	1.00	1.00	1.00
Creche/day mom	1.33	1.15	0.24***
at home	2.16**	1.22	0.62
Multiple Forms of Childcare			
Parent	1.00	1.00	1.00
Grandparents	0.88	1.02	0.92
relatives/non-familial	0.97	1.21	2.01
No other carer	0.94	0.88	1.10
Maternal age			
15-24	1.00	1.00	1.00
25-29	1.25	1.10	1.32
30-34	1.29	1.28	0.68
35-39	1.27	1.16	0.66
40-49	1.19	1.05	0.81
Marital status			
Married/living together with partner	1.00	1.00	1.00
single/divorced	0.82	1.01	0.89
Religion			
No religion	1.00	1.00	1.00
Christianity	0.95	1.11	0.68
Other religions	1.25	1.64	0.63
Ethnicity			
English and Afrikaans	1.00	1.00	1.00
Tsonga and others	1.01	1.80	2.78*
Sotho	0.72*	1.03	0.57
Nguni	0.74*	0.78	0.91
Caregiver's age at first birth			
12-19	1.00	1.00	1.00
20-24	0.78*	1.03	0.88

25-30	1.00	0.82	1.23
31-43	0.65	1.39	0.49
Children ever born			
1 child	1.00	1.00	1.00
2 children	0.91	1.04	0.90
3 Children	0.89	0.96	1.22
4 children	0.55*	0.56*	0.68
5+ children	0.77	0.84	0.68
Caregiver medical aid			
Yes	1.00	1.00	1.00
No	1.41	1.25	1.90
Employment			
Employed	1.00	1.00	1.00
Unemployed	0.90	0.97	0.81
Caregiver depression			
Non depressive symptoms	1.00	1.00	1.00
Depressive symptoms	1.04	1.11	0.61
Household size			
1-2 people	1.00	1.00	1.00
3-4 people	1.08	0.79	1.71
5-6 people	1.13	0.90	1.51
7+ people	1.29	0.98	1.17
Socioeconomic class			
Low income	1.00	1.00	1.00
Middle income	0.97	1.15	0.82
High income	1.39	1.70	2.39
Food spending			
less than R800	1.00	1.00	1.00
R800-R1100	1.01	1.11	0.68
R1200-R1900	0.82	0.91	0.74
R2000-R2900	1.25	0.86	0.82
R3000+	1.38	0.77	1.45
Food availability			
Yes	1.00	1.00	1.00
No	1.29*	1.25	1.13
No. of rooms			
1 room	1.00	1.00	1.00
2-3 rooms	0.88	0.98	1.14
4-5 rooms	0.94	1.13	0.82
6+ rooms	1.17	0.89	1.01
Electricity			
Yes	1.00	1.00	1.00
no	0.82	1.29	0.66
Water sources			
other water sources	1.00	1.00	1.00
public tap	0.81	0.79	1.09
piped water at home	0.74	0.85*	0.65

Toilet Type			
None/bucket	1.00	1.00	1.00
chemical/Pit-latrine	1.56	1.00	0.75
flush toilet	1.59	1.11	0.63
Toilet sharing			
Yes	1.00	1.00	1.00
No	0.96	1.27	0.68
Media access			
Yes	1.00	1.00	1.00
No	1.22	0.99	1.44
Dwelling unit status			
Dilapidated	1.00	1.00	1.00
needs maintenance	1.20	1.48*	1.32
structurally sound	1.10	1.30	1.45
Type of dwelling unit			
Brick/traditional house	1.00	1.00	1.00
Flats/townhouse	0.88	0.72	0.97
Backroom/informal	1.13	0.73	0.62
Safety			
No break-ins	1.00	1.00	1.00
Housebreak-ins sometimes	1.08	1.08	0.97
Housebreak-ins	0.92	0.98	0.62
Type of residence			
Rural	1.00	1.00	1.00
Urban formal	1.23	1.05	1.08
Urban informal	1.03	1.09	0.51
Province			
Western Cape	1.00	1.00	1.00
Eastern Cape	1.02	1.34	0.53
Northern Cape	0.87	1.69	0.92
Free State	0.95	1.12	0.68
KwaZulu Natal	1.00	1.14	0.75
North West	0.91	1.03	0.38
Gauteng	0.82	1.39	0.66
Mpumalanga	1.34	1.62	0.80
Limpopo	0.60	0.97	0.25*
/cut1	**2.77**	**2.72**	**0.23**
/cut2	**4.06**	**3.77**	**1.60**

Summary of section 4

In summary, the random effects indicate that child stunting is influenced by a combination of factors specific to the child, caregiver-related factors, and household-level factors. These factors

collectively account for a significant portion of the variation in child stunting in this data. When looking at overweight, the risk factors for child overweight in these models appear to include age, birthweight, ethnicity, and certain caregiver characteristics. However, many other factors, including household and environmental factors, also play a role. The random effects suggest that there is substantial unexplained variation in child overweight that is associated with differences between households. When interpreting the results for variations in underweight, the random effects and ICC suggest that there is significant variation in child underweight that can be attributed to differences between groups, especially at the child and caregiver levels. However, adding household-level variables and the full set of variables does not explain all the variation, and there is still substantial unexplained variation in child underweight, particularly in the full model.

The study conducted ordered logistic regression models to identify factors associated with increased risks of moderate or severe stunting, overweight, and underweight in children. For stunting, children aged 12-23 months had a significantly higher risk (OR = 2.51), while females exhibited a lower risk compared to males (OR = 0.74). Higher birthweight (3 kg: OR = 0.54, 4-5 kg: OR = 0.50), certain ethnicities (Sotho: OR = 1.41, Nguni: OR = 1.09), and childcare at home (OR = 2.16) were associated with stunting. Factors like higher income (middle income: OR = 0.97, high income: OR = 1.39), food availability, and spending were protective. Limpopo province showed a significant association with lower stunting risk (OR = 0.60). Regarding overweight, older children (12-23 months: OR = 1.34), “Nguni” ethnicity (OR = 2.72), and maternal age (30-34 years: OR = 1.28) increased the risk, while higher income (middle income: OR = 1.15, high income: OR = 1.70) and certain provinces (Eastern Cape: OR = 1.34, Northern Cape: OR = 1.69, Mpumalanga: OR = 1.62, Gauteng: OR = 1.39) were associated with overweight. Factors such as birthweight, medical aid, household size, food spending, and dwelling unit status played roles in underweight risk. Notably, living in urban informal settlements decreased the risk (OR = 0.51).

Various factors such as maternal age, caregiver's employment, depression, and household characteristics significantly contributed to weight status disparities among children across South Africa.

Section 5: Exploring a Multi-Sectorial Approach to Enhancing Child Nutritional Outcomes in South Africa

Section 5 of this study examines the critical subject of multi-sectoral approaches to improve child nutrition outcomes in South Africa. The study focused attention on the valuable insights of Early Childhood Development (ECD) practitioners. These individuals play a crucial role in the lives of young children, often serving as the first point of contact and support for families.

The objective of this section is to explore how ECD practitioners perceive the potential and challenges of a multi-sectoral approach in addressing child malnutrition. By understanding their experiences and insights, this study can obtain valuable knowledge on how to effectively integrate various sectors, such as healthcare, education, and social services, to create a comprehensive and sustainable environment that promotes optimal child nutrition.

Through qualitative research interviews, this section delves into the perspectives of ECD practitioners and gain an understanding of 1) The strengths and limitations of the current approach to addressing child malnutrition in South Africa, 2) Their perceptions of the potential benefits and challenges associated with implementing a multi-sectoral approach and 3) Recommendations for improving the effectiveness of a multi-sectoral approach from the ECD perspective.

Five in-depth interviews were conducted with ECD practitioners from Thulani and GaMasemola. Three interviews were conducted in Thulani, and two interviews were conducted in GaMasemola. These interviews yielded four key themes. The qualitative findings from these interviews present the narratives of ECD practitioners who care for children during the day when their primary caregivers are absent. Among the five ECD centres, two of them were unregistered,

which meant that they were unable to access the government's R17 per day nutrition subsidy. However, all the ECD practitioners came from similar backgrounds in terms of their location. For instance, ECD practitioners from Thulani operated their centres from their primary homes, where they lived with their families. On the other hand, in Limpopo, the ECD centres were standalone learning areas used exclusively for ECD purposes and were not for personal use.

Table 4. 30 Themes from qualitative interviews with ECD practitioners

Emerging themes	**Sub-themes**
1) Multisectoral initiatives to improve child nutrition	
2) Effective multisectoral collaboration	Benefits of a multisectoral approach Barriers to multisectoral collaboration
3) Collaboration and roles	
4) Service delivery	

Generally, ECD practitioners spend the whole day with children under 5 years old. This allows them to spend time with the children and monitor what could possibly influence children's nutritional outcomes. In the in-depth interviews, the caregivers expressed their perceptions on multisectoral collaboration to improve child nutritional outcomes. They discussed factors such as community access to food, poverty, lack of collaboration, lack of service delivery, and challenges in implementing multisectoral collaboration in childcare and child nutritional outcomes. The following narratives from ECD practitioners reflect their views on the community's access to healthy food and the presence of multisectoral initiatives aimed at improving child nutrition.

"Most people in this community are unemployed. You can walk around this township, you will see that people are around. The issue of healthy food is a difficult one when there is no money. You can even see how some children look when they arrive at the ECD centres in the morning. From just looking at them, you can tell that some of them did not even eat breakfast before they came here. If they can't do the basic such as paying me school fees, how do you expect them to buy healthy food and vegetables?*"*

(KII/female, age 50, Thulani)

Some ECD practitioners expressed that although the situation in the communities was dire, with high unemployment rates, there were organizations attempting to assist by teaching community members how to create their own food gardens. However, not everyone was receptive to this help.

"There used to be this organisations coming here encouraging people in the community to grow their food. Mhh (laughs), where will be growing food here? As you can see, there is no space? I wonder what has happened to the people who took those seeds. I wonder it worked or whether they have their food gardens"

(KII/female, age 42, Thulani)

"People in this community grow their food. It is the only way that we survive. We eat pap, morogo [spinach] and other vegetables". The only problem arises when there are no rains, then we cannot water our plants.

(KII/female, age 50, GaMasemola)

Theme: Effective multisectoral collaboration

Caregivers were asked about the benefits of multisectoral initiatives and how they could collaborate with various sectors to enhance children's nutritional outcomes.

"*First, the commitment needs to come from the parents, because whatever we do as ECD practitioners, we still need to receive permission from the parents. This means that we all need to work together. For example, sometimes you invite a parent to the parent's meeting, some parents would actually send the other child while the invite particularly specified that the parent needs to come.*" *(KII/female, age 42, Thulani)*

Sub-theme: Barriers to effective multisectoral collaboration

The ECD practitioners mentioned that documentation and ECD registration pose difficulties, which ultimately hinders the optimal development of children. The below narrative shows an experience of being denied the nutrition grant due to structural constraints and limited space. The availability of yard space is crucial for the application process, particularly in urban areas like Thulani, which transitioned from an informal settlement to government-subsidized structures. Consequently, the challenge of yard space was more pronounced in urban settings compared to rural areas. The study found that addressing these issues could potentially enhance children's health outcomes. One ECD practitioner shares her concern below:

"To benefit from the R17 a-day-nutrition grant, you must be registered with the department of social development. The registration process is a long process and requires a lot of documents. The houses built in this community are RDP houses, part of the requirements of ECD registration is that you must show proof of land ownership. Where will I get that?"

(KII/female, age 51, Thulani)

This participant asserts that the community they live in needs the services of the ECD centre. Despite not meeting the registration requirements set by the Department of Social Development, her centre continues to run and is dependent on school fees. However, some caregivers cannot afford these fees.

"This crèche does not have a permit to operate yet. Although it is registered as a nonprofit organization, there are still compliance issues that the Department of Social Development (DSD) has, which make it difficult for us to follow." Therefore, I have to rely on the child school fees of R400 a child per month. Sometimes I don't even know whether that money will come or not. Sometimes I use my own money to buy food. As you can see, the crèche is a safe space for children to be cared for and they even get food. Children who are not in crèches roam around the streets-

what is worse is that we do not even have safe areas to play here in this community. Empty spaces have become rubbish dumping sites. Our local government does not care about the ECD centre. You can see even during Covid-19, all schools and employment sectors were told they could return to work, just not the ECD sector"

(KII/female, age 51, Thulani)

Another issue raised by ECD practitioners in relation to multisectoral collaboration is the problem of referrals. They are concerned that when they identify issues with a child and provide the necessary information on where caregivers should seek help, the challenge is that the sector to which parents are referred may not help or may redirect them to different sources without providing the necessary support.

"*In my centre, there is a child who comes from a really poor family. That child does not have a birth certificate because the mother of the child had since left and left the child with the granny. The granny cannot get a birth certificate. I have tried sending the granny to the social workers to get help, even today, she is still not helped. The granny can't apply for the child support grant because there is no birth certificate. It would have been better if they were receiving the grant because they could at least buy more food. Sometimes as the ECD practitioner, you make this referral and parents will not take you seriously because where you are sending them to go, they still do not receive the help that they need*"

(KII/female, age 47, GaMasemola)

Theme: Collaboration and roles of different sectors

Some ECD centres have praised the collaboration they have had with various sectors in the childcare and protection continuum. For instance, the ECD practitioner below highlights how they can work with the Department of Health for growth monitoring and immunization of the children.

"The clinics come at least two times a year. The sister checks the children and if there are any abnormalities, they give the child a referral letter for the caregiver to take it to the hospital or clinic, depending on the severity of the case. Sometimes when social workers come to monitor the creches, we are able to point out the issues we identify with some of the children, which they [the social workers] can go follow up on." *(KII/female, age 51, Thulani)*

Another ECD practitioner praised a social worker from the Department of Social Development. The social worker had taken action in a household grappling with chronic poverty within an intergenerational setting. In this household, both the child's mother and grandmother were unemployed. The social worker's intervention included assisting the grandmother in applying for the old age grant. Additionally, some ECD practitioners also praised the community initiatives from local NGO's who were providing local people with food garden seeds in the townships in efforts to increase healthy eating.

However, when it comes to the health collaboration. in some instances, ECD practitioners expressed the inconsistencies in clinic visits for routine growth monitoring. Some report that they would go to ECD centres if there is an outbreak of a certain disease or if there is a campaign initiated by the government to administer a certain vaccine. This makes it difficult for ECD practitioners to make their own plans. Below is a view of the ECD practitioner:

"We never really know when the sisters from the clinic are going to come. It is different every year. Sometimes they come at the beginning of the year, sometimes in the middle of the year. It is hard to tell. It would have been better if they told us in advance as to when they were coming so that we can also plan our things. I have had to cancel a trip because the [clinic] informed us late. "

A challenge that arises in health sector collaboration is that sometimes the issues that ECD practitioners raise are not taken seriously at health facilities. The following are the views expressed by the ECD practitioner:

"*One day I noticed that this child in my class was refusing to eat. I asked the parent to send the child to the clinic for assessments. When the mother took the child to the clinic, they turned the child away and told the mother that there was nothing wrong with the child. Fortunately, the mother was also worried because this was starting to affect the child's weight, the mother took the child to the doctor, who discovered a child had an allergy causing a sore throat, hence he did not want to eat."*

(KII/female, age 42, Thulani)

Theme: ECD centre impact

ECD practitioners who were registered indicated that the fact that their centres were receiving nutrition support was very beneficial and that could help ensure they buy nutritious foods. Below are the words of the ECD practitioners:

"*Although food is expensive, the nutrition grant goes a long way to help with ensuring that children in ECD centres have food. You see, some parents are unemployed, at least when they bring their children to the ECD centres, they are sure that their children would at least have something to eat -breakfast and lunch. At least what remains a worry is how we pay the staff working at the ECD centre*"

(KII/female, age 47, Thulani)

Although the ECD practitioners are grateful to have the nutrition grant, practitioners raise that food is expensive and often must amend the dietary meal plans provided to ensure children have sufficient foods. Below the ECD practitioners narrate their challenges:

"*The meal plans provided by the DSD require that we serve children certain portions to ensure that they meet their dietary requirements. We want to adhere to those menu's but it is not always possible. Firstly, the nutrition grant is too small. I have been operating my centre for the past 12*

years and this amount has remained unchanged. How many times has the food prices gone up? Just yesterday the petrol price went up and we know what that means for food prices"

(KII/female, age 47, GaMasemola)

"We must cut the diet. For example, if the menu says we must give them meat atleast 3 times a week, we end up giving them only once a week. Remember, some parents are not even [paying for their children, they just send them as they are, and we must make a plan on what to feed their kids".

(KII/female, age 50, GaMasemola)

Theme: Service delivery

ECD practitioners also highlighted the importance of maintaining a clean environment and having access to clean drinking water to improve children's health. While those working in rural areas mentioned facing water shortages, their counterparts in urban areas reported difficulties with water, electricity, and waste management. Challenges included irregular garbage collection, unpredictable water interruptions, and limited accessibility to water sources. These issues often forced ECD practitioners to temporarily close their facilities due to hygiene concerns on days when water was unavailable.

"Here in Thulani, we do not have electricity. In fact, we have not had electricity since one year ago. People do not want to pay for electricity, so Eskom [electricity provider] cut us off. It is very difficult for us to manage to preserve our food. This also affects the quantity of the food that we buy. It's boring to always go to people's houses to put your meat or food in other people's fridges. It is a lot of work to be going up and down fetching the food, so ECD practitioner we make sure that we finish the food that we have cooked."

(KII/female, age 51, Thulani)

ECD practitioners in rural Limpopo shared their concerns about the impact of water shortages on food preparation and sanitation in their community. The lack of access to clean water has affected their ability to prepare food and maintain hygiene standards, as caregivers require clean water for tasks such as handwashing before handling children, changing diapers, and preparing food.

"The shortage of water is a problem. At first, the municipality used to open the communal taps once a week, every Sunday. Since the beginning of this year, the taps no longer have water. We are relying on Jojo tanks to get rainwater which are now running dry because it is winter and there is no rain."

(KII/female, age 47, GaMasemola)

Summary of section 5

The findings from in-depth interviews with Early Childhood Development (ECD) practitioners shed light on the complex challenges and opportunities surrounding child nutritional outcomes in South Africa, particularly within the context of community access to healthy food and the effectiveness of multisectoral collaboration initiatives. ECD practitioners, who play an important role in the daily care and monitoring of children under 5 years old, highlighted the impact of socioeconomic factors such as poverty and unemployment on children's nutritional well-being. Despite efforts by some organizations to promote initiatives like community food gardens, challenges persist, including limited space and lack of community engagement. Moreover, barriers to effective multisectoral collaboration were evident, with issues ranging from systemic challenges in ECD registration to insufficient support from local governments. The narratives also underscored the importance of parental involvement and the need for streamlined referral systems to address identified challenges effectively. Despite these obstacles, ECD practitioners acknowledged the invaluable support provided by collaboration with various sectors, particularly in health, for growth monitoring and immunization efforts. Additionally, the provision of nutrition grants to registered

ECD centres was highlighted as beneficial, although practitioners emphasized the need for increased funding to meet rising food costs and ensure adequate nutrition for children. Overall, the findings underscore the complex interplay of factors influencing child nutritional outcomes in South Africa and highlight the importance of concerted efforts across sectors to address these challenges effectively.

Chapter 5: Summary of findings and hypothesis testing

5.0 Introduction

This chapter presents a comprehensive summary of study discussing the social context of childhood malnutrition in South Africa. The findings are divided into five sub-objectives: (i) determining the levels and patterns of childhood malnutrition in selected low-income communities in South Africa, (ii) examining the individual child, caregiver, and household factors associated with childhood malnutrition in the study setting, (iii) investigating the relationship between food insecurity and childhood malnutrition, (iv) exploring how the socio-cultural and childcare practices of caregivers predispose under-5 children's malnutrition in selected low-income communities in South Africa, and (v) investigating how a multi-sectorial approach can be employed to improve child nutritional outcomes in South Africa. Therefore, this chapter rigorously examines individual-level child, caregiver, and household-level variables to shed light on the root causes and factors that influence children's nutritional status. Furthermore, this chapter explores hypothesis testing, which allows for thorough analysis and evaluation of the factors that explain childhood malnutrition.

5.1 Summary of the findings

This study drew the analysis from the NIDS study on 2 966 mothers and their children. The findings provide a nuanced understanding of the child, mother and household's demographic and sociocultural factors that influence children's nutrition , health, care and overall wellbeing.

Key findings from objective 1: To determine the levels and patterns of childhood malnutrition in South Africa

The study presents the percentage distributions of characteristics at the individual child, caregiver, and household levels. The study found that a slightly higher proportion of male children compared to females, which is consistent with previous research (Grech & Mamo, 2020). The majority of the children sampled were Africans, with hospital deliveries being the most common, and more than half of them had a normal birth weight. However, most of the children were not covered by medical aid. Nearly 70% of all children were cared for at home during the day, with various caregivers including parents, grandparents, relatives, and non-family members. Regarding mothers, the majority were aged 40-49 (28.55%) and were single or divorced (73.87%). Many of them had their first child as teenagers (45.19%), reflecting the national trend where 1 in 4 girls become pregnant as teenagers, with a sharp 60% increase during COVID-19 in provinces such as Gauteng (Barron et al., 2022). The study found that 62.37% of caregivers had a secondary education, and nearly 60% were unemployed, with 22.98% actively seeking employment. High levels of depressive symptoms were observed among caregivers (94.23%). Most households consisted of 1-2 people with a perceived low socioeconomic income level, spending less than R800 ($42) per month on food. While most households had access to electricity and piped water, nearly 30% still used pit-latrine toilets and shared facilities, and some faced structural issues. High crime rates were reported, with nearly 70% of households affected by house break-ins. The majority of households were in urban formal settings (58.76%), with representation from Gauteng (29.41%), KwaZulu Natal (16.66%), and the Western Cape (12.06%) provinces.

Key findings from objective 2: To examine the individual child, caregiver, and household factors associated with childhood malnutrition in the study setting.

The study presents this study findings and addresses the study's objectives by providing a comprehensive analysis of childhood malnutrition levels and patterns. It also examines individual, caregiver, and household characteristics associated with malnutrition. Our analysis of variables related to children and indicators of malnutrition, including stunting, overweight, and underweight, revealed significant associations. Males exhibited higher rates of stunting (23.70%) and overweight (16.84%), while females were slightly more likely to be underweight (5.60%). Child age, particularly between 12-23 months, showed the highest percentages of stunting (33.43%) and overweight (32.69%). Birth weight significantly influenced stunting and underweight, with low-birth-weight children showing the highest rates. African children displayed the highest malnutrition indicators, and home care was associated with higher rates of stunting and overweight compared to other caregiving settings. Analysis of caregiver-level variables highlighted associations between older mothers, single/divorced caregivers, and specific malnutrition outcomes. Household-level characteristics, such as size and food spending, also showed associations with malnutrition indicators.

Based on the quantitative results, several themes were drawn to show the factors associated with childhood malnutrition. These themes included childcare and socio-cultural practices, knowledge of feeding practices, health-seeking behaviour, and child caregiving arrangements. This study also found that socio-cultural practices and gender bias were identified as factors affecting children's diets and care. The knowledge of feeding practices varied among caregivers, impacting child nutrition. This study also found that health-seeking behaviour was influenced by healthcare access, service quality, and the attitudes of healthcare providers. Finally, child caregiving arrangements, especially family dynamics, played a significant role in child malnutrition.

Key findings from objective 3: To investigate the relationship between food insecurity and childhood malnutrition.

Quantitative Insights:

- **Socio-economic Income:** The quantitative results suggest that higher socio-economic income is associated with elevated odds of overweight, particularly in high-income households. Unexpectedly, this contradicts the common expectation that higher income is protective against malnutrition. This unexpected finding emphasizes the importance of considering various factors, including food choices and dietary patterns, in understanding the relationship between income and child malnutrition.
- **Food Spending:** The quantitative analysis indicates varying relationships between food spending and different nutritional outcomes. Higher spending is associated with increased odds of overweight but does not consistently show a significant association with stunting or underweight.
- **Food Availability:** The presence or absence of food availability is not consistently associated with stunting, overweight, or underweight.

Qualitative Insights:

- **Impact of COVID-19:** The qualitative findings shed light on the significant impact of the COVID-19 pandemic on households' ability to provide nutritious foods for children. Caregivers reported disruptions in livelihoods, job losses, and economic uncertainty, leading to adjustments in food choices and expenditure. These challenges highlight the vulnerability of households, irrespective of income, during external shocks.
- **Food Affordability and Availability:** Participants described the challenges of food affordability, with rising prices affecting their ability to purchase nutritious foods. The qualitative narratives align with the quantitative findings, emphasizing the importance of considering the economic context in understanding childhood malnutrition. Caregivers'

strategies, such as bulk buying and food gardening, reflect adaptive responses to cope with food insecurity.

- **Government Grants:** Participants' perspectives on government grants provide additional context to the quantitative analysis. While some caregivers did not view these grants as sufficient, others relied on them as a crucial income source during challenging times. The qualitative insights underscore the interconnectedness of economic factors, government support, and household food security.

Key findings from objective 4: To explore the extent to which the socio-cultural and childcare practices of caregivers predispose under-5 children to malnutrition in selected low-income communities in South Africa.

The qualitative findings provide valuable insights into how socio-cultural practices of caregivers' impact childhood malnutrition in South Africa. The theme "Childcare and socio-cultural practices" reveals that cultural beliefs have a significant influence on the nutritional well-being of children. Mothers shared how traditional gender norms affected the treatment of boys and girls, particularly in rural areas. Boys were often favoured over girls due to cultural expectations that they would support the family in the future. The perception that boys are stronger and require more protection further contributed to differential treatment.

The qualitative findings highlight the critical role of various factors, including family care systems, health systems, environmental systems, early childhood education, and social welfare. Regarding family care systems, diverse family dynamics impact children's access to care and nutrition, including absent fathers in urban areas and paternal labour migration in rural areas. The involvement of caregivers, especially mothers and grandmothers, in childcare is essential. The lack of parental knowledge about when to start complementary feeding and when to stop breastfeeding contributes to child malnutrition. However, some mothers reject traditional practices and emphasize the importance of treating children equally. They challenge outdated customs that value

boys more than girls, indicating a shift in perspectives. The qualitative data suggests a complex interplay between cultural traditions and evolving attitudes towards gender-based disparities in childcare practices.

Another key theme, “Knowledge on feeding practices,” explores the role of caregiver knowledge in child malnutrition. The transition from breastfeeding to complementary feeding is a critical period that influences stunting and overweight among children aged 12-23 months. While mothers recognize the importance of breastfeeding, challenges arise in understanding the optimal duration and timing of complementary feeding. Participants express receiving conflicting advice and facing difficulties adhering to guidelines due to perceived hunger in infants.

Mothers primarily receive knowledge on child feeding from healthcare practitioners during prenatal care and vaccination visits. However, discrepancies in adherence to guidelines are evident, indicating a need for improved education and support for caregivers. Additionally, participants mention relying on advice from family members, especially elders, and alternative sources such as platforms like momConnect.

The theme “Health seeking and socio-cultural practices” explores the impact of cultural beliefs on health-seeking behaviours. The delay in seeking antenatal care due to cultural beliefs and fears reflects how socio-cultural practices may contribute to low birth weight and subsequent underweight in infants. The qualitative data emphasizes the need for targeted interventions that address cultural barriers to timely healthcare utilization.

Lastly, the theme “Child caregiving arrangements” underscores the significance of family structure and relationships in shaping children’s nutritional outcomes. Disrupted family relationships, conflicts, and lack of support in caregiving contribute to stress among mothers and inconsistencies in childcare practices. Participants express concerns about the safety and well-being of children in the care of relatives or neighbours. Some mothers prefer sending their children

to creches for professional care, highlighting the importance of paid services in ensuring safety and proper care.

Key findings from objective 5: To investigate how a multi-sectorial approach can be employed towards improving child nutritional outcomes in South Africa.

The findings highlight various challenges and opportunities in addressing child nutritional outcomes in South Africa through a multisectoral approach. The lack of parental participation in early childhood education adversely affects communication and information sharing between ECD practitioners and caregivers, hindering effective support systems. There is a notable demand for health services in both urban and rural settings, yet infrequent healthcare visits to ECD centres impede continuous monitoring and follow-up for children with nutritional deficiencies. Barriers to healthcare utilization, including negative clinic experiences such as long queues and staff attitudes, underscore the urgent need for improved service delivery. Challenges related to water shortages, electricity cuts, and waste management significantly impact hygiene and nutrition, with distinct disparities between urban and rural settings influencing food preparation and sanitation practices. Moreover, barriers to ECD registration due to compliance issues limit access to government nutrition grants, which have the potential to enhance children's nutritional outcomes. ECD practitioners also emphasize the importance of income-generating opportunities and government involvement in creating employment opportunities to alleviate poverty and reduce dependency on social grants. Overall, the study underscores the necessity of a comprehensive multisectoral approach addressing familial, health, environmental, and social factors to holistically improve child nutritional outcomes in South Africa.

5.2 Hypothesis testing

The aim of this section is to test the research hypothesis proposed in the study and determine how the evidence from the findings supports these hypotheses. Specifically, gaining a holistic

understanding of the factors associated with childhood malnutrition can provide a more comprehensive understanding of the social context surrounding childhood malnutrition. Our conceptual framework is based on the idea that nutrition, food security, and caregiving practices are relevant in understanding childhood malnutrition. This study primarily relied on the work of UNICEF in 1990 regarding the causes of undernutrition and the United Nations' Food and Agriculture Organization (FAO). The following research hypotheses were tested/ evaluated:

Testing of hypotheses

Hypothesis one

- **H_0**: There are no significant variations in the prevalence of childhood malnutrition across different households.
- **H_1**: There are significant variations in the prevalence of childhood malnutrition across different households.

The hypothesis above examines the variations in the prevalence of childhood malnutrition across different households. It was tested by conducting a multi-level mixed-effects logistic regression, as this study assumed the data was normally distributed within each group. The ICC provides a measure of the proportion of total variability in understanding childhood malnutrition due to differences between households and individuals. The significance of the ICC was assessed using the likelihood ratio test. The likelihood ratio test compared the fit of the model with the ICC to a model without the ICC. The difference in model fit to the chi-square distribution to determine statistical significance were compared, with the p-value set at 95% significance level (α=0.05). Results from the analysis of this data show that the p-value was below 0.05 significance level, therefore the null hypothesis was rejected and concluded that there was a significant ICC, indicating variability at the household level across all indicators of childhood malnutrition.

Hypothesis two

- **H_0**: Individual-level factors such as child's age, birthweight, and ethnicity are not associated with childhood malnutrition.
- **H_1**: Individual-level factors such as child's age, birthweight, and ethnicity are associated with childhood malnutrition.

Hypothesis two tested the relationship between individual child level factors (such as age, birthweight and ethnicity) and childhood malnutrition. This hypothesis was tested using the multi-level logistic regression. The significance of this relationship was tested by examining the p-value corresponding to the estimated odd ratios, with the p-value set at 95% significance level (α=0.05). Results from the analysis show that age, birthweight and ethnicity were associated with all the three indicators (stunting, overweight and underweight) of childhood malnutrition. Therefore, this study reject the null hypothesis in favour of the alternative hypothesis.

Hypothesis three

- **H_0**: There is no difference in the likelihood of childhood malnutrition between children living in rural and urban areas.
- **H_1**: Children living in rural areas are more likely to be malnourished compared to their counterparts living in urban areas.

Hypothesis three tested the relationship between place of residence and childhood malnutrition. The chi-square test and the multi-level logistic regression were used to assess this relationship. The significance of this association was tested by examining the p-value corresponding to the estimated odd ratios, with the p-value set at 95% significance level (α=0.05). The results from this analysis yielded a p-value above 0.05, which implies that there is no sufficient

evidence of an association between place of residence and childhood malnutrition. This means that there is insufficient evidence in the sample to support the alternative hypothesis.

Hypothesis four

- **H_0**: There is no association between maternal education and child malnutrition.
- **H_1**: There is an association between maternal education and child malnutrition.

Hypothesis five

- **H_0**: There is no association between maternal nutrition knowledge and child malnutrition.
- **H_1**: There is an association between maternal nutrition knowledge and child malnutrition.

Hypothesis four and five tested the relationship between maternal education and nutrition knowledge with childhood malnutrition. The chi-square test and the multi-level logistic regression were used to assess the relationship between maternal education and childhood malnutrition. The significance of this association was tested by examining the p-value corresponding to the estimated odd ratios, with the p-value set at 95% significance level (α=0.05). The results from this analysis yielded a p-value above 0.05, which implies that there is no sufficient evidence of an association between maternal education and childhood malnutrition. This means that there is insufficient evidence in the sample to support the alternative hypothesis.

Hypothesis six

- **H_0**: Low household income status is not significant predictor of childhood malnutrition.
- **H_0**: Low household income status is a significant predictor of childhood malnutrition.

Hypothesis six tested the relationship between household income and childhood malnutrition. The chi-square test and the multi-level logistic regression were used to assess the relationship between household socioeconomic status childhood malnutrition. The significance of this association was tested by examining the p-value corresponding to the estimated odd ratios, with the p-value set at 95% significance level (α=0.05). The results from this analysis yielded a p-value above 0.05, which implies that there is no sufficient evidence of an association between household socioeconomic status and childhood malnutrition. This means that there is insufficient evidence in the sample to support the alternative hypothesis.

Hypothesis seven

- **H_0**: There is no association between household size and child malnutrition.
- **H_1**: There is an association between household size and child malnutrition.

Hypothesis eight

H_0: There is no association between food insecurity and child malnutrition

H_1: There is an association between food insecurity and child malnutrition

Hypothesis seven and eight tested the relationship between household size, food insecurity and childhood malnutrition. The chi-square test and the multi-level logistic regression were used to assess the relationship between household size, food insecurity and childhood malnutrition. The significance of this association was tested by examining the p-value corresponding to the estimated odd ratios, with the p-value set at 95% significance level (α=0.05). The results from this analysis yielded a p-value above 0.05, which implies that there is no sufficient evidence of an association between household size, food insecurity and childhood malnutrition. This means that there is insufficient evidence in the sample to support the alternative hypothesis.

In the case of hypotheses 9 and 10, the qualitative data provided rich contextual information and evidence to support the hypothesized relationships between childcare practices, collaboration among different systems, and childhood malnutrition. While we did not conduct formal statistical tests on these hypotheses, the qualitative findings offer compelling insights that can inform future research and policy interventions.

Hypothesis nine

- **H_0**: Poor childcare practices (including socio-cultural and feeding practices) do not influence dietary choices and do not impact childhood malnutrition.
- **H_1**: Poor childcare practices (including socio-cultural and feeding practices) influence dietary choices and impact childhood malnutrition.

Hypothesis nine was evaluated based on the qualitative data collected from the field. Based on the caregiver narratives on childcare from the caregivers and the cause-and-effect evidence on literature as outlined above, this study rejects the null hypothesis.

Hypothesis ten

- **H_0**: Collaboration between family, health, education, and social welfare systems does not positively impact child nutrition outcomes.
- **H_1**: Collaboration between family, health, education, and social welfare systems positively impacts child nutrition outcomes.

Hypothesis ten was tested based on the qualitative data collected from the field. Based on the ECD practitioners' narratives on the importance of the collaboration between family, health, education, and social welfare systems. The available literature as shown above provides evidence

on the importance of multisectoral collaboration to improve children's nutritional outcomes. Therefore, this study rejects the null hypothesis.

5.3. Theoretical and empirical context for the study's research hypotheses

This section provides the theoretical and empirical context that underpins the study hypotheses. The first hypothesis focuses on the prevalence of childhood malnutrition and suggests that there are likely to be variations in malnutrition rates among different households in South Africa. Numerous studies in population studies and epidemiology consistently show variations in childhood malnutrition rates across households and communities (De & Chattopadhyay, 2019; Jain et al., 2021; Nahalomo et al., 2022). These studies often report differences in malnutrition rates based on a complex interplay of socioeconomic, demographic, behavioural, and environmental factors. For instance, Jain et al. (2021) argue that households are embedded within communities and districts, implying that an understanding of childhood malnutrition at a lower level can help policymakers tailor interventions to improve childhood malnutrition within and between populations. This hypothesis supports the established notion that households play a fundamental role in shaping children's nutritional outcomes since they are the foundation of childcare. Based on the UNICEF conceptual framework on maternal and child nutrition, the household can create an environment that fosters the child's survival. The food and nutrition security framework further links the child's survival to the household's assets and economic environment. Bronfenbrenner's ecological systems theory argues that the concept of microsystems provides a framework for understanding the individual's immediate environment (Bronfenbrenner, 1979). In the context of childhood malnutrition, the microsystem includes various elements of the household that influence the child's development and well-being. Disparities in access to nutritious foods can contribute to variations in childhood malnutrition.

The second hypothesis suggests that certain factors at the individual child level, such as age, birthweight, and ethnicity, are associated with childhood malnutrition. Research has demonstrated that children's development varies based on their age, with younger children being more susceptible to malnutrition due to their rapid growth (Gavhi et al., 2020; Govender et al., 2021; Modjadji & Mashishi, 2020). The child's birthweight is influenced by environmental conditions during pregnancy, including maternal nutrition, as well as the first 1000 days of life (Rolland-Cachera et al., 2016). Children born to underweight mothers and those breastfed for longer periods are at a higher risk of being stunted (Chowdhury et al., 2018), highlighting the importance of the maternal antenatal and postnatal period. Children with low birthweight are also more prone to growth faltering and nutritional deficiencies (Nyati et al., 2019b). Based on these findings, our study hypothesizes that infants (<12 months old) have better nutritional status compared to toddlers (1-3 years old) and preschoolers (3-5 years old). This is because infants in the first 6 months of life are primarily breastfed or rely on formula feeding, which provides a well-rounded balance of nutrition, meeting their needs for fats, carbohydrates, protein, and vitamins. As infants transition to solid foods, there is a gradual introduction of nutritious complementary foods along with breastfeeding or formula feeding. Moreover, infants at this age are still reliant on their caregivers and have not yet developed food preferences. On the other hand, when toddlers are considered and preschoolers in comparison to infants, one can infer that they are transitioning from a diet mainly consisting of breast milk or formula to family-consumed complementary foods. This transition is crucial as it has implications for the types of foods children are exposed to. It can be challenging depending on the food choices made by the family, which may be influenced by their access to and affordability of certain foods. Additionally, at this age group, children begin to develop their own food preferences, which can contribute to picky eating habits and pose challenges for caregivers in promoting healthy eating habits (Benjamin-Neelon et al., 2018a). Literature also indicates the risk of nutrient gaps if children are not exposed to a variety of foods.

This can be attributed to diets high in processed or energy-dense foods that lack proper nutrition (Darmon & Drewnowski, 2015; Moreno, 2017; Mushaphi et al., 2017).

The third hypothesis suggests that there are disparities in childhood malnutrition between urban and rural areas. A significant amount of research has been conducted to understand the patterns of childhood malnutrition in both urban and rural settings. According to the social determinants of health, health outcomes are influenced by social, economic, and environmental factors that individuals are exposed to. Several studies consistently show that children in urban areas have a lower risk of undernutrition (stunting and underweight) compared to those in rural areas. However, urban settings may also have higher rates of overnutrition (overweight and obesity). These disparities have been attributed to differences in access to health services, household income, and parental education. The Health Belief Model suggests that health-related behaviours are influenced by perceptions of health risks and the perceived benefits of preventive actions. Therefore, disparities in childhood malnutrition may be related to differences in beliefs, knowledge, and awareness about nutrition and healthcare among caregivers in urban and rural settings. The social environment in which children grow up can protect them against childhood malnutrition. Based on this, I have hypothesized that children living in urban areas have better nutritional outcomes compared to children in rural areas. In some rural areas, dependence on agriculture for livelihood can lead to seasonal variations in income and food availability. This geographical isolation can result in a reliance on the available crops, which can affect dietary diversity and lead to nutritional deficiencies among children. Rural areas face various challenges, including poor infrastructure, limited access to services, low socio-economic status, reliance on social protection programs, and lower parental education. Literature also suggests that the prevalence of childhood malnutrition is higher in rural areas due to rapid urbanization. As a result, the triple burden of childhood malnutrition and the double burden of child malnutrition, which refers to the co-existence of multiple nutrition adversities in one child due to poor nutrition outcomes is observed.

The fourth hypothesis suggests that child malnutrition is associated with lower maternal education and nutrition knowledge. This hypothesis is based on the human capital theory, which argues that education is an investment in an individual's skills and knowledge, leading to increased productivity and improved economic outcomes (Marginson, 2017). Maternal education is considered a key determinant of child malnutrition. Numerous studies have consistently shown that maternal factors, such as education and nutrition knowledge, play a critical role in determining children's nutritional status (Adedokun & Yaya, 2021; Khattak et al., 2017; Mistry et al., 2019). For example, in Pakistan, higher levels of maternal education have been linked to reduced odds of child malnutrition (Khattak et al., 2017). This association is likely due to educated mothers having better nutrition knowledge, which enables them to make informed decisions about feeding practices and healthcare utilization for their children.

This study proposes that maternal education acts as a protective factor against childhood malnutrition. Mothers with higher education levels are not only knowledgeable about feeding practices but also capable of making informed decisions about seeking healthcare for their sick children. On the other hand, women with lower levels of maternal education may be more vulnerable and have limited nutrition knowledge. This lack of knowledge can result in suboptimal feeding practices, including early or delayed introduction of complementary foods, inadequate breastfeeding, and the failure to recognize and address early signs of malnutrition. However, it is also possible that low maternal education can be attributed to economic challenges experienced by women, which may limit their ability to purchase diverse foods that meet their children's nutritional requirements. In resource-constrained households characterized by poverty, maternal nutrition education alone may not be sufficient, highlighting the importance of socioeconomic status in children's nutritional outcomes.

The sixth hypothesis suggests that childhood malnutrition is linked to lower income status. According to the UNICEF conceptual framework on maternal and child nutrition, socio-economic

status, which is often equated with financial resources, is a crucial factor that influences children's nutritional outcomes. Lower socio-economic status is frequently associated with insufficient income, which in turn prevents households from affording nutritious food, living in suitable environments, and accessing healthcare services. The relationship between household socio-economic status and childhood malnutrition has been extensively studied and documented. Researchers argue that socio-economic status, as measured by employment status, income, parental education, and occupation, is a significant determinant of children's nutritional outcomes. Empirical evidence suggests that a higher socio-economic status is linked to a reduced risk of malnutrition, including conditions such as stunting, wasting, and underweight (Caleyachetty et al., 2022; Phooko-Rabodiba & Mbhenyane, 2019; Popkin et al., 2020b).

The seventh hypothesis suggests that childhood malnutrition is related to both larger household size and food insecurity. This hypothesis is founded on the family resource theory, which argues that resources like food and income must be shared among family members. According to this theory, children's malnutrition is not solely the result of individual dietary choices or biological factors, but is deeply influenced by the dynamics and structure of the family system (Aubel et al., 2021; Deepika Sharma and Vilma Tyler, 2021).

Therefore, the idea that larger household size and food insecurity contribute to childhood malnutrition is based on the understanding that resources, including food, are often limited and must be distributed among family members. Food adequacy may pose challenges in larger families. The UNICEF conceptual framework on maternal and child nutrition emphasizes the importance of nutrient-rich foods as the underlying determinants of childhood malnutrition (UNICEF, 2021b). The same framework identifies good diets, which consist of age-appropriate and nutrient-rich foods for children, as immediate determinants of child malnutrition. As the number of family members increases, it is likely that children's access to food and care may decrease (Mulu & Mengistie, 2017; Sisha, 2020), potentially leading to decreased nutritional

food intake and childhood malnutrition. The food and nutrition security framework states that in order for households to achieve food security, there must be access to safe, sufficient, and nutritious foods to meet the dietary needs of children (Committee on World Food Security, 2017). Empirical evidence supports this hypothesis, as studies have consistently shown that children from larger families and food-insecure households are more likely to experience malnutrition. Additionally, the association between household food insecurity and various forms of child malnutrition, such as stunting, overweight, and underweight, has been consistently reported across different geographical contexts (Clarke et al., 2021; Mulu & Mengistie, 2017; Siddiqui et al., 2020; Tebeje et al., 2017). Overall, the evidence strongly suggests that food insecurity is a critical determinant of childhood malnutrition.

The ninth hypothesis suggests that poor childcare practices, including socio-cultural and feeding practices, affect dietary choices and contribute to childhood malnutrition. Several theories and frameworks help us explain this relationship. For instance, the Health Belief Model argues that individuals' health behaviour is influenced by their perceptions of health risks, the benefits of taking action, and the barriers they face (RHIhub, 2024). Poor childcare practices may stem from caregivers' perceptions of health risks, cultural beliefs, and obstacles to adopting optimal feeding practices, ultimately impacting dietary choices, and contributing to childhood malnutrition. The UNICEF maternal and child framework asserts that childcare practices such as age-appropriate feeding, food preparation, and dietary practices are fundamental determinants. However, adequate childcare and nutrient-rich diets are immediate determinants of positive child nutrition outcomes (UNICEF, 2021b). The nurturing care framework highlights the importance of responsive caregiving (UNICEF/WHO/The World Bank, 2018). Various studies have identified several factors that contribute to childhood malnutrition, including inadequate dietary intake, suboptimal breastfeeding, and poor infant and young child feeding (IYCF) practices (Chakona & Shackleton, 2019; Mushaphi et al., 2017; Tydeman-Edwards et al., 2018). In the context of South Africa, low

maternal dietary diversity, low-quality complementary foods, and short duration of exclusive breastfeeding have been identified as key issues related to poor childcare practices (Wrottesley et al., 2021). It also highlights the influence of social circumstances, such as income and cultural beliefs, on maternal eating habits and breastfeeding behavior, indicating that these socio-cultural factors significantly contribute to childhood malnutrition (Chakona, 2020).

The tenth hypothesis suggests that collaboration between family, health, education, and social welfare systems has a positive impact on child nutrition. This hypothesis is based on the understanding that child nutrition is a complex issue influenced by various social factors. It is guided by the Ecological Systems theory, which argues that individuals are influenced by multiple systems, including the microsystem (family), mesosystem (interaction between different systems), and macrosystem (broader cultural and societal influences). The collaboration between education, health, the family, and the welfare system highlight the importance of interconnectedness in addressing childhood malnutrition. Several studies provide empirical evidence supporting this hypothesis. Firstly, research has consistently shown that maternal education plays a crucial role in child nutrition. Mothers' knowledge about nutrition, child care practices, and healthcare-seeking behaviors significantly affect children's health outcomes (Armar-Klemesu et al., 2000; Mistry et al., 2019). Secondly, social assistance programs such as child support grants have been found to improve child nutrition by increasing nutritional intake (Leila Patel, Hochfeld, Ross, et al., 2019). Furthermore, the Community of Practice for Child Wellbeing in South Africa, which involves collaboration between researchers, practitioners, government, and non-government organizations, has shown positive outcomes in child nutrition (L Patel et al., 2022). Additionally, nutrition-sensitive programs that empower women have been proven to enhance child nutrition outcomes (Heckert et al., 2019). Lastly, partnerships between community-level services such as early childhood development centres, local health clinics, the department of social welfare, and

environmental systems responsible for water and sanitation play a crucial role in improving child nutrition outcomes (Sello, Adedini, & Odimegwu, 2023).

Chapter 6: Discussions

6.0 Introduction

This chapter presents the discussion and interpretation of the study's findings, as presented in chapters 4 and 5, and integrates these findings with the relevant literature. The purpose of this chapter is to address the central research topic of this study, which is understanding the social context of childhood malnutrition in South Africa.

This study emerged against the background that childhood malnutrition is a complex health outcome among children, connected to the social context in which they live. The motivation for conducting this study is that childhood malnutrition is a multi-dimensional challenge that encompasses various aspects of society. These aspects are not limited to individual-level factors but also include household-level factors, community factors, socio-cultural factors, care practices, and multi-sectoral dimensions. Considering this context, a brief description of the results is provided while also considering the available literature. Understanding the significance of the social context of childhood malnutrition in South Africa is crucial for several reasons, including: 1) identifying the root causes of malnutrition, 2) designing targeted interventions to address specific individual, household, and community needs to improve children's nutritional outcomes, and 3) drawing lessons from contexts similar to South Africa and learning from those experiences.

To achieve this, the study addressed five specific objectives: First, to determine the levels and patterns of childhood malnutrition in South Africa. Second, to examine the individual, household, and community-level factors associated with childhood malnutrition in the study setting. Third, to investigate the relationship between food insecurity and childhood malnutrition. Fourth, to investigate the influence of socio-cultural practices of caregivers on childhood malnutrition in selected low-income communities in South Africa. Fifth, to investigate how a multi-sectoral approach can be employed to improve child nutritional outcomes in South Africa. By addressing these objectives, this study has shed light on the complex interplay of factors that contribute to childhood malnutrition among children under 5. Therefore, this is achieved through integrating the quantitative results and qualitative findings to provide an in-depth understanding of the social context of childhood malnutrition in South Africa.

6.1 Discussion on the levels and patterns of childhood malnutrition

Following the SDG target 2.2, which aims to end all forms of malnutrition by 2025 (UNSCN, 2017), the study identified alarming patterns of malnutrition characterized by stunting (22.16%), overweight (16.40%), and underweight (5.04%). These findings underscore the urgent need for targeted interventions to address both undernutrition and overnutrition, as childhood malnutrition often coexists within the same communities and households. The levels and patterns of childhood malnutrition in South Africa have not changed much in nearly a decade. This is supported by the findings of the South African Health and Nutrition Examination Survey conducted in 2012, the South African Demographic and Health Survey conducted in 2016, and the National Food and Nutrition Security Survey conducted by the Human Sciences Research Council in 2022 (Shisana et al., 2013; Simelane et al., 2024; STATSSA, 2017a). Data collected by the SADHS show stunting to be 27%, underweight 6%, and overweight 13% (Govender et al., 2021). Recent data from the National Food and Nutrition Security Survey South Africa show that stunting was 28.8, underweight 7.7% and overweight 22.6% (Simelane et al., 2024). When compared to a

neighbouring country such as Namibia, South Africa has a higher prevalence of childhood stunting than Namibia's stunting rate of 22.7%. Although the prevalence of stunting is much higher in other neighbouring countries such as Lesotho (34.6%) and Botswana (28.9%), more work still needs to be done in South Africa to improve child stunting (Development Initiatives, 2022). Additionally, South Africa is far from reaching the global target of a 40% reduction in stunting from the global baseline year of 2012 (UNSCN, 2017). Onis and colleagues (2013) caution against countries merely adopting and implementing global nutrition policies. They assert that countries should consider how their demographic changes, risk factors, and nutrition challenges are influenced by dietary habits and sociocultural practices (De Onis et al., 2013).

The high prevalence of overweight in this study is consistent with the global trends in obesity. Previously, obesity was primarily a challenge in low-income countries (May et al., 2020). However, a study conducted in four low to middle-income countries, including Kenya, South Africa, Malawi, and Ghana, by Kimmel et al. (2019) found that the patterns of malnutrition are changing due to lifestyle changes, economic development, and urbanization. These changes are also attributed to shifts in nutrition. For example, in South Africa, despite having the highest Gross Domestic Product (GDP) among the countries mentioned, the highest rates of obesity (13.3%) were observed among children. On the other hand, Malawi, which has the lowest GDP, had the highest prevalence of stunting (37%) (Kimmel et al., 2019). This suggests that while GDP indirectly affects income levels, it has implications for overweight among children, which is associated with immediate health risks such as type 2 diabetes, high blood pressure, and cardiovascular diseases (Sartorius et al., 2020). Increased income in South Africa can improve access to food and healthcare, which positively impacts children's nutritional outcomes. The study's findings of high stunting and overweight are consistent with another study in the country, which identified the double burden of childhood malnutrition (Modjadji & Madiba, 2019a). This study also revealed that malnutrition is not limited to children under the age of five

but is also a broader household-level challenge. Mothers of children under five also exhibited overweight and stunting, which are predictors of overweight and stunting among their children (Modjadji & Madiba, 2019a). Recent evidence suggests that sub-Saharan African countries are now facing a triple burden of childhood malnutrition, which includes overnutrition, undernutrition, and micronutrient deficiency in the same child (Ahinkorah et al., 2021; Modjadji & Madiba, 2019b; Mudogo & Mwaisaka, 2017). The high prevalence of overweight and stunting found in this study indicates a nutrition transition characterized by diets high in calories and processed foods. Therefore, the government, in collaboration with civil society, needs to address the challenges associated with changing lifestyles due to urbanization. This includes promoting nutrition education among households to ensure a shift towards healthier diets and knowledge of nutritious foods.

6.2 Patterns of childhood malnutrition across different demographic variables

South Africa's demographic transition is characterized by falling birth rates and a stabilizing population. Our study shows a nearly even split between male and female children. This finding is in line with previous research that shows slightly more male children than female children at birth (Adebowale & Palamuleni, 2015; Grech & Mamo, 2020; Nwokocha, 2007). WHO data from the years 1996-2000 on 88,875,750 live births found that factors influencing the sex ratio at birth include natural or man-made causes (Grech & Mamo, 2020). Regarding child malnutrition, these findings show that female children had lower odds of being stunted compared to male children. This finding echoes a national study in the country, as well as other studies in other developing countries, which show that patterns of stunting are more prevalent among boys compared to girls (Shisana et al., 2013; Thurstans et al., 2020). Our quantitative analysis shows that female children have higher odds of being overweight compared to male children. This result is unexpected considering our qualitative findings, where some caregivers expressed the belief that "boys eat a lot compared to girls," leading to overfeeding of male children. Contrary to this study findings,

other studies have found higher rates of childhood malnutrition among female children compared to male children across the indicators of wasting, stunting, and underweight (Ali et al., 2018; Elnadif, 2020). These findings invalidate the supposition that male children are more advantaged nutritionally compared to female children. According to Nshimyiryo et al. (2019), besides issues of nutrition and feeding practices, biological fragility associated with diseases or other exposures may affect the growth of boys. The findings of this study suggest that sex as a determinant for childhood malnutrition is inconclusive. Therefore, while there are sex-based differences in childhood malnutrition in different settings, the literature indicates no consistency in the patterns of childhood malnutrition among sexes. This indicates the importance of paying attention to all children's needs and understanding the context in which they are brought up to guide nutritional interventions.

This study findings show a strong association between age, stunting, and overweight. The null hypothesis that stated that there was no relationship between the child's age and the likelihood of childhood malnutrition was rejected. Within the variable of age, different patterns of malnutrition are observed in the different age groups of children. In our study, children aged 12-23 months exhibit a significantly higher prevalence and higher odds of stunting compared to other age groups. This study reveals that as the age of the child increases, particularly from ages 12-35 months, childhood malnutrition is likely to increase. This result is not remarkable given that this is a prime age group where most children stop being breastfed and complementary feeding resumes. A study of 94 low- and middle-income countries echoes this study findings and maintains that stunting was highest among children aged 0-23 months. Additionally, the 0-23 months age group is particularly at risk due to extended exposure periods to deprivation and a buildup from harmful exposures to infections and malnutrition (Karlsson et al., 2023). Furthermore, Karlsson et al. (2023) found that among children 28 months and older, the prevalence of stunting declined as children caught up on their growth. This means that children who were once stunted before their

second birthday can become non-stunted after turning two years old. A similar study in Indonesia found the same result but attributed the higher stunting among the age group 0-24 months to inappropriate caregiver feeding patterns (Noucie Septriliyana et al., 2022).

This study also found that children aged 0-11 months have a higher prevalence of being overweight and underweight. This finding is supported by a study conducted in South-West Nigeria on a sample of 420 children aged 6-24 months, which shows a link between the child's age, breastfeeding, and childhood malnutrition (Abolurin et al., 2021). This finding suggests the importance of prioritizing early intervention during the mother's antenatal period, where healthcare providers can closely monitor the child's growth and provide appropriate nutritional support. It is important to encourage early life nutrition, as it can have an impact on children's long-term health and nutrition outcomes.

This study shows a higher prevalence of being underweight among children aged 48-59 months. These findings are in line with our qualitative findings, where caregivers did not know when to introduce complementary feeding and when to stop breastfeeding. This confusion may have an impact on the children's dietary requirements. In the qualitative interviews, caregivers mentioned that the last time they had received formal nutritional information was when they were attending antenatal care classes. This highlights the unmet need for nutritional counselling among caregivers in the postnatal period. The findings of this study suggest that children in the age group of 48-59 months have primarily transitioned from diets that were primarily based on breast or formula milk to diets that include solid foods. Therefore, the prevalence of underweight in this age group suggests that malnutrition is persisting into late childhood. If the transition is not well managed, children are at risk nutritionally. Furthermore, inadequate feeding frequency can contribute to malnutrition in this age group. Evidence also shows that it is at this age group that children are growing rapidly and require nutrients and diets high in energy to support their growth. Additionally, at this age group, children are more susceptible to infections and illnesses, which

can also reduce their appetite for food (Madiba et al., 2019; Mkhize & Sibanda, 2020; Modjadji & Madiba, 2019b). Based on these findings, it is important to have community-based initiatives to implement programs that promote the nutritional status of young children and encourage healthy eating habits.

6.3 Discussion of the factors associated with childhood malnutrition.

Among the individual-level factors associated with child malnutrition, our study found that children with a birthweight of 1-2.9 kg were significantly more likely to be stunted and underweight. Conversely, children with a high birthweight were more likely to be overweight. A global analysis on risk factors associated with adverse nutritional outcomes among children under five attributed growth restrictions in utero to antenatal care and the type of diet or nutrition the mother received (Danaei et al., 2016). The mother's dietary patterns and social behaviour during pregnancy influence children's birth outcomes. Consistently, other studies have found that mothers with low birthweight and short stature are associated with having underweight or stunted children. Therefore, interventions should be directed towards pregnant and breastfeeding women (Danaei et al., 2016; le Roux et al., 2020; Nshimyiryo et al., 2019).

In our qualitative assessment, caregivers were asked about their understanding of childhood malnutrition. In their responses, they did not understand how a child's height or weight, particularly when a child is underweight, can be attributed to the food the children ate. However, regarding overweight, some recognized that weight could be due to overfeeding. Some caregivers attributed the child's weight or stature to their religious beliefs, family stature, or family genes. A study conducted in Kenya echoed this study findings that malnutrition was not seen as a health problem but rather a normal part of children's growth outcomes (Muraya et al., 2016). Since malnutrition was not considered a health problem, caregivers did not seek healthcare in a timely manner. Studies have found that delayed healthcare utilization for children can lead to impaired growth and development, a weakened immune system, long-term chronic health conditions, and

the cycle of poverty and malnutrition. This has a negative impact on children's health outcomes, resulting in morbidity and mortality among children under five (Govender et al., 2021; Siddiqui et al., 2020). Studies have identified different motivating factors for seeking healthcare for children under five. According to Ali et al., culture plays a critical role in understanding the causes of diseases, observable symptoms, and appropriate treatments (Ali & Woldearegai, 2019).

The findings highlight the importance of nutrition information. They also emphasize the importance of programs such as momConnect, a program that provides information not only about childcare during the prenatal stage but also beyond the birth of children. This program also offers nutritional education on child health outcomes (Peter Barron et al., 2016, 2018). This underscores the need for nutritional education among mothers of children under five. Our quantitative results found that children in urban formal areas have the highest prevalence of stunting and underweight. However, among rural areas, more children were found to be overweight. A study conducted in North America found that the nutritional status of children in rural areas was influenced by social and cultural variables (Pérez et al., 2023). The context of our qualitative assessment was in rural and urban-township settings. Both communities were characterized by high unemployment rates, dependence on social protection programs such as grants, single parenting, dependence on public health facilities, lower education levels (up to secondary education), perceived low socioeconomic income, and low expenditure on food (expenditure below R1 200).

Besides the high unemployment rates noted above, our results also show that some mothers were discouraged jobseekers. This means that these mothers had given up on looking for employment opportunities, which can contribute to stress. We also found that 80.59% of the children in our sample were recipients of the child support grant. This finding suggests economic vulnerability in the study population. Furthermore, this study found a significant relationship between stunted children and those who were recipients of the child support grant. This finding

suggests that grant-dependent households potentially face challenges in providing adequate nutrition to children under five. Despite this finding, previous research conducted in South Africa found that government grants, including the child support grants, have ameliorated poverty, and these grants have been key drivers for improved child growth outcomes (Leila Patel, 2012). We therefore argue that without the child support grant, the prevalence of child stunting would have been much higher than the findings of this study. Additionally, this finding suggests that the grant amount might not be sufficient to address all aspects of children's nutritional needs. Our results also show high crime rates, such as house break-ins. According to STATSSA (2020), 64% of the population in South Africa is made up of the labour force. However, a destabilizing environment has been created where people cannot get employment as social ills, such as rising crime rates, have been observed. A study conducted in rural Sekhukhune, Limpopo Province, has found that high caregiver unemployment rates and poor household income have exacerbated food insecurity among households, and children under five years are the most affected (Phooko-Rabodiba & Mbhenyane, 2019).

In our qualitative findings, caregivers narrated how they were looking for employment, but because of the lack of opportunities, high inflation rates, and the negative lasting impacts of COVID-19 on jobs, mothers were forced to stay at home. Participants in our qualitative assessment mentioned that besides the child support grant, the newly introduced Social Relief of Distress grant (SRD) was an addition to their source of income. These findings suggest that grants contribute to the economic well-being of households and potentially improve children's nutritional outcomes. While some studies have found caregiver unemployment to be associated with poor child nutritional outcomes (Chakona & Shackleton, 2019; Fagbamigbe et al., 2020; Modjadji & Madiba, 2019a), a study conducted in Egypt contradicts these findings and asserts that maternal employment is associated with a negative impact on the child's nutritional outcomes. This study

further asserts that the mother's net income does not offset the time lost for childcare (Rashad & Sharaf, 2019).

Our quantitative findings also revealed that caregivers exhibited high levels of depressive symptoms. The nurturing care framework demonstrates the connection between caregiver mental health and parenting practices, such as the ability to provide adequate care, attention, and support for children's nutritional needs (UNICEF/WHO/The World Bank, 2018). Qualitative findings that shed light on this outcome indicate that most of the interviewed mothers were single mothers who often relied on the child support grant of R510. Research has shown that maternal autonomy, encompassing household decision-making, freedom of movement, and control over economic resources, is associated with improved nutritional outcomes in children. However, single mothers may experience limited autonomy due to economic constraints and societal norms, which could potentially impact their children's nutrition (Paul & Saha, 2022; Saaka, 2020). Furthermore, this study found that mothers primarily served as caregivers for children under 5. In the absence of mothers, children received care from other individuals within the household, with fathers and grandparents being the next available sources of support. Nevertheless, some caregivers did not receive any additional assistance in childcare, resulting in 33.04% of children having no other caregiver. Our qualitative findings underscore the importance of social networks in childcare. Caregivers mentioned the benefits of having someone to help them with childcare in their absence. While some caregivers expressed concerns about the diet of their children when they were not present, others felt comfortable with other household members caring for their children in their absence. These findings indicate that single mothers bear the sole responsibility for childcare and household management, often face lower income levels, and may struggle to afford nutritious food, leading to higher rates of malnutrition among their children. A study conducted in Indonesia also found that psychological distress among caregivers was associated with socio-economic factors, low education, low employment status, and originating from a rural area, all of which had an

impact on children's linear growth and stunting (Susiloretni et al., 2021). This study found that most children who were of creche-going age (24-59 months) were cared for at home during the day. The high unemployment rate among caregivers can also explain why they chose to keep their children at home instead of sending them to creches. However, studies have shown that children cared for at home are at a higher risk of obesity due to excessive screen time, parental unemployment, poverty, and lack of nutritious foods (Ansuya et al., 2018; Topothai et al., 2022).

In South Africa, the government regards creches as private entities. While creches in low-income settings with children who receive the child support grant can qualify to apply for the ECD nutrition grant of R17 per child, parents still need to pay fees for their children to attend creches. ECD practitioners have mentioned that they charge between R150 - R500 for fees, with rural creches charging the lowest amount, R150 – R200 per child, per month. This finding raises questions about potential barriers preventing children from attending creches or ECD facilities. These barriers could be related to affordability and accessibility. Our results also show a significant relationship observed among underweight children in school (Grade R or Grade 1). This finding suggests the importance of early identification of malnutrition and intervention. Detecting these signs in the early years can allow for timely support, potentially preventing future deterioration. Previous studies confirm that children who go to school or are in ECD centres are better off nutritionally. This is because children benefit from school nutrition and school feeding programs, where meals are regulated to have certain nutritional values, thus improving their nutritional status (Graham et al., 2018; Tomlinson, 2007). The National Planning Commission adopts a youth lens in understanding the challenges faced by young people. Among the planned interventions is ensuring that children are exposed to at least two years of early childhood (NDP, 2011).

The 2030 National Development Plan aims to ensure that all people in South Africa have access to clean and running water throughout the country. However, our qualitative findings reveal that areas such as GaMasemola and Thulani continue to experience water shortages or unplanned

water cuts. There is a reliance on communal taps that are only open on specific days of the week. This study findings indicate that environmental challenges, such as water shortages and electricity outages, have been identified as affecting hygiene, food preservation, and overall nutrition. These challenges disproportionately impact both urban and rural areas, highlighting the need for targeted interventions to ensure consistent access to essential resources. Studies have shown that water scarcity can result in inadequate sanitation and hygiene, thereby increasing the risk of diarrheal diseases and other infections that can contribute to malnutrition (Ansuya et al., 2018; Toma et al., 2023). Previous studies have also demonstrated that people in rural areas engage in food gardening; however, water scarcity can hinder food production, leading to food insecurity and limited access to nutritious diets (Ansuya et al., 2018; Edokpayi et al., 2018).

6.4 Childhood malnutrition by household level factors

The results of our study revealed that the variation in child malnutrition across households was slightly higher for overweight (38.3%), followed by underweight (33.9%) and stunting (30.2%). This variation, measured by the ICC as shown by model 4 in tables 4.9, 4.10, and 4.11, has been commonly observed in various studies using multi-level analysis on child health outcomes (Adedini et al., 2015; Amegbor et al., 2020; Ayele et al., 2022). This study findings support a study conducted in India, which found that childhood malnutrition studies often focus on neighbourhoods and districts, neglecting households as a unit of analysis. The study by Jain and colleagues (2021) found that excluding the household level from the models led to an inflation in the variance estimates among children and communities. Additionally, they found that households played a significant role in children's malnutrition status, including stunting, wasting, underweight, and overweight (Jain et al., 2021).

Bhavnani et al. (2023) argues that when identifying household factors contributing to childhood malnutrition, it is important to promote behavioural changes among households to reduce vulnerability. However, a study on nutrition programs in Nigeria found that addressing

childhood malnutrition required moving away from using theories and focusing on dealing directly with the social determinants that contribute to adverse health outcomes. The same study also emphasized the need to consider environmental and socioeconomic impacts, rather than solely focusing on health literacy promotion (Akpan, 2017).

Our qualitative findings revealed that the COVID-19 pandemic has exacerbated food insecurity in households, resulting in insufficient access, availability, affordability, and utilization of foods to meet the dietary needs of the households. These findings align with a study conducted in South Africa during the peak of the COVID-19 pandemic, which assessed the socio-economic impacts of the pandemic on child hunger over time. The study found that the burden of hunger increased at the start of the pandemic, with urban households experiencing the highest levels of child hunger (Alaba et al., 2022).

6.5 The relationship between Food Insecurity and Childhood Malnutrition

Higher-income households are often associated with better nutrition. However, this study findings reveal instances where higher-income households have higher rates of underweight and stunted children under the age of 5. Although our quantitative data identified some differences in childhood malnutrition rates based on socioeconomic income and food spending categories, these differences were not statistically significant. Most households in our study consisted of 1-2 people or 3-4 people. Approximately half of the households had low incomes, with a third of them spending less than R800 on food. According to Statistics South Africa, nearly half of the children are considered monetarily poor, as their families spend below the food poverty line of R760[9] (STATSSA, 2023). Previous studies have shown that household income and size can impact food insecurity (Chakona & Shackleton, 2019; Chandrasekhar et al., 2017; Naicker et al., 2015).

[9] The food poverty line refers to the minimum amount of money required by an individual to afford the basic daily energy intake.

Although our study did not find a statistically significant relationship between large household size and malnutrition, we observed that households with more members had a higher percentage of stunted and overweight children. Previous research has indicated that children face multiple deprivations in their personal lives and households. In addition to lack of income, these deprivations include social exclusion in health and education, poor living standards, and living in poverty-stricken households with high rates of caregiver unemployment (de Milliano & Plavgo, 2018; Omotoso & Koch, 2018; von Fintel, 2021).

The lack of statistical significance in some results is unexpected, as the literature consistently documents that children from lower socioeconomic backgrounds are at higher risk of malnutrition. The literature also demonstrates associations between low socioeconomic status, low food spending, and food insecurity (Berra, 2020; Phooko-Rabodiba & Mbhenyane, 2019). This study findings suggest that, based on this data, there is insufficient evidence to conclude that socioeconomic income, food availability, or food spending significantly impact child malnutrition outcomes in the study population. However, the qualitative findings present contradictory evidence, as mothers expressed a perceived lack of economic access to affordable, safe, and nutritious foods, which ultimately affects children's nutritional outcomes. Additionally, mothers reported that the COVID-19 pandemic has further exacerbated their socioeconomic status due to job losses, travel restrictions, rising food prices, and the closure of Early Childhood Development (ECDs) centres. The qualitative findings of this study also revealed that mothers possess knowledge about the types of nutritious foods that should be given to children but face difficulties purchasing them due to financial constraints. The SANHANES study found that the average diet in South Africa is micronutrient poor and energy-dense, indicating that South Africans consume excessive amounts of calorie-rich foods. Aboud (2011) explores how cultural differences exist in dietary preferences and perceptions of how certain foods impact health. Overall, these findings

indicate that cultural viewpoints and dietary choices have a significant impact on childhood malnutrition.

The findings of this study show that children who are cared for at home during the day have worse nutritional outcomes compared to children in creches or at school. These findings suggest a potential link between childcare practices and nutrition. Children who are cared for at home may be exposed to different feeding practices, dietary patterns, or care routines that could contribute to poorer nutritional status. Additionally, the nutritional disparity between children in different childcare settings (home, creches, or school) highlights the importance of considering the impact of the environment in which children spend their daytime hours. These results also suggest that children in creches or schools may have better access to structured meals or nutritional support compared to those at home. This emphasizes the importance of ensuring that all childcare settings, including home-based care, provide access to balanced and nutritious meals to support children's growth and development. Similar studies have also highlighted deficiencies in the diets of children under five who are cared for at home. These diets lack essential nutrients and include foods high in sugar and fats, with a shortage of fruits and vegetables, unhealthy take-away foods with excessive salt, and carbonated sugar-sweetened drinks (Benjamin-Neelon et al., 2018b; Chakona, 2020; Yue et al., 2016). However, some authors argue that childhood malnutrition is not solely a result of poor eating habits. Instead, it is a challenge that arises from commercial practices, leaving families and children with limited options for food choices (Lutchman, 2022; Mkhize & Sibanda, 2020). Studies have found that food insecurity among households underscores the importance of an adequate and consistent supply of food for a child's growth, development, and nutritional outcomes. Although South Africa has enough available food and is a net exporter of food, challenges related to access and affordability persist for many households due to factors such as high unemployment rates and low-income levels. In their study, Jennifer and colleagues found that

food insecurity in households can disrupt eating patterns among children, exposing them to unhealthy, energy-dense foods (Aiyer et al., 2019).

6.6 Discussion on socio-cultural and childcare practices

Understanding the influence of socio-cultural and childcare practices on children's nutritional outcomes is important. Our quantitative results demonstrate a significant relationship between ethnicity and being overweight, with Nguni children having higher odds of being overweight. Some studies offer a plausible explanation for this finding, stating that among Nguni ethnic groups, particularly the Zulu-speaking cultural groups, being overweight is considered the norm. This is particularly prevalent among females. Older Zulu women argue that males prefer women who are "thick" rather than slim, so girls are overfed from a young age (Kassier et al., 2019; Ogana & Ojong, 2013).

This study findings reveal the impact of sociocultural practices on childhood malnutrition. Traditional gender norms, which favour boys over girls, contribute to differential treatment and nutritional disparities. However, some mothers indicate a shift in perspectives, emphasizing evolving attitudes toward sex preference in childcare practices. Studies have shown that cultural differences significantly influence dietary preferences, which in turn affect childhood malnutrition. In South Africa, a similar study found that customs and social factors cause inadequate maternal nutritional diversity and suboptimal infant and young child feeding practices. This includes young mothers' beliefs about breastfeeding and indigenous food preparation methods, resulting in children consuming low-quality diets (Chakona, 2020). This study also found that certain foods like eggs and dairy products are not given to girl children because of the belief that they cause faster growth. This finding aligns with evidence from previous studies, which argue that food taboos[10] contribute to the undernutrition of caregivers and children under 5 years old

[10] Food taboos refers to the non-consumption of certain foods because of cultural, ethnic or religious beliefs.

(Otoo et al., 2015; Ramulondi et al., 2021; Shwetha, 2017). In similar contexts to South Africa, some women have reported not providing certain healthy foods to their children due to perceived "safety" concerns. For example, in Zambia, eggs are believed to cause baldness, while in Ghana, eggs are avoided because of the perception that they cause overweightness among children (Arzoaquoi et al., 2015; NC et al., 2015). With regards to childcare practices, this study findings highlight the importance of responsive child caregiving in children's nutritional outcomes. It was clear that caregivers had different approaches to how and when they fed their children, including a combination of breastfeeding and formula milk. This is contrary to the World Health Organization's recommendation of exclusive breastfeeding for the first six months of life (World Health Organization & UNICEF, 2017). Furthermore, this study findings show that caregivers often initiated solid foods much earlier due to the belief that children were getting hungry, thereby justifying early complementary feeding.

According to the Global Nutrition Report, South Africa lacks sufficient data to evaluate the country's progress towards meeting the global target of exclusive breastfeeding for 50% of infants (Global Nutrition Report, 2020). Current prevalence data indicates that only 31.6% of infants aged 0-5 months were exclusively breastfed. In contrast, a study conducted in Ethiopia found that insufficient breast milk was associated with the early introduction of complementary foods[11]. This same study attributed conditions such as stomach distension in some children to flaws in how their mothers cared for them (Degefa et al., 2022).

Numerous studies have emphasized the importance of the maternal prenatal period and the first 1000 days in determining the nutritional status and overall health outcomes of children (AL-Zwaini et al., 2020; de Groot et al., 2022; UNICEF, 2021b). Additionally, a study in Tanzania discovered that cultural practices, such as pre-lacteal feeds and plain maize meal porridge,

[11] Giving newborn babies any substance other than breast milk

contradict the WHO's recommendations on child feeding, potentially contributing to childhood malnutrition (Mwaseba et al., 2016).

Our qualitative findings revealed that mothers were uncertain about when to start introducing solid foods to their infants due to the influence of other family members, such as grandparents and parents, within the household. This uncertainty appears to arise from conflicting advice received from these family members, suggesting that family dynamics play a significant role in decision-making regarding infant feeding. A study conducted in the Western Cape Province of South Africa provides a possible explanation for this study findings. This study discovered that complementary foods were introduced as early as 2 months, with 34% of infants receiving them before reaching six months of age. Furthermore, the study found that the majority of children under five years old (76.5%) were primarily given cereal as their food source (Ikobah et al., 2023).

While this quantitative analysis did not specifically focus on complementary feeding, previous studies on childhood malnutrition have revealed that early introduction of complementary foods is associated with younger maternal age, low socioeconomic status, limited maternal education, early return to employment, and caesarean delivery (Modjadji & Mashishi, 2020; Tang et al., 2015; Toma et al., 2023). Similar studies have also demonstrated that the early introduction of complementary foods is linked to various adverse health outcomes in children, such as type 1 diabetes, undernourishment, and overweight (Tang et al., 2015; Virtanen et al., 2013). Conversely, a study conducted in India found that delayed introduction of complementary foods, as well as a lack of dietary diversity and improper food preparation, contributed to child malnutrition (Davey et al., 2015). These findings suggest that there may be broader societal issues or cultural norms influencing early feeding practices, which in turn contribute to child malnutrition. This analysis showed that most caregivers demonstrated knowledge of the types of diets their children needed - a balanced diet including fruits, vegetables, protein, dairy, and starch. However, the mothers in our study reported that they did not receive any nutritional counselling after pregnancy.

Additionally, in our study, mothers stated that if their children showed signs of malnutrition, nurses at clinics would criticize them, stating their children were either too short, underweight, or overweight, but no actions were taken. It is known that nutrition knowledge and counselling can improve a mother's understanding and habits regarding optimal feeding practices for children (Mistry et al., 2019). According to Motebejana et al. (2022), nutrition knowledge is a determining factor in feeding practices. Further, nutritional knowledge can enhance caregivers' ability to provide diverse and appropriate foods for their children (Motebejana et al., 2022). A cross-sectional study conducted in Northern Bangladesh found that mothers who received nutritional training had children with a lower prevalence of stunting, wasting, and being underweight. This study also suggests that both government and non-government organizations should invest in expanding nutritional programs that specifically focus on training mothers in their children's nutrition (Hossain & Hossain, 2022).

The incidence of childhood malnutrition is also influenced by caregiving practices related to healthcare utilization during childhood illness. Our results indicate that one-third of caregivers did not seek immediate care when their children were ill. The main reason given was that the child's illness was not severe enough. This finding suggests a potential risk of complications or worsening health conditions. Furthermore, the mothers' perceptions of the child's illness reflect a subjective assessment of the severity of the illness. This may indicate gaps in health literacy and awareness among mothers regarding the signs and symptoms of childhood illness. Studies have shown that timely health-seeking behaviour is crucial in childcare practices. These studies confirm that delayed health-seeking can exacerbate children's health status (Adedini et al., 2020; Degefa et al., 2022; Mabetha et al., 2021),

This study revealed that most children relied on public health services for healthcare, while only a small percentage (6.91%) sought private medical care. Additionally, the study found a significant association between the lack of medical aid and stunted growth. Qualitative findings

indicated that caregivers expressed dissatisfaction with the quality of care provided at local clinics, highlighting potential issues. This dissatisfaction may act as a substantial barrier to seeking healthcare, resulting in delayed or inadequate treatment for childhood illnesses, ultimately contributing to malnutrition. Caregivers' reluctance to use local clinics due to perceived deficiencies in services suggests obstacles to access. Therefore, it is crucial to identify and address these barriers, such as medication shortages, inconsistent healthcare provision, and limited access to vaccinations, to improve the utilization of public health services and prevent malnutrition. Another study on healthcare utilization in low-income settings identified major barriers including poverty, long queues, limited access to health facilities, and a lack of awareness regarding the severity of illnesses (Adedini et al., 2020). Ali and Woldearegai (2019) offer a plausible explanation for this study findings, arguing that individuals seek help not only for their own interests but also due to community identity shaped by experiential, cultural, and personal factors. The diagnostic report conducted by the commissions revealed an unequal distribution of public services, with poor quality in certain areas, including the public health system, failing to meet public demands (NDP, 2011).

6.7 Discussion on the multi-sectorial approach for improving child nutritional outcomes.

The social determinants of health refer to the circumstances in which people are born, raised, employed, and age. The qualitative findings of this study provide insights into family care systems, health systems, environmental systems, and social systems and how these various levels/systems can synergize to ensure better nutritional outcomes for under-5 children in South Africa. Within the family care system, this study has observed multiple factors that influence childhood malnutrition. These factors include low socioeconomic status, low levels of higher education, and high levels of unemployment. Previous studies have already established that social determinants of health have a significant impact on health outcomes. These studies support this study findings

and underscore the importance of collaboration between sectors to improve children's health and nutritional outcomes (Amri et al., 2022; Jain et al., 2021; Tette et al., 2016). Furthermore, the World Health Organization has previously emphasized the importance of understanding the social determinants of health as a basis for forming multisectoral collaborations. This collaboration is based on the recognition that the nutritional outcomes of children cannot be addressed in isolation (WHO, 2023b).

This study findings also indicate that different childcare systems operate independently and lack integrated coordination to meet children's needs. This lack of coordination suggests that childcare services are fragmented, with each system functioning in isolation (Bennett et al., 2018; De Onis et al., 2013). Studies have shown that the fragmented nature of childcare systems may contribute to communication barriers among different sectors. Additionally, poor communication can have long-lasting negative effects, including a lack of information sharing, missed opportunities for collaboration, and challenges in addressing the root causes of childhood malnutrition holistically (Klemm et al., 2022; Reinhardt & Fanzo, 2014; Sello, Adedini, & Odimegwu, 2023).

In South Africa, the National Development Plan recognizes the need for a multidimensional framework to promote national development (NDP, 2011). Therefore, the UNICEF framework on the causes of undernutrition and the food and nutrition security framework used in this study are relevant for understanding the social context of childhood malnutrition. In terms of multisectoral collaboration, the UNICEF framework emphasizes the integration of childcare and services, while the food and nutrition security framework highlight the importance of ensuring access to safe and nutritious foods (FAO, 2000; UNICEF, 2021b).

With regards to childcare systems, this study findings show that ECD practitioners face challenges in the referral process, highlighting barriers to accessing healthcare services for young

children. Shortages of medication and jurisdiction-related issues impede timely and effective healthcare, which in turn contributes to delayed or inadequate treatment for conditions that could lead to malnutrition. This study findings highlight the issues South Africa faces in confronting childhood malnutrition. Although there have been efforts directed at improving childhood malnutrition through multi-sectorial approaches, such as the implementation of the Nutrition Roadmap introduced from 2013 to 2017 in the country, challenges still exist (DoH, 2013). This is because the responsibility of caring for children under-five overlaps among caregivers and other government departments, including the Department of Health, Social Development, and Department of Basic Education (DSD, 2019).

In contrast, the issue of nutrition, which affects children's care and nutritional outcomes, is treated differently in other contexts. For example, in Zambia, the National Food and Nutrition Commission (NFNC) was a statutory Board under the Ministry of Health. However, in 2015, it was moved to the Office of the Presidency because of the importance of food and nutrition. This move was critical and strategic, aiming to: 1) increase focus on the multisectoral approach, gaining cooperation from sectors such as education, agriculture, social welfare, and education; 2) gain political commitment and visibility, ensuring that the NFNC is closer to the center of power and shows heightened commitment to improving nutrition across the country; and 3) address the issue of "silos" and go beyond sectorial divides to increase nutrition-related efforts across different government departments (Harris et al., 2017).

Regarding health services, our study has shown that the involvement of ECD practitioners and nurses in health and nutritional screening of children exemplifies the potential benefits of a multisectoral approach. This finding highlights the interconnectedness of the health sector and ECD in understanding childhood malnutrition. Collaborative efforts between these sectors are crucial for a comprehensive approach to child well-being, encompassing both health and developmental aspects. The high dependence on public health services underscores the importance

of a robust and well-functioning public health system. A study conducted by Tontisirin and Bhattacharjee (2008) supports this study findings and advocates for the importance of community-based solutions to improve children's nutritional outcomes. They further assert that in order to develop programs that improve nutritional outcomes, communities need to be involved in the entire process to ensure an equitable and sustainable basis (Tontisirin & Bhattacharjee, 2008). With regards to environmental systems, this study identified challenges in accessing water. In places like Soweto, water cuts occasionally occur, while areas like GaMasemola lack sufficient water altogether. Research has demonstrated that the lack of access to clean and adequate water directly impacts nutrition. This lack of water also violates the South African Bill of Rights, which guarantees the fundamental right to access food and water. Water is essential for hygiene, food preparation, and overall health. Insufficient water availability can compromise caregivers' ability to maintain proper sanitation and hygiene practices, which in turn affects children's nutritional status. Poor sanitation can lead to infections and illnesses, further exacerbating the nutritional well-being of children (Edokpayi et al., 2018; Tofail et al., 2018). Effective collaboration across multiple sectors is crucial in addressing both the immediate water scarcity and the subsequent health impacts. The absence of announcements about water closures suggests a breakdown in communication between the municipality and the community. Developing robust early warning systems and communication channels is vital. This requires collaboration between local government, health authorities, and community leaders to ensure that timely and accurate information reaches residents.

The 2013 series of maternal and child health series initiated by the Lancet has identified that in multisectoral collaborations, there was a lack of inclusion of one of the most important factors such as hygiene, water and sanitation (Kim et al., 2020). In a randomised control trial in Pakistan, households which received soap and received promotion on handwashing had children with higher development compared to children whose homes did not receive an intervention (Tofail et al.,

2018). Studies have reported poor hygiene, poor water quality and poor sanitation to be associated with poor child health outcomes such as children getting exposed to cholera, diarrhoea and intestinal worms (Farah et al., 2021; Mshida et al., 2018; Tofail et al., 2018). Caregivers also expressed their concerns about the lack of electricity. This was not only attributed to power cuts but in Soweto, some parts of the community of Thulani had not been paying for services, resulting in the power supply cutting them off. This has had an adverse impact on the food storage and food preparation. The is also a high risk of foods being spoilt because of the lack of refrigeration capacity. Refrigeration is crucial for preserving perishable foods and preventing spoilage. In the absence of reliable electricity, caregivers may face challenges in ensuring food safety and maintaining a diverse and nutritious diet for children. The risk of foods being spoiled due to the lack of refrigeration capacity can compromise the nutritional quality of the diet provided to children. Spoiled foods may not only be unsafe for consumption but can also lead to a reduction in the variety of foods available, limiting the child's access to essential nutrients.

The lack of electricity can significantly impact caregivers' ability to store and prepare food, which is crucial for preserving perishable items and preventing spoilage. Without reliable electricity, caregivers may face challenges in ensuring food safety and providing a diverse and nutritious diet for children. The issue of communities not paying for services, leading to power supply cutoffs, highlights the need for community-level solutions. Multisectoral collaboration involving local governance, community leaders, and energy providers should be pursued to develop sustainable and equitable solutions for ensuring electricity access for all, particularly vulnerable populations like children.

This study findings indicate that only half of the caregivers had access to media coverage. The different type of media coverage being referred to were television, radio, newspapers, online sources and cell phones. Studies have shown that digital media can enhance caregivers' nutritional knowledge through targeted educational interventions, food access and best practices related to

child nutrition (Clarke et al., 2021; Motebejana et al., 2022). A study conducted in low-income settings, such as India, revealed that people suffer from various health-related conditions regardless of their socio-economic status. Caregivers primarily obtained their nutritional knowledge from their mothers or grandmothers. This finding suggests an opportunity for multisectoral collaboration to support community-based education programs. By collaborating with healthcare professionals, community leaders, and educational institutions, the reach and effectiveness of nutritional education initiatives can be enhanced to meet the specific needs of the community. According to Kuruvilla et al. (2018), media can serve as a platform for information exchange. When used correctly, it can be a valuable resource for facilitating coordination and promoting multisectoral collaboration to improve children's nutritional outcomes. A study in India demonstrated that various media platforms can be targeted to address specific issues through a two-way communication approach, which allows for feedback.

Chapter 7: Conclusions and recommendations

7.0 Conclusions

In conclusion, this study analysed data from the NIDS study, which involved 2,966 mothers and their children, providing a comprehensive understanding of the social context influencing children's nutrition, health, care, and overall well-being. The findings from the study shed light on the complex interplay of demographic, socio-cultural, care practices, economic, and healthcare-related determinants.

The prevalence of childhood malnutrition, including stunting and overweight, highlights the urgent need to address nutritional challenges in South African communities. Cultural beliefs, such as attributing child growth to genetics and religious beliefs, contribute to different perceptions of malnutrition. The study also found that factors such as gender, age, birth weight, ethnicity, and healthcare-seeking behaviour significantly influence child malnutrition outcomes.

The study's multi-level logistic regression models demonstrate the nuanced relationships between individual, caregiver, and household factors, underscoring the importance of considering various dimensions in understanding childhood malnutrition. Maternal age, education, employment, household size, and maternal depressive symptoms emerged as influential factors. Qualitative insights further deepen our understanding of the impact of socio-cultural and childcare practices on children's nutritional well-being, highlighting traditional gender norms, gaps in feeding practices knowledge, and the influence of caregiving arrangements on malnutrition.

The study also explores the impact of food insecurity, challenging traditional expectations by revealing that higher socio-economic income is associated with increased odds of children being overweight. Qualitative insights shed light on the significant impact of the COVID-19 pandemic on households, emphasizing the vulnerability of families to external shocks and the importance of adaptive strategies in coping with food insecurity.

The final objective investigates the potential of a multi-sectorial approach to improve child nutritional outcomes. The study identifies key areas for intervention, including family care systems, health services, environmental conditions, early childhood education, and social welfare. The findings underscore the need for targeted interventions that address cultural barriers to healthcare utilization, improve knowledge dissemination on feeding practices, and enhance access to healthcare services, particularly in Early Childhood Development (ECD) centres.

In summary, this study provides a comprehensive understanding for designing and implementing effective policies and interventions aimed at improving child nutritional outcomes in low-income communities in South Africa. The multi-faceted nature of the findings emphasizes the importance of a holistic, multi-sectorial approach that considers cultural, economic, healthcare, and environmental factors to address the challenges associated with childhood malnutrition.

7.1 Strengths and Limitations

Strengths

The use of a sequential explanatory research design, which combines both quantitative and qualitative methods, provides a comprehensive understanding of the social context of childhood malnutrition. This approach allowed the researcher to explore patterns and relationships quantitatively, while also gaining a deeper understanding of the narratives that influence childhood malnutrition through qualitative inquiry. The advantage of using mixed methods is that the study benefits from the strengths of both quantitative and qualitative methods. This means that while the quantitative methods allowed for generalization and identification of levels and patterns of childhood malnutrition, qualitative data provided a rich understanding of caregivers and children's lived experiences, perceptions, and socio-cultural practices related to childhood malnutrition. Furthermore, the qualitative research enhanced the quantitative analysis, addressing questions that could not be fully answered by quantitative methods alone, such as socio-cultural and childcare practices.

In the qualitative component of the study, the use of structured topic guides in in-depth interviews ensured that key themes related to childcare practices, understanding of child malnutrition, socio-cultural practices, food insecurity, and the role of ECD practitioners were systematically covered. This structured approach-maintained focus while allowing for flexibility. Additionally, the use of focus group discussions provided an additional advantage to the richness of the data collected. This is because the focus group discussions provided a platform for caregivers with similar backgrounds to share experiences and perspectives. This group experience allowed the researcher to observe how caregivers influence each other and added to the understanding of childcare practices and childhood malnutrition. This study also integrated the quantitative and qualitative findings to better understand the research problem, allowing for the results to be presented and interpreted jointly. The sequential research design allowed the researchers to formulate research hypotheses based on quantitative findings and further explore these findings through qualitative research.

Another strength was that the data was analysed at two levels: the individual child level and the household level. The merging of different datasets provides a holistic view of the factors influencing childhood malnutrition, acknowledging the interplay between individual and household level factors. Additionally, because households were nested within communities, the inclusion of interviews with ECD practitioners provided evidence from a community level perspective.

Limitations

This study has several limitations that impact its generalizability and interpretation. The five-year gap between qualitative and quantitative data raises concerns about the influence of intervening events, such as the pandemic. These limitations can be broadly categorized into those related to data collection and analysis, and those related to study design and scope. The five-year gap between qualitative and quantitative data collection phases raises concerns. Firstly, the

qualitative data were not collected from the same respondents used for the quantitative component. Notwithstanding, the qualitative data furnished additional insights on the social context of childhood malnutrition which the quantitative data could not provide. Secondly, concerns are raised about the impact of intervening events, such as the COVID-19 pandemic, on child nutritional outcomes.

The presence of missing observations in some variables and outcome measures could introduce bias, particularly if the missing data is not random. As a secondary analysis of existing data, the study had limited control over variables. This resulted in the use of proxy measures for key concepts like food security, potentially compromising accuracy. Additionally, important variables like breastfeeding practices and child healthcare utilization were not included due to limitations in the original data. The cross-sectional nature of the data restricts the ability to capture dynamic changes over time and establish causal relationships between variables. Small sample sizes limit generalizability and statistical power. The use of clustering from the 2011 South African Census limited the availability of community-level variables that could have provided valuable context. The purposive and snowball sampling techniques used in the qualitative component may have introduced selection bias by excluding caregivers who did not meet specific criteria. Additionally, limited community-level variables, sampling methods in the qualitative component, and the focus solely on mothers and caregivers restrict the comprehensiveness of the study. Finally, unexplored factors like maternal diet and children's physical activity may play a role in understanding the prevalence of overweight children. Considering these limitations is crucial when interpreting the findings and drawing conclusions. Future research should employ longitudinal designs, utilize more comprehensive data collection methods, and include a wider range of participants and perspectives.

7.2 Policy implications and recommendations

The study findings have important policy implications. Firstly, this study shows a high prevalence of stunting and overweight among children under 5. With the current levels of stunting and overweight in the country, South Africa is not on track to achieve sustainable development goals 1-3, which include eradicating poverty, ending hunger, and promoting good health and well-being. Without relevant and timely interventions to address childhood malnutrition, it will be unrealistic for South Africa to achieve SDGs 1-3 by 2030.

Secondly, childcare arrangements play a crucial role in improving children's nutritional outcomes. Children who are cared for at home are experiencing negative nutritional outcomes. Additionally, given the high unemployment rates among caregivers and increased poverty levels in households, there is a need for support programs for parenting. Caregivers should be empowered with skills to enhance their livelihood activities and income-generating opportunities. This could involve government initiatives to promote education, employment, vocational training, and entrepreneurship. These measures can also help reduce poverty and dependence on social grants.

Thirdly, because caregivers often lack knowledge about when to start weaning their children, programs should be established to educate caregivers about appropriate childcare practices and provide information on available resources to improve child health outcomes. This could include educational campaigns, workshops, and support groups that focus on optimal feeding practices, early childhood development, and health-seeking behaviours.

Fourthly, the study recommends further exploration of child feeding practices and beliefs across various cultural contexts. This would include qualitative studies to document child feeding practices that would document evidence on feeding habits, beliefs and attitudes on food. Additionally, these studies should investigate how cultural beliefs influence dietary choices and perceptions of malnutrition. Such studies would provide valuable insights that can help address malnutrition more effectively by aligning health interventions with cultural realities.

Fifthly , policies that hold fathers accountable for childcare should be strengthened. These policies should also promote gender equality within families and communities. Gender awareness campaigns and community engagement initiatives can be implemented to challenge traditional gender norms and ensure equal treatment of boys and girls.

Sixthly, there should be implementation and support for multisectoral collaboration involving health, education, social welfare, and environmental sectors. A central department could be established to facilitate integrated efforts in addressing the complex determinants of childhood malnutrition and to hold these departments accountable for service delivery.

Seventhly , improving access to healthcare services, especially in low-income communities, should be a priority. Policies should focus on increasing the frequency of healthcare practitioner visits to Early Childhood Development (ECD) centres, providing growth monitoring, nutrition assessments, and vaccinations.

Eighthly , environmental challenges affecting nutrition, such as water shortages and electricity cuts, should be addressed. Policies should focus on improving infrastructure, waste management, and ensuring consistent access to clean water and electricity in both urban and rural settings.

Ninthly , there should be encouragement and funding for longitudinal studies to track the impact of childhood malnutrition on long-term health outcomes. Policies should support research initiatives that provide valuable insights into the long-term consequences of malnutrition and inform targeted interventions.

Tenthly , the registration process for ECD centres should be streamlined to ensure that eligible centres can access the government nutrition grant (R17-a-day). Additionally, the nutrition grant should be increased to account for rising food costs. This could involve addressing compliance issues and providing support to centres during the application process.

The eleventh priority is that, ECD centres should be made accessible based on the findings which show that unregistered centres and children cared for at home are disproportionately affected by malnutrition. The nutrition grant should be provided to centres regardless of their registration status. Furthermore, funding support should be provided to caregivers who cannot afford ECD services.

Finally, support should be given to community-led initiatives that address malnutrition at the household and community levels. Policies should be developed to provide resources and recognition to community-driven programs, such as food gardens, aimed at promoting healthier practices and reducing disparities in childcare.

7.3 Specific Recommendations

Based on the above analysis and conclusions drawn from the study on the social context of childhood malnutrition in South Africa, several recommendations emanating from this research are aimed at promoting a holistic, multisectoral approach to improve child nutritional outcomes. These recommendations are as follows:

1) Policies and programmes aimed at addressing childhood malnutrition should regularly be evaluated and their effectiveness assessed. This evaluation should be done considering existing policies based on research findings and changing socio-economic conditions considering the economic shocks. This is to ensure that policies are responsive to the changing nature of childhood malnutrition.
2) Family support is importance for fostering a positive child environment. Therefore, it is recommended that educational programs should be designed targeting improvements in caregivers and family knowledge on optimal childcare practices, including breastfeeding, complementary feeding, and early childhood education.

3) To rectify the issue of high unemployment and social grant dependency, this study recommends the need to explore income-generating opportunities for unemployed caregivers to alleviate poverty. This study also advocates for creation of employment opportunities in rural areas and townships to address high levels of poverty faced by households.

4) To ensure health care utilisation in South Africa, health facilities should be accessible, especially for ECD centres for continuous monitoring of child growth outcomes and follow ups for children with nutritional deficiencies. Healthcare services should also be integrated and barriers to healthcare utilisation such as long queues, bad staff attitudes, shortage of medications and negative clinic experiences be improved.

5) There is a need to implement measures to address the challenges related to water shortages, electricity cuts, and waste management, as these directly impact hygiene, sanitation, and food preparation in both urban and rural settings. Strategies to minimise water disruption that force ECD centres to close should be developed.

6) The early childhood development centre registration process should be streamlined and simplified. Centres should be provided with guided support to improve the registration process to ensure that all eligible centres can access government nutrition grants.

7) Unregistered centres should also be given the nutrition grant but also supported to meet the compliance requirements to be registered.

8) There must be a promotion of the involvement of parents and caregivers in early childhood education meetings to facilitate communication and information sharing between ECD practitioners and families. This community engagement can foster support systems to strengthen family care systems, recognising the important role of mothers, caregivers, and other family members in childcare.

7.4 Frontiers for future research

Future research in the field of childhood malnutrition in South Africa can explore various frontiers to enhance our understanding and develop more effective interventions to resolve the challenge of childhood malnutrition in the country. Some potential frontiers for future research include:

1. More longitudinal studies to track the impact of early childhood malnutrition on long-term health outcomes, such as educational attainment and socio-economic status are needed in South Africa.
2. The influence of nutritional interventions such as community-based nutritional programs should be investigated and their effectiveness on reducing childhood malnutrition.
3. Future studies should research the potential benefits of strengthening the healthcare systems, particularly in low-income communities. Assess the impact of increased access to healthcare services utilisation, improved healthcare infrastructure, and health education on childhood malnutrition rates.
4. Explore the potential of digital health solutions, including telehealth services such as momConnect and other mobile applications in providing caregivers with real-time information and support on optimal feeding practices, healthcare access, and early childhood education.
5. Future studies should conduct research on community-led initiatives and empowerment programs that aim to address malnutrition at lower community levels and assess how communities can promote healthier childcare practices.
6. Future studies could investigate the potential impact of climate change on food security and water availability in different regions of South Africa. Assess how environmental

factors, influenced by climate change, may exacerbate childhood malnutrition and explore adaptive strategies.

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Appendices

Appendix 1. 1 Policy brief

Policy Brief

March 2024

Every Child Thrives: Dismantling Barriers and Building Solutions for Child Nutrition

The context and the problem

Childhood malnutrition, encompassing both undernutrition and overnutrition, is a significant public health challenge globally. South Africa, despite its efforts, faces a persistent burden of childhood malnutrition. This is evident in the high prevalence rates of stunting, where 1 in 4 children are stunted, a higher than a developed country such as the US. Overweight is also on the rise with 13% of the children under-5 in the country being overweight and 7.5% being underweight. These statistics have not improved much since the last three decades.

The high prevalence of childhood malnutrition in the country is concerning because it signifies the failure for the country to achieve Sustainable development 1-3 of poverty medication, zero hunger, and good health and wellbeing. The problem with childhood malnutrition is that it is an indicator of underlying issues like food insecurity, defined as the lack of consistent access to nutritious food. Despite being a food exporter, South Africa struggles with poverty, limited education and employment opportunities, and environmental hazards, all hindering access to affordable, healthy food. The complex nature of childhood malnutrition necessitates a multi-sectoral approach involving families, communities, and government systems.

Key findings:

- **High Prevalence:** The study identified a concerning prevalence of childhood malnutrition: 22.16% stunting, 16.40% overweight, and 5.04% underweight.
- **Socioeconomic Factors:** A strong association exists between poverty and malnutrition. Nearly 30% of households fall below the food poverty line, and half experience food insecurity. The COVID-19 pandemic further exacerbated this vulnerability.

- **Caregiver Practices:** Cultural beliefs and limited knowledge about nutrition and child feeding practices influence dietary choices. Traditional restrictions on certain foods and lack of awareness about weaning duration hinder optimal nutrition.
- **Childcare Environment:** The study highlights the disintegration of support systems. Caregivers lack guidance on nutrition and responsive feeding practices. Additionally, fragmented healthcare and social services limit access to comprehensive support.
- **Community and Household Factors:** Children cared for at home are more susceptible to stunting and overweight compared to those attending childcare facilities. Low birth weight and residing in structurally weak dwellings further increase the risk of malnutrition. Interestingly, caregiver ethnicity and religion were associated with specific forms of malnutrition.

Policy Recommendations:

- **Addressing Food Insecurity:** Implement robust social safety nets and food security programs to ensure consistent access to nutritious food for vulnerable households.
- **Strengthening Early Childhood Development (ECD) Programs:** Integrate comprehensive nutrition education and responsive feeding practices into ECD programs. Empower caregivers with knowledge on healthy dietary choices and appropriate weaning practices.
- **Enhancing Healthcare and Social Services:** Foster collaboration between healthcare and social service providers to offer holistic support. This includes addressing the needs of the entire family unit and providing timely referrals for additional assistance.
- **Promoting Community-Based Interventions:** Develop culturally sensitive community outreach programs to address traditional beliefs and promote optimal feeding practices.
- **Targeted Interventions:** Implement targeted interventions based on identified risk factors such as low birth weight, household structure, and childcare arrangements.

Conclusion: Childhood malnutrition requires a multi-pronged approach that addresses the underlying social determinants. By focusing on food security, strengthening ECD programs, improving access to healthcare and social services, and promoting community-based interventions, policymakers can significantly reduce the prevalence of malnutrition and ensure optimal health outcomes for all children. Future research should 1) Investigate the specific

cultural beliefs influencing dietary choices and explore culturally appropriate strategies to address them. 2) Conduct in-depth research to understand the factors contributing to the observed variation in malnutrition within communities.

Appendix 1. 2 Ethical clearance certificate

UNIVERSITY OF THE WITWATERSRAND, JOHANNESBURG

Research Office

HUMAN RESEARCH ETHICS COMMITTEE (NON-MEDICAL)
R14/49 Sello

CLEARANCE CERTIFICATE	**PROTOCOL NUMBER: H21/04/34**
PROJECT TITLE	Social contexts of childhood malnutrition in low-income communities in South Africa
INVESTIGATOR(S)	Miss M Sello
SCHOOL/DEPARTMENT	Social Sciences/
DATE CONSIDERED	16 April 2021
DECISION OF THE COMMITTEE	Approved Risk Level: Low
EXPIRY DATE	27 September 2024

DATE 28 September 2021 **CHAIRPERSON** (Professor J Knight)

cc: Supervisor : Prof S Adedini & Prof C Odimegwu

DECLARATION OF INVESTIGATOR(S)

To be completed in duplicate and **ONE COPY** returned to the Secretary at Room 10004, 10th Floor, Senate House, University. Unreported changes to the application may invalidate the clearance given by the HREC (Non-Medical)

I/We fully understand the conditions under which I am/we are authorized to carry out the abovementioned research and I/we guarantee to ensure compliance with these conditions. Should any departure to be contemplated from the research procedure as approved I/we undertake to submit an amendment of the protocol to the Committee. **I agree to completion of a regular progress report. For Minimal and Low studies, this is due annually on 31 December. For Medium and High Risk studies, this is due twice annually on 30 June and 31 December.**

Signature **Date** 29, 09, 2021

PLEASE QUOTE THE PROTOCOL NUMBER ON ALL ENQUIRIES

Appendix 1. 3 Focus group participant information sheet



Participant Information Sheet

Dear Sir / Madam

My name is Matshidiso Sello, and I am a PhD student in the department of Demography and Population Studies at the University of the Witwatersrand, Johannesburg. As part of my studies, I must undertake a research project, and I am investigating The Social Context of Childhood Malnutrition in low-income communities in South Africa, under the supervision ofProfessor Sunday Adedini. The aim of this research project is to investigate the influences of the social contexts on childhood malnutrition in selected food-insecure and low-incomecommunities in South Africa.

As part of this project, I would like to invite you to take part in a focus group discussion on understanding child malnutrition. This activity will involve being asked questions and will take around 45 – 60 minutes of your time. With your permission, I would also like to audio record the interview using a digital device. This recording will be stored in the researcher's password protected laptop. Only the researcher will have access to this recording. It will be deleted after 10 years.

There will be no personal costs to you if you participate in this project, you will not receive any direct benefits from participation and there are no disadvantages or penalties if you choosenot to participate or if you withdraw from the study. You may withdraw at any time or choosenot to answer any question if you do not want to. The interview will be completely confidentialand anonymous as I will not be asking for your name or any identifying information, and the information you give to me will be held securely and not disclosed to anyone else. I will be using a fictitious name (false name) to represent your participation in my final research report.

If you experience any distress or discomfort at any point in this process, we will stop the interview or resume another time.

If you have any questions during or after the interview about this research, feel free to contact me on the details listed below. This study will be written up as a research report which will be available online through the university library website. If you wish to receive a summary of this report, I will be happy to send it to you. If you have any concerns or complaints regardingthe ethical procedures of this study, you are welcome to contact the University Human Research Ethics Committee (Non-Medical), telephone +27(0) 11 717 1408, email hrecnon-medical@wits.ac.za

Yours sincerely, Matshidiso
Valeria Sello

Researcher:
Matshidiso Valeria Sello, 681670@students.wits.ac.za/ 073 811 8159

Supervisor: Professor Sunday Adedini
Sunday Adedini Sunday.adedini@wits.ac.za 011 717 4054

Appendix 1. 4 Caregiver in-depth information participation sheet



Participant Information Sheet

Dear Sir / Madam

My name is Matshidiso Sello, and I am a PhD student in the department of Demography and Population Studies at the University of the Witwatersrand, Johannesburg. As part of my studies, I must undertake a research project, and I am investigating The Social Context of Childhood Malnutrition in low-income communities in South Africa, under the supervision of Professor Sunday Adedini. The aim of this research project is to investigate the influences of the social contexts on childhood malnutrition in selected food-insecure and low-income communities in South Africa.

As part of this project, I would like to invite you to take part in an in-depth interview on understanding child malnutrition. This activity will involve being asked questions and will take around 45 – 60 minutes of your time. With your permission, I would also like to audio record the interview using a digital device. This recording will be stored in the researcher's password protected laptop. Only the researcher will have access to this recording. It will be deleted after 10 years.

There will be no personal costs to you if you participate in this project, you will not receive any direct benefits from participation and there are no disadvantages or penalties if you choose not to participate or if you withdraw from the study. You may withdraw at any time or choose not to answer any question if you do not want to. The interview will be completely confidential and anonymous as I will not be asking for your name or any identifying information, and the

information you give to me will be held securely and not disclosed to anyone else. I will be using a fictitious name (false name) to represent your participation in my final research report. If you experience any distress or discomfort at any point in this process, we will stop the interview or resume another time.

If you have any questions during or after the interview about this research, feel free to contact me on the details listed below. This study will be written up as a research report which will be available online through the university library website. If you wish to receive a summary of this report, I will be happy to send it to you. If you have any concerns or complaints regarding the ethical procedures of this study, you are welcome to contact the University Human Research Ethics Committee (Non-Medical), telephone +27(0) 11 717 1408, email hrecnon-medical@wits.ac.za

Yours sincerely, Matshidiso
Valeria Sello

Researcher:
Matshidiso Valeria Sello, 681670@students.wits.ac.za 073 811 8159

Supervisor: Professor Sunday Adedini
Sunday Adedini Sunday.adedini@wits.ac.za 011 717 4054
.

Appendix 1. 5 Participant informed consent form



Consent Form

Title of project: Social contexts of childhood malnutrition in low-income communities in South Africa

Name of researcher: Matshidiso Valeria Sello

I, ... , agree to participate in this research project. The research has
been explained to me and I understand what my participation will involve. I agree to the

following:(Please circle the relevant options below).

I agree that my participation will remain anonymous	YES	NO
I agree that the researcher may use anonymous quotes in his / her research report	YES	NO
I agree that the interview may be audio recorded	YES	NO
I agree that the information I provide may be used anonymously after this project has ended, for academic purposes by other researchers, subject to their own ethics clearance being obtained.	YES	NO

…… (signature)
…… (name of participant)
…… (date)

…… (signature)
…… (name of person seeking consent)
…… (date)

Appendix 1. 6 Participant distress protocol

Distress Protocol

Principal Investigator: Matshidiso Valeria Sello

Title of the project: The social context of childhood malnutrition in South Africa

The In-depth individual questionnaire and focus group guide contains questions that may be upsetting for the participants to answer.

The researcher aims to ask these questions in a non-judgmental manner and is aware that some questions may cause distress to the participants. In these instances, the researcher will try providing the necessary support by doing the following:

1) Observe the respondent for hints that may suggest distress (e.g., finger tapping)

2) Listen carefully for changes in the tone (e.g., high pitched voice)

3) Acknowledging the behaviour or feelings of the participants (e.g For example, if the respondent's voice suddenly becomes soft, the researcher will ask the participant if they are alright.

(4) If the researcher observes that the participant is struggling to maintain composure, or she begins to cry, the researcher will acknowledge the distress by asking the participant if they would like to take a short break and allow them time to regain composure.

(5) Once the participant is composed, the researcher will attempt to finish the interview. However, if the participant is too agitated or upset to continue, the researcher will arrange to finish the interview at another time.

6) The researcher will be patient with the distressed participants and allow them time until they are ready to proceed with the interview.

7) If the participant goes off the topic, the researcher will re-direct them to the questions at

hand.

8) If participants exhibit any kind of threatening behaviour or verbal abuse towards the researcher, the researcher will politely end the interview.

9) If the researcher believes that someone's life or health is in imminent danger, she will offer resource information to the respondent; and volunteer to make a call to one of the toll-free numbers for her in the interview setting.

There are three levels of distress that the researcher will look out for. The researcher's response will be based on the type of distress that the participant is showing:

Level of distress	Signs of distress

Level 1: Distress situation
(Mild distress)
	• A participant indicates they are experiencing a high level of stress or emotional distress OR
	• Exhibit behaviours that suggest that the interview is too stressful such as:
	  • Change in voice tone or volume
	  • Changes in focus
	  • Hesitancy to answer questions
	  • Fidgeting, finger tapping
	  • Use of inappropriate language/cursing
	  • Provides non-relevant answers to questions asked
	  • Displays an unwillingness or hesitancy to continue

Level one: Researcher's response	• The researcher will stop the interview and offer the respondent a short break. • The researcher will let the participant know that they are in a safe space. • If the participants found the questions to be stressful, the participants would be asked if they wanted to continue or schedule the interview for later. **Based on the participants response, the researcher will do the following:** a) If the participants say yes, the researcher will continue with the interview b) If the participant says yes but not now, the researcher will reschedule the interview for later in the day or another day. c) If the participants say they do not want to continue with the interview anymore- the researcher will terminate the interview.
Level 2: Distress situation (Moderate distress)	Level 1 signs and any of the following: • Displays signs of distress that may include long pauses, or sighing • Sobbing, weeping, and/or crying on the • Displays other obvious signs of agitation • Displays flat voice tones • Being non-responsive • Provides nonsensical/bizarre answers • Asks to speak with a mental health professional.
Level two: Researcher's response	

	Based on the participants response, the researcher will offer to provide information or services where the participant can get help at no cost
Level 3: Distress situation	Both level 1 and level 2 distress signs plus the following: • Participant will be very agitated and/or crying openly • Participant may be very inappropriate in all her responses to the researcher • Talks about passive or active suicidal thoughts with or without a plan • Talks about wishing another person was dead with or without a plan to kill the person • Respondent poses an immediate threat to themselves or someone else
Level three: Researcher's response	Researcher will stop the interview and refer the participants Encourage the participant to contact their GP or go to the nearest clinic Follow participant up with courtesy call (if participant consents)

The researcher will refer participants based on the identified source of their distress:

For child support grants and social relief grants

South African Social Security Agency: 0800 601 011

Child abuse

Childline - 0800 05 55 55

Health complaints

Department of health -Gauteng - 0800 203 886
Department of health- Limpopo - 0800 919 191
National Institute for Communicable Diseases: 0800 029 999
Covid-19 hotline: 0800 029 999
Emergency services (Ambulance): 08600 10177

Gender-based violence: provide support and counselling to victims of Gender-Based Violence

Gender-based violence command centre: 0800 428 428

Stop Gender violence: 0800-150-150

Mental health Counselling services, counselling service dealing with all forms of abuse, HIV/AIDS, bereavement, suicide and eating disorders

National Crisis Line 24 hour telephonic 0861 322 322
Mental Health Information Line: 0800 567 567
Suicide Crisis Helpline: 0800 12 13 14

The South African depression and anxiety group (SADAG): 0800 567 567

Emergency services (reporting crime):

Police - 08600 10111
Salvation Army (report human trafficking): 08007 37283

Appendix 1. 7 Permission letters

23 August 2021

BLESSED ASSURANCE CRECHE
Enquiries: Principal NTOMBIZODWA MASIZI
Contact number 0785407 26
Thulani Phase 6
Soweto
Johannesburg

Ms Matshidiso Sello
Department of Demography and
Population Studies
University of the Witwatersrand
E-mail: 681670 students. wits.ac.za

Dear Ms Matshidiso Sello

Title: The social context of childhood malnutrition in low-income settin s in South Africa

Ethics application number: HRECNM20-11-012

Permission letter

I NTOMBIZODWA from BLESSED ASSURANCE ECD gives approval for Miss Matshidiso Sello to recruit caregivers of children under-5 from my ECD Centre under the above mentioned research title.

The followin conditions must be observed:

1) The researcher must do the recruitment of participants in the afternoon around the times when caregivers fetch their children.
2) The facility will only be visited once ethical clearance has been given by the University of the Witwatersrand
3) Participants rights and confidentiality will be maintained all the time
4) No resources from the above facility (financial or materials will be used for the study) and the facility will not incur any additional costs for this study
5) The Researcher will submit a final research copy to the ECD
6) The Researcher must liaise with the school principal before coming to do the recruitment at the ECD facility

Regards

BLESSED ASSU NCE ECDC
NPO No: 050-079
2071 Block 6 Doornkop, Dobsonville
Cell: 078 548 7426
Date: 23/08/2021

23 August 2021

LESEDI Day Ca

Ms Matshidiso Sello
Department of Demography and
Population Studies
University of the Witwatersrand
E-mail: 681670@students.wits.ac.za

Enquiries: Principal Joyce Tlh
Contact number 060330 93

BLOK 1 Thulani Phase
Soweto
Johannesburg

Dear Ms Matshidiso Sello

Title: The social context of childhood malnutrition in low-income settings in South Africa

Ethics application number: HRECNM20-11-012

Permission letter

I Joyce Tlhogoe from LesediD. C. ECD gives approval for Miss Matshidiso Sello to recruit caregivers of children under-5 from my ECD Centre under the above mentioned research title.

The following conditions must be observed:

1) The researcher must do the recruitment of participants in the afternoon around the times when caregivers fetch their children.
2) The facility will only be visited once ethical clearance has been given by the University of the Witwatersrand
3) Participants rights and confidentiality will be maintained all the time
4) No resources from the above facility (financial or materials will be used for the study) and the facility will not incur any additional costs for this study
5) The Researcher will submit a final research copy to the ECD
6) The Researcher must liaise with the school principal before coming to do the recruitment at the ECD facility

Regards

JTlhogoe

LESEDI DAY CARE
5117 BLOCK 1
DOORKOP 1725

23 August 2021

Ms Matshidiso Sello
Department of Demography and
Population Studies
University of the Witwatersrand
E-mail: 681670@students. .wits.ac.za

Ncedisizwe Day Care
Enquiries: Principal Nowelile
Contact number 0788246547
Block 4 Thulani Phase
Soweto
Johannesburg
Doornkop

Dear Ms Matshidiso Sello

Title: The social context of childhood malnutrition in low-income settings in South Africa

Ethics application number: HRECNM20-11-012

Permission letter

I Nowelile Mdlalo from Ncedisizwe ECD gives approval for Miss Matshidiso Sello to recruit caregivers of children under-5 from my ECD Centre under the above mentioned research title.

The following conditions must be observed:

1) The researcher must do the recruitment of participants in the afternoon around the times when caregivers fetch their children.
2) The facility will only be visited once ethical clearance has been given by the University of the Witwatersrand
3) Participants rights and confidentiality will be maintained all the time
4) No resources from the above facility (financial or materials will be used for the study) and the facility will not incur any additional costs for this study
5) The Researcher will submit a final research copy to the ECD
6) The Researcher must liaise with the school principal before coming to do the recruitment at the ECD facility

Regards

N E Mdlalo

NCEDISIZWE DAY CARE AND PRE-SCHOOL
NPO No: 073-108
3580, Block 4, Doornkop
Thulani, Dobsonville 1865
Cell: 078 824 8541

23 August 2021

Ms Matshidiso Sello
Department of Demography and
Population Studies
University of the Witwatersrand
E-mail: 681670@students. wits.ac.za

THERESA DAY CARE CENTRE
Enquiries: Principal LERATO NGOBENI
Contact number 081 348 7780
Thulani Phase BLOCK S
Soweto
Johannesburg

Dear Ms Matshidiso Sello

Title: The social context of childhood malnutrition in low-income settings in South Africa

Ethics application number: HRECNM20-11-012

Permission letter

I LERATO NGOBENI from THERESA ECD gives approval for Miss Matshidiso Sello to recruit caregivers of children under-5 from my ECD Centre under the above mentioned research title.

The following conditions must be observed:

1) The researcher must do the recruitment of participants in the afternoon around the times when caregivers fetch their children.
2) The facility will only be visited once ethical clearance has been given by the University of the Witwatersrand
3) Participants rights and confidentiality will be maintained all the time
4) No resources from the above facility (financial or materials will be used for the study) and the facility will not incur any additional costs for this study
5) The Researcher will submit a final research copy to the ECD
6) The Researcher must liaise with the school principal before coming to do the recruitment at the ECD facility

Regards

L Ngobeni

Theresa Day Care Center
NPO No: 086-899
2817 Block 5 Doornkop
Cell: 073 732 1628 - 071 [illegible] 5426

Appendix 1. 8 In-depth interview schedule

In-depth interview questionnaire

Study title: Social context of child malnutrition in South Africa

Principal investigator: Matshidiso Valeria Sello

Theme 1: Demographics

1) Please give me details of your background.

Probe for the following:

- Date of birth
- Gender
- Place of residence
- Religion
- Ethnicity
- Migration status
- Number of household members
- Number of sleeping rooms in the house.

Theme 2: Family structure

- What is your relationship with people you live with at home?
- How many children do you have?
- How many children under-5 do you live with in your household?
- Who is your last child closest to?
- Who is mainly responsible for preparing the food and taking care of the children in yourhousehold?
- Are the children under-5 in your household being cared for elsewhere besides your home?

- How would you describe your interaction or relationship with your household members?
- What role does the father of the child have in the upbringing of the child?

Theme 3: Current activity

1) Are you currently employed?If yes:
    - Permanently employed.
    - Temporary employed
    - Self-employed

If no:

2) Are you currently looking for employment?
    - Yes
    - No

3) Did your household receive any kind of help during the Covid-19 pandemic?
    - Yes
    - No

4) What kind of help did you receive?
    - Food parcels
    - Covid-19 relive fund
    - Donations from other NGO's

Theme 4: Food security

1) What is your perception on food adequacy?

Probe:

-This question asks if participants have had enough food to eat

- Also need to probe if the kinds of food that are participants preferred were thefoods that food secure people eat that food insecure people cannot eat.

- Probe for preferred foods in the participant's culture

- Probe for the kinds of foods that food secure people eat that food insecure peoplecannot afford to eat

- If respondents did not cut the portions of food during the COVID 19 lock downregulations because they wanted to save, if they had diverse food to choose from,

2) What are your thoughts on your child's food intake and money spent on buying food?

Probe:

This question asks if there was not enough money to buy food

Question asks if the family was cutting down on portions of food to ensure that at leastthe currently available food is enough for everyone in the household?

3) What are your concerns about what and how your child is fed when you are not around them?

Probe:

Are you anxious about how and what your child is fed when you are not around?

4) In what way has the Covid-19 lock down regulations impacted on your income and ability to buy food?

Probe:

The source of income and the individual's capacity to buy food

Theme 5: Mother's knowledge about the health and nutrition status of the child

1) What is your view of a healthy child?

Probe:

Child's weight, height, diet, illness episodes

2) What role do you think breastfeeding plays in the health of your child?

Probe:

How long do you think a child should be breastfed?

3) What is your understanding of the concept child malnutrition?

Probe:

Availability of food, child's weight, height

4) Tell me about the sources of the nutrition information you have received?

Probe:

When was the last time you received information about childcare?Did you receive and child nutrition counselling at the health care facility?

5) In what way did the Covid-19 lockdown regulations affect your health seeking for the child?

Probe:

If caregiver was able to seek care for the child during lockdown regulations eitherfor child vaccinations or for child illness episodes.

Theme 6: Childcare practises

1) In your views, what kind of diet should your child follow?

Probe:

Caregiver's perception of importance of healthy food groups i.e vegetables, fruits

2) How do childcare practices affect nutritional status of children?

Probe:

An extent in which socio-cultural practices of caregivers predispose under-5 children to malnutrition? If there are any taboos on the type of food that must not be given to children but are eaten by the rest of the family?

3) How do you think gender preference affect the nutrition of children under-5?

Probe:

On any cultural practices that affect the diet of your child, if certain foods are notgiven to children if they are girls or if the serving of food quantities differ for boys and girls.

Appendix 1. 9 In-depth interviews with ECD owners

Theme 1: Community context

1. Can you tell me about the type of community that you live in.

Probe: *Employment status of caregivers, community poverty levels, crime in the community*

Theme 2: Day care centre profile

1. Tell me about your Day Care Centre

Probe: *Tell me about the number of children you have, how old are they, how many are boys and howmany are girls, in which areas are the children mainly based (Formal area or informal areas?)*

-Is the creche registered? What is the adult-to child ratio?

Theme 3: Childcare practises

1. Please tell me about the form of childcare training you have received.

Probe: *Was the childcare training formal or informal?*

- *If formal, from where (type of institution) did you receive the training and what were thenutrition programs covered?*
- *How long was the training?*
- *What was covered in the training?*

(Probe whether training included nutrition and menu planning?)

2. Tell me about the food-based dietary requirements followed at the creche

Probe: *Are children of different ages receiving the same food?*

- *Are there separate guidelines that the centre follows for children of different age groups?*

Theme 3: Community and family strengthening

1. Does your creche belong to an ECD Forum? If yes, how does it benefit you and your creche?(***probe*** *for knowledge sharing and advocation, bulk buying of food and resources*)

2. How do you think the community and caregivers can work together to improve children'snutritional outcomes?

1. **Probe**: *How can relationships between day mothers, ECD owners and primary caregivers beimproved in prioritising child health? What do you think can be done to improve the health and safety of children who attend your creche or in your community?*

3. Does the centre keep an incident book (to record children who get dropped off showingillness symptoms or injury at creche?)

Probe: *What do you do when you notice that the child is sick? (probe on the steps taken i.eencouraging the parent to take the child tpo the clinic)*

Theme 4: Systems strengthening

1. What do you think is the role that different government departments can play in improving children's nutritional outcomes and safety?

Probe: Do government officials come to your centre and if they do how often do they come?

-What kind of support do you receive from other government departments? Do local clinics come tothe creche to do health checks and vaccinations for children?

- What kind of institutional support do you think the government could provide that could help yourcreche in improving the care of children? (probe assistance with registering your creche with the municipality?)

Theme 5: Financing and implications of child nutrition

How are you financing your creche?

Probe:

Tell me if your creche is receiving the nutrition grant?

-What impact did Covid-19 have on the creche financing?

-How much do you charge for school fees?

-Do you get any other financial or other support from (JAM, Tiger brands, Cotlands, Play groups,Nutrition Program Subsidy R17 a child)

Appendix 1. 10 Focus group discussion guide

Study title: Social context of child malnutrition in South Africa

Principal investigator: Matshidiso Valeria Sello

Introduction

The researcher will introduce herself to the study participants and allow them to introduce themselves using pseudo names (not real names). Added to the introduction, the researcher will give a backgroundof the study to the participants as well as outline the purpose of the study and the study objectives. In addition to this, the researcher will outline the ground rules that will guide the focus group discussion,which includes informing participants to feel free to express themselves, one person to speak at a timeas well as give their ideas, perceptions, and comments. The researcher will also ask for permission to record the interview. Respondents will be assured that there are no wrong answers and all the information given will be treated with high confidentiality.

If participants agree to participate, they will be given consent forms to sign prior to the interview.

Purpose of discussion

The researcher will inform the participants about the purpose of the discussion, which will include gaining their knowledge and perceptions on childcare practices, food security, how the household socio- economic status and community characteristics impact on the health and nutrition status of children, theimpact of dietary intake (food selection) on the nutrition status of children under-5, as well as the impactthe environment has on the growth and development of children under-5.

Focus group discussion questionnaire.

Ice-breaker question

Tell me about how it has been for you to raise your child/children under 5 in the last few years?

Probe:

If there were any challenges in raising their children in terms of health, financial andemotional well-being; joys, expectations, and fears in terms of bringing up their children

Topic 1: Perceptions and knowledge on child feeding and childcare practises?

1) What is your view on how children should be fed during the first 6 months of life?

   a. What is your view about how they should be fed in the first 5 years of life?

Probe: *the importance of breastfeeding, at which point should children be breastfed, what isthe ideal duration of breastfeeding? At what age or period should complementary feeding be introduced? What kind of complementary foods should be given to a child?*

Topic 2: Child health

5) What do you know about child malnutrition?

Probe:

The state of a healthy child, weight for age (underweight), weight for height (BMI), height for age (stunting)

6) How do you think the health of children can be improved?

Probe:

For the accessibility of health care services (distance, are caregivers able to get thehelp they need? Are there any barriers to health care)?

Topic 3: Family size and impact on child malnutrition

1) In your view, how does the size of a family or household affect the health and nutrition status of achild?

Probe: *Is there any implication of large family size for poor child nutrition?*

Topic 4: Childcare and socio-cultural practises

1) How do childcare and cultural practices affect the nutritional status of children?

Probe:

Which foods should children eat, and which foods should they not eat.

2) Are there any taboos on the type of food that should not be given to children?

Probe: *foods that are not given to children and the perceived effects that these foods have on children*

3) Based on your ethnic beliefs, are there any taboos that you practice on the type of food thatshould not be given to children?

If yes, mention those taboos and such foods that should not be given to under-5 children

1) Who takes largest share of meat or fish in your household – – father, mother, grown-up childrenor under-5 children?

Topic 5: Food security and secondary childcare

2) If sufficient food, fish or meat are available in your household, who is given priority in termsof who to feed first – father, mother, grown-up children or under-5 children?
3) What do you know about secondary childcare?
4) In your opinion, how does secondary childcare affect the health and nutrition status of thechildren under-5?

Probe:

Whether mother thinks leaving her child under the care of someone else (i.e caregiver at nursery schools or any caregiver other than mother) affects the nutrition of her children (i.e how the food is prepared, and the types of food given to the child in mother's absence).

5) In your views, during Covid-19 lockdown regulations, how did the availability or non-availability of what to eat impact on the health and nutrition status of children under-5?

Probe:

If participants have had enough food to eat, did not cut the portions of food during the COVID 19 lock down regulations because they wanted to save, if they had diverse food to choosefrom.

Topic 5: Community perceptions and child malnutrition

1) In what way does household environment affect the health and wellbeing of a child?

Probe: *child health and wellbeing in the environment where they are:*

Positives: electricity, portable water, access to good health facilities, good crèche etc.

Negatives: environmental pollution, (secondary smoking, air pollution, domestic violence, crime, etc.)

Experience: How will you categorize your household environment under the above headings – positives, or negatives? Do your child(ren) experience positive or negative household environmentor a mixture of both?

2) What are the community norms and practices regarding childcare in your community?***Probe for community traditions in how children are brought up – e.g. exclusive breastfeeding, using feeding bottle with milks.***

3) What do you think are the community norms and taboos of food consumption?

Probe:

For the types of foods that the community believes children should eat and should not eat.

Why should children not eat certain foods?

What are those foods?

Topic 6: Natural environment and child health

1) How do you think the natural environment affects the health and nutrition of the child? Probe for how caregivers think the rainfall, temperature and vegetation affects the nutrition statusof children under 5.

2) What roles do ECDs play in the development and wellbeing of children in this community?

Probe:

Are there negative reporting about how ECDs take care of children in this community?

3) What are the positive reporting about ECDs?

Appendix 1. 11 Literature review matrix of selected studies

S/N	Title & Source	Author(s) & year	Data Source	Method	Level of Analysis	Findings	Limitation / research gaps
1	Influence of gender preference and sex composition of surviving children on childbearing intention among high fertility married women in stable union in Malawi.	Adedokun et al (2021)	Malawian Demographic and health survey	Binary logistic regression	Individual	Adverse nutritional status of children is a major challenge in sub-Sharan Africa	The study did not include all possible factors that could influence the nutritional status of children
2	Factors associated with malnutrition among under five children in developing countries: A review.	Kalu et al (2018)	Published articles on child malnutrition	Systematic review	Regional – Africa and Asia	High rates of mortality of malnourished children in sub-Saharan Africa result from factors such as low intake of calories, high rates of HIV/AIDS, political instability,	The study focuses on developing countries in Africa and Asia, limiting generalizability to other regions

						conflicts among groups and poor implementation of government policies	
3	Malnutrition in Sub-Saharan Africa: burden, causes and prospects.	Bain et al (2013)	Published articles on child malnutrition after 1993	Systematic review	Regional: Sub-Saharan Africa	Malnutrition is estimated to contribute more than one third of all child deaths in sub-Saharan Africa	Neglect of rural and agricultural development in understanding child malnutrition
4	Nutritional health of young children in South Africa over the first 16 years of democracy	Iversen et al. (2011)	Published articles on child malnutrition between 1 January 1994-30 June 2010	Review of literature databases, official reports, and conducting field research in urban and rural areas	Communities	Many young South African children have inadequate nutritional status, with high rates of stunting, micronutrient deficiencies, hunger and food insecurity	Not applicable (the paper does not provide specific limitations of the study conducted by authors)
5	A Review of Selected Studies on the Factors Associated with the Nutrition	Mkhize & Sibanda (2020)	Review of published articles between 2010–2019	Review of electronic data bases on the factors	Individuals and households	The paper highlights a lack of studies in urban areas and identifies various factors influencing child	Research gaps include the lack of studies conducted in poverty-stricken urban areas, ab uneven distribution of studies across provinces

	Status of Children Under the Age of Five Years in South Africa.			influencing the nutritional status of children under the age of five years		malnutrition in South Africa	
6	Patterns of healthcare utilisation and barriers affecting access to child healthcare services in low-income urban South African	Adedini et al (2020)	A health care utilization survey conducted between April and September 2015	Binary logistic regression	Individuals	Barriers to accessing healthcare were reported for more than half of the sampled children in two South African low-income settings.	Limited generalizability beyond the selected locations in South Africa
7	Persistent malnutrition and associated factors among children under five years attending primary health care	Modjadji & Mashishi (2020)	A cross sectional descriptive study was conducted	Binary logistic regression	Individuals	Suboptimal complementary feeding predisposed children to stunting and underweight.	A lack of statistical reliability testing for the questionnaire

	facilities in Limpopo Province, South Africa						
8	Promoting Early Childhood Development through Combining Cash Transfers and Parenting Programs	Arriagada et al (2018)	Review of 10 papers	The methods involve a combination of literature review, case studies, and impact evaluation results to examine the potential, practice, and evidence of combining cash	Households	Cash transfers protect households from poverty, addressing budget constraints, and improving human capital investment, ultimately contributing to enhancing the child's development outcomes.	Difficulty in making comparisons across programs

				transfer programs with parenting interventions			
9	Caregivers' Knowledge and Food Accessibility Contributes to Childhood Malnutrition: A Case Study of Dora Nginza Hospital, South Africa	Clarke et al. (2021)	A cross sectional study was conducted	Descriptive statistics	Individual level	Poor socio-economic status and food inaccessibility are possible contributing factors to malnutrition	The study relied on self-reported data, which may introduce bias or inaccuracies
10	To be a woman is to make a plan": A qualitative study exploring mothers' experiences of the Child Support Grant in supporting children's diets	Zembe-Mkabile et al (2018)	Qualitative data from in-depth and focus group discussions	Latent thematic content analysis methods	Individuals	Caregivers faced challenges in providing nutritionally adequate diets for children due to the limited value of the CSG and competing household priorities	Further research is needed to understand the impact of nutrition-sensitive non-food inputs

	and nutrition in South Africa						
11	'I know what I should be feeding my child': foodways of primary caregivers of Child Support Grant recipients in South Africa	Zembe-Mkabile et al (2022)	Qualitative data from in-depth and focus group discussions	latent thematic content analysis methods	Individuals	Caregiver's food choices were more influenced by financial and physical constraints rather than cultural practices or personal preferences.	The study was only limited to specific regions in South Africa.

Appendix 1. 12 Results from the Variance Inflation Factor

Child level variables

Variable	**VIF**	**1/VIF**
Child Ethnicity	1.42	0.704996
Medical Aid	1.4	0.715566
child caregiving	1.39	0.72025
Childbirth place	1.37	0.727311
race	1.33	0.749944
Age	1.29	0.773221
child support grant	1.26	0.792918
Health seeking	1.23	0.815581
Alternative care	1.16	0.86295
birthweight	1.12	0.896739

Mean VIF	1.3	

Caregiver level variables

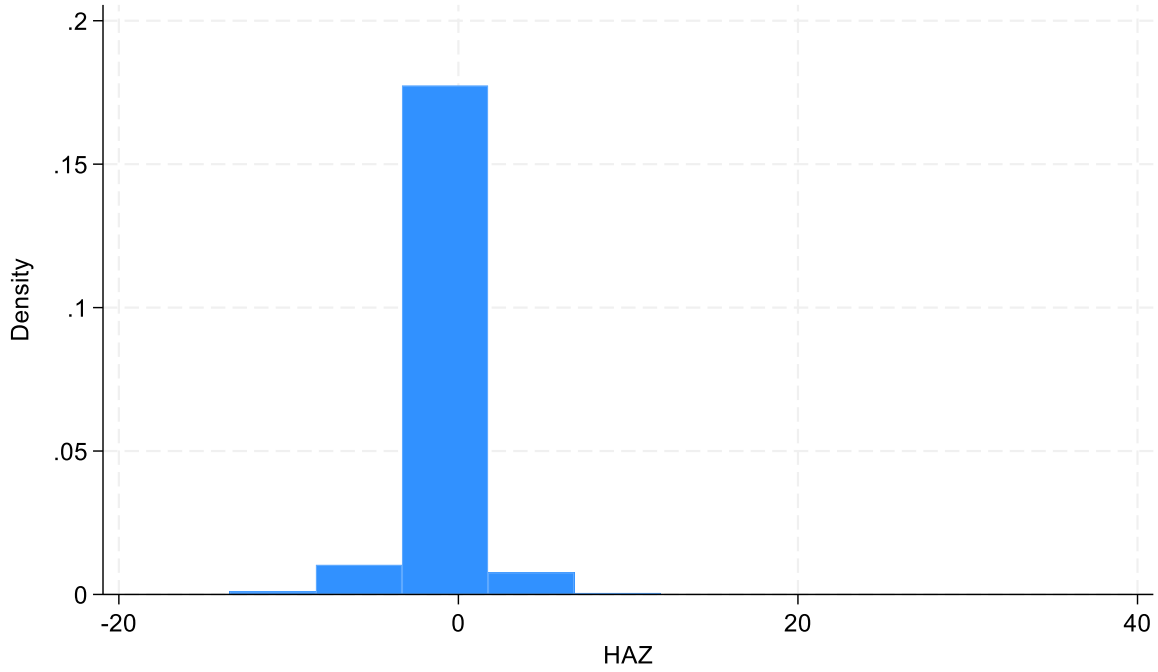
Variable	VIF	1/VIF
Employment status	3.33	0.300614
Current activity	3.26	0.306412
caregiver religion	1.25	0.801541
marital status	1.23	0.814048
children ever born	1.19	0.838892
education level	1.18	0.849559
Age at first birth	1.13	0.881064
caregiver medical aid	1.09	0.917125
Depressive symptoms	1.01	0.98798
caregiver ethnic group	1.01	0.98998
Mean VIF	1.57	

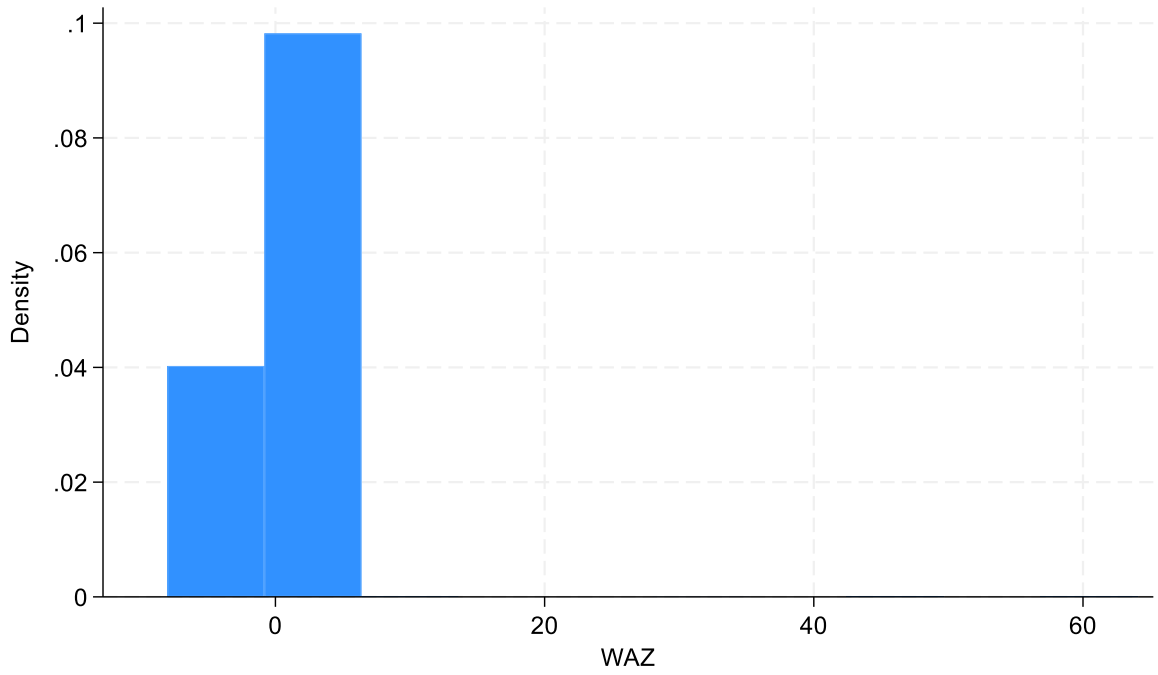
Household level variables

Variable	**VIF**	**1/VIF**
household rooms	1.99	0.50326
Toilet sharing	1.47	0.680164
Toilet type	1.45	0.688027
Type of dwelling unit	1.44	0.695124
Food spending	1.39	0.717363
Water source	1.39	0.721592
Dwelling unit status	1.21	0.827334
Food availability	1.18	0.843954
Media access	1.09	0.914985
Household Electricity	1.08	0.92804

household safety	1.01	0.989722
socioeconomic status	1.01	0.993115
Mean VIF	1.31	

Appendix 1. 13 Malnutrition Cut-offs

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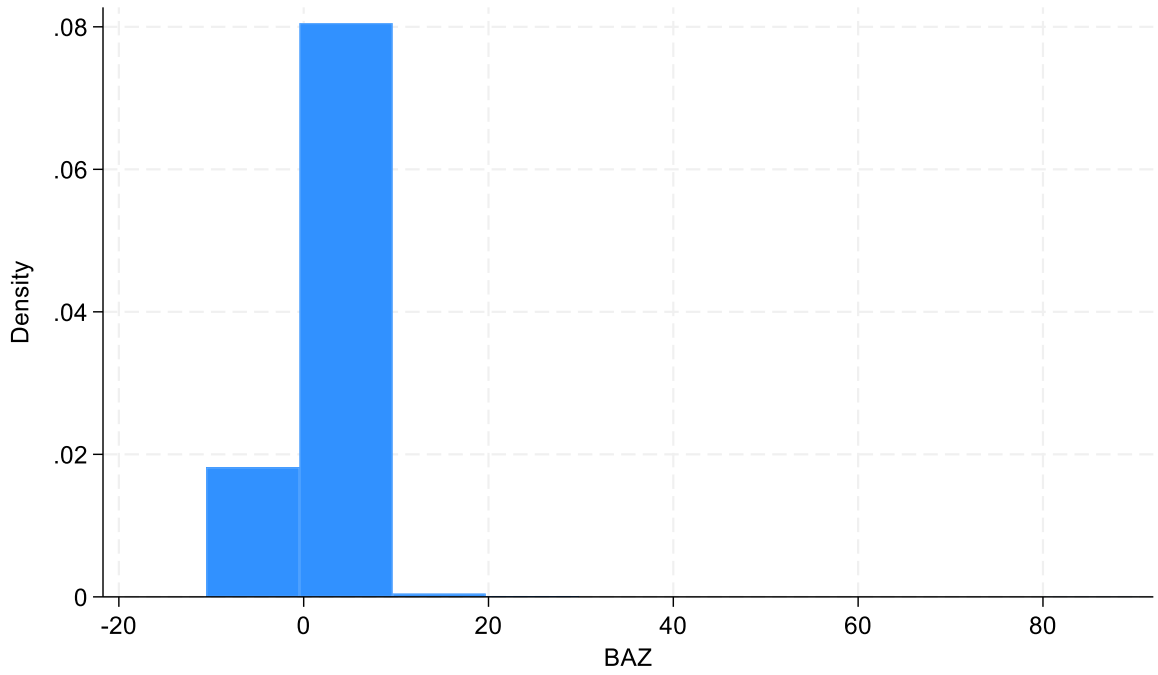
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Appendix 1. 14

Dissemination Plan

Title	Conference	Target Journal	Status
The Relationship between Childcare-Giving Arrangements and Children's Malnutrition Status in South Africa	2022: Southern Africa Social Protection Network (SASPEN) 2022: School of Public Health Research Day 2023: International Consortium of Social Development Colloquium- Africa branch	International Journal of Environmental Research and Public Health	Published- January 2023
Linking different care and support systems to improve childhood malnutrition: Perceptions of Early Childhood Development practitioners of integrating multi-sectoral social systems.	2022: National Institute Humanities and Social Science Doctoral Conference 2023: Global Health Promotion Conference – Rajagirri College of Social Sciences, India	The Open Public Health Journal	Published – October 2023
An investigation of childhood malnutrition and health seeking amidst the Covid-19 pandemic: A qualitative assessment	2022: African Social Science Unit or Research and Evaluation conference (Assure)	BMC Health Services Research	Draft – to be submitted May 2024
The Effect of the Covid-19 Pandemic on Childcare and the Nutritional Outcomes of	2022: University of Nigeria, Nsukka	Children & Youth Services Review	Draft – to be submitted June 2024

Children: Perceptions of ECD Practitioners			
Exploring Childhood malnutrition, Food Security, and Social Context: Implications for Social Development Processes in Gauteng and Limpopo	2023: Post graduate DAAD exchange program	Journal of Social Development in Africa	Under-review
The social Context of childhood malnutrition in South Africa	2023: The Public Health Association of South Africa 2023: School of Public Health / CARTA conference	Journal of Child Health Care	Draft – to be submitted April 2024
Patterns of child health care utilization in urban and rural South Africa: A qualitative investigation		Health SA Gesondheid: Journal of Interdisciplinary Health Sciences	Draft – to be submitted June 2024
The conception of health and care in improving child malnutrition: A review of the food and Nutrition framework using South Africa as a case study.		Child Care in Practice	to be submitted September 2024
"Making ends meet: Caregiver livelihood strategies and children's nutritional status"			to be submitted October 2024
The social context of concurrent malnutrition among children under five in South Africa			to be submitted January 2025