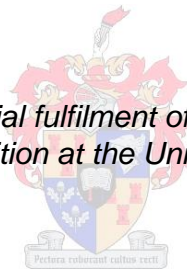


Anthropometric status in children aged 6-36 months, born from
intended and unintended pregnancies in vulnerable
communities from the Western Cape Province

by
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*Thesis presented in partial fulfilment of the requirements for the
degree Master of Nutrition at the University of Stellenbosch*



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DECLARATION

By submitting this thesis electronically, I declare that the entirety of the work contained herein is my own, original work, that I am the sole author thereof (save to the extent explicitly otherwise stated), that reproduction and publication thereof by Stellenbosch University will not infringe any third-party rights and that I have not previously, in its entirety or in part, submitted it for obtaining any qualification.

ENGLISH ABSTRACT

South Africa has a high rate of unintended pregnancies among vulnerable women. There is a growing body of evidence that shows the importance of the first 1000 days of life (namely, from conception to 2 years old). This time period in the life cycle provides a crucial window of opportunity for proper nutrition, which could improve overall health, cognitive capacity and academic performance, leading to improved health and socio-economic circumstances on an individual and national scale in South Africa. Improving the quality of women's and girls' pre-conception nutritional intake, as well as their intake during the period of pregnancy, could boost progressive maternal and child health and development outcomes.

This cross-sectional study measured the pregnancy intention of mothers (n=72), aged 15 to 43 years old, retrospectively to analyse the impact thereof on their child's current nutritional status in two vulnerable peri-urban communities in the Western Cape. Other determinants of health and its effects on children's nutritional status were also investigated. From the sample population, 39% (n=28) of the pregnancies were categorised as "Unplanned", 46% (n=33) as "Ambivalent" and only 15% (n=11) as "Planned". Infants born from ambivalent pregnancy intention had a slightly lower birth weight than those of unplanned and planned pregnancy intention. Pregnancy intention and the current anthropometric status of the child were not associated [CI: -1.86 to 1.86]. A non-linear association was found between the ages of the sample population and their anthropometric status. Children aged 12 to 28 months were more prone to malnutrition. Women receiving their main income from the Child Support Grant had a significantly lower pregnancy intention than those women receiving their main income from either family or the child's father (Prob > F =0.0038).

No literature was previously available on whether there is a link between the high rate of unintended pregnancies in vulnerable communities in South Africa, and malnutrition in young children born from such pregnancies. This research concludes that unintended pregnancies did not contribute to malnutrition in the studied vulnerable peri-urban communities. Hence, even though many of the pregnancies were unintended, it seems as if most of the mothers found a way to care for the child. Improving nutritional quality and the emotional wellbeing of all women of childbearing potential, therefore, presents a key opportunity to improve future generations' health and mitigate the risk of adverse long-term economic outcomes. Future mothers should be empowered to make decisions in the best interest of their children, regardless of whether the pregnancies were planned or unplanned.

AFRIKAANSE OPSOMMING

Suid-Afrika ondervind 'n hoë koers van onbeplande swangerskappe onder kwesbare vroue. Daar is toenemende bewyse vir die belangrikheid van die eerste 1000 dae van lewe (naamlik vanaf bevrugting tot twee-jarige ouderdom). Hierdie lewensiklus-fase voorsien 'n kritieke venster periode vir behoorlike kwaliteit voeding, wat algehele gesondheid, kognitiewe kapasiteit en akademiese prestasie kan verbeter, wat kan lei tot verbeterde gesondheid en sosio-ekonomiese toestande op 'n individuele en nasionale vlak in Suid-Afrika. Verbetering van meisies en vrouens se voedingsinname voor bevrugting sowel as gedurende die swangerskap, kan dus progressiewe uitkomst vir die moeder en kind se gesondheid en ontwikkeling beteken.

Hierdie deursnee-studie het die swangerskap intensies van moeders ($n=72$), 15 tot 43 jaar oud, in twee kwesbare, buitestedelike gemeenskappe in die Wes-Kaap retrospektief gemeet om sodoende die impak daarvan op hul kinders se huidige voedingstatus te analiseer. Ander faktore wat gesondheid bepaal en die effekte daarvan op kinders se voedingstatus was ook ondersoek. Uit die steekproef bevolking was 39% ($n=28$) van die swangerskappe gekategoriseer as "Onbepland", 46% ($n=33$) as "Ambivalent" en slegs 15% ($n=11$) as "Beplan". Kinders gebore uit ambivalente swangerskappe het 'n effens laer geboortegewig gehad as dié van onbeplande of beplande swangerskappe. Die huidige antropometriese status van die kinders en swangerskap intensie was nie geassosieer nie [CI: -1.86 tot 1.86]. 'n Nie-liniêre assosiasie was gevind tussen die ouderdomme van die steekproef bevolking en hul antropometriese status. Kinders tussen 12 en 28 maande oud was meer geneig tot wanvoeding. Vrouens wat hul hoofinkomste ontvang het van 'n Kinderondersteuningstoelae het 'n betekenisvolle laer swangerskap intensie gehad as dié vrouens wat hul hoofinkomste ontvang het van hul families of die kinders se vader (Prob > $F = 0.0038$).

Geen literatuur was voorheen beskikbaar oor die moontlikheid van 'n skakel tussen die hoë onbeplande swangerskapskoers in kwesbare gemeenskappe in Suid-Afrika, en wanvoeding in jong kinders gebore uit sulke swangerskappe nie. Hierdie navorsing het tot die gevolgtrekking gekom dat onbeplande swangerskappe nie bygedra het tot wanvoeding in die bestudeerde kwesbare, buitestedelike gemeenskappe nie. Dit blyk dat meeste van die moeders n manier gevind het om na die kind om te sien, ten spyte van die feit dat baie van die swangerskappe onbepland was. Die verbetering van voeding en die emosionele welstand van alle vrouens met die potensiaal om swanger te raak bied dus 'n gulde

geleentheid om die toekomstige generasies se gesondheid te verbeter en die risiko van ongunstige, langtermyn ekonomiese uitkomst te verminder. Toekomstige moeders moet bemagtig word om besluite te maak in die beste belang van hul kinders of die swangerskappe beplan of onbepland was.

ACKNOWLEDGEMENTS

Firstly, I am thankful to God who inspired me to take on this challenge of seeking answers to the questions that I have been pondering on and for giving me the strength and wisdom to push through and complete this research. I am eternally grateful to my husband, Alfie, and our children, Emma, Alfie and Hannah, for their support and for allowing me time to study, research and write. I also want to express my most heartfelt gratitude to my dear father and mother, who taught me to always give my best and never give up. Also, I want to thank all my family and friends who encouraged me to keep going and diligently prayed for me. My sincere thanks to my supervisor, Prof Lisanne du Plessis, for her valuable feedback and advice throughout the preparation and writing of this thesis. Thank you to Dr Carl Lombard for assisting with the statistical analysis and interpretation of the data and to Dr Donald Skinner for his valuable guidance. I am also sincerely thankful to Dr Elizabeth Hellström and my colleagues at Be Part Yoluntu Centre, Mbekweni, who supported me, especially during the data collection, with patience. Thank you for the amazing work you do in this vulnerable community. To all the mothers and children from the Mbekweni and Dalvale area who were willing to partake in this study and share their experiences with me: I am forever honoured and grateful for being allowed to gain insight into your lives and struggles.

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LIST OF ABBREVIATIONS

ARV	Anti-retroviral
BMI	Body Mass Index
CES-D	Centre for Epidemiologic Studies Depression Scale
CSDH	Commission on Social Determinants of Health
CSG	Child Support Grant
DCHS	Drakenstein Child Health Study
DoH	Department of Health
EBF	Exclusive breastfeeding
ECD	Early childhood development
HAZ	Height-for-age z-score
HFIAS	Household Food Insecurity Access Scale
HIV	Human Immunodeficiency Virus
ICF	Informed Consent Form
LMIC	Low- and middle-income countries
LMUP	The London Measure of Unintended Pregnancy
Lowess	Locally Weighted Scatterplot Smoothing
PD	Positive Deviance
PTSD	Post-Traumatic Stress Disorder

SANHANES-1 South African Nutritional Health and Nutrition Examination Survey

SD Standard Deviation

SES Socio-Economic Score

TOP Termination of pregnancy

TOST Two-one-sided statistical test

UNFPA United Nations Population Fund

UNICEF United Nations Children's Fund

WASH Water, sanitation and hygiene

WAZ Weight for age z-score

WHA World Health Assembly

WHO World Health Organization

WHZ Weight-for-height z-score

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Child Support Grant (CSG): A Child Support Grant is a cash transfer paid monthly to the qualifying primary caregiver for every child born on or after 1 October 1994 up to the age of 18 years to supplement the household income. Both the child and the caregiver must be South African citizens¹.

Double burden of malnutrition: The double burden of malnutrition is characterised by the coexistence of undernutrition, along with overweight, obesity and diet-related non-communicable diseases, within individuals, households and populations and across the life-course².

Food security: A situation that exists when all people, at all times, have physical, social and economic access to sufficient, safe and nutritious food that meet their dietary needs and food preferences for an active and healthy life³. The dimensions of food security are food availability, access, utilisation and stability⁴.

Food insecurity: A situation that exists when people lack secure access to sufficient amounts of safe and nutritious food for normal growth and development and an active and healthy life. It may be caused by the unavailability of food, insufficient purchasing power, inappropriate distribution or inadequate use of food at the household level. Food insecurity, poor conditions of health and sanitation, and inappropriate care and feeding practices are the major causes of a poor nutritional status. Food insecurity may be chronic, seasonal or transitory⁵.

Malnutrition: Malnutrition refers to deficiencies, excesses or imbalances in a person's intake of energy and/or nutrients. The term covers two broad groups of conditions. The one is "undernutrition" which includes stunting (low height for age), wasting (low weight for height), underweight (low weight for age) and micronutrient deficiencies or insufficiencies (a lack of important vitamins and minerals). The other is overweight, obesity and diet-related non-communicable diseases (such as heart disease, stroke, diabetes and cancer)⁶.

Mixed ancestry: This term refers to a South African population group comprising 32-43% Khoisan, 20-36% Bantu-speaking African, 21-28% European and 9-11% Asian ancestry⁷.

Vulnerable communities: Such communities are those where people are unable to buffer themselves from hazards for a number of reasons and have a low ability to cope with short-term shocks (such as droughts) and mitigate chronic stressors, which in turn means that the negative impacts on their livelihoods resulting from such coping and survival strategies are very high⁸.

CONTRIBUTIONS BY PRINCIPAL RESEARCHER AND FELLOW RESEARCHERS

The principal researcher, Adri Holm, developed the idea and protocol. The principal researcher planned the study; undertook data collection; captured the data for analyses; analysed and interpreted the data with the assistance of a statistician, Dr Carl Lombard; and drafted the thesis. Prof Lisanne du Plessis, Dr Donald Skinner and Dr Carl Lombard provided input at all stages and revised the protocol and thesis.

CHAPTER 1 – GENERAL INTRODUCTION

1.1 Introduction

In Sub-Saharan Africa, almost a third of pregnancies in women of childbearing age (15 to 49 years old) are unintended and mostly occur in adolescents and women under the age of 25 years⁹. South Africa has a similarly high rate of unintended pregnancies, with only 22.4% of low-income women countrywide having planned pregnancies¹⁰. There is a growing body of evidence that shows the importance of the first 1000 days of life (namely, from conception to 2 years old)¹¹. This time period in the life cycle provides a crucial window of opportunity for proper nutrition, which could improve overall health, cognitive capacity and academic performance¹², leading to improved health and socio-economic circumstances on an individual and national scale in South Africa.

Since the unintentional pregnancy rate is so high among vulnerable communities in South Africa, programmes and policies should support better nutrition for all, especially amongst women of childbearing age. This includes adolescent girls, where almost no pregnancies seem to be consciously planned¹⁰. Improving the quality of women's and girls' preconception nutritional intake as well as their intake during pregnancies could boost progressive maternal and child health outcomes. Previous research reported that health outcomes could be more dependent on the circumstances and emotions surrounding the pregnancy, rather than on the pregnancy intention¹³. Thus, by protecting and supporting all mothers-to-be, regardless of their pregnancy intention, and promoting nurturing care among them, resilience of communities and health systems can be enhanced¹¹. Nutritional and mental support for all women and girls of childbearing potential should be promoted, in addition to focussing on preventing unplanned pregnancies.

1.2 Motivation for Study

No literature was previously available on whether there is a link between the high rate of unintended pregnancies in vulnerable communities in South Africa and malnutrition in young children born from such pregnancies. Yet, the researcher observed the nutritional and maternal dynamics in the low-income, peri-urban communities of Mbekweni, which is predominantly an African community, and Dalvale in Paarl East, having a mostly mixed ancestry population. From these observations, questions arose regarding the high unintended pregnancy rate in the two communities and the effect this, together with other

determinants of health, has on the nutritional status of the children growing up in these challenging circumstances.

The following research question motivated the design of this research study: Are children of 6 to 36 months of age, from the mentioned vulnerable communities and born from unintended pregnancies, more prone to malnutrition, as an outcome of the social determinants of health, than those children from intended pregnancies? In other words, are unintended pregnancies associated with malnutrition in this population?

The proposed research study could help clarify whether the high rate of unintended pregnancies in vulnerable communities potentially influence the anthropometrical status of children aged 6 to 36 months and investigate which other social determinants of health might affect this phenomenon. If unintended pregnancies indeed affect the nutritional status of these young children, the research would stress the importance of identifying these unintended pregnancies early on as high-risk pregnancies in relation to the future nutritional status of a child. Priority prenatal and postnatal nutritional and mentoring interventions could thus possibly reduce the prevalence of malnutrition among children born from such pregnancies.

1.3 Aims and Objectives

The main aim of the research was to compare the anthropometric status in children aged 6 to 36 months who were conceived unintentionally with those from intended pregnancies in vulnerable communities from the Western Cape Province.

The primary objectives of the research were:

- Determining the anthropometric status of children aged 6 to 36 months;
- Determining the intendedness of the pregnancies; and
- Assessing the association between the maternal pregnancy intention and child anthropometric status.

The secondary objectives of the research were:

- Determining the socio-economic risk factors associated with malnutrition in these children;

- Determining the vaccination history (immunisation status) of these children;
- Determining aspects of household food security of the mother-child pairs;
- Determining the maternal biological and behavioural factors;
- Determining the maternal levels of depression and PTSD; and
- Determining the weight at birth and comparing the intention of the pregnancy between low birth weight and normal birth weight babies.

1.4 Hypothesis

Null Hypothesis: The pregnancy intention, measured by the LMUP score, is different between mothers with children with a normal nutritional status versus mothers with children with under- or over-nutrition.

Alternative Hypothesis: The pregnancy intention, measured by the LMUP score, is equivalent between the nutrition groups.

1.5 Research Question

Are children of 6 to 36 months of age, from a vulnerable community in the Western Cape, born from unintended pregnancies, more prone to malnutrition, as an outcome of the social determinants of health, than those from intended pregnancies? In other words, is unintended pregnancies associated with malnutrition in this population?

1.6 Assumptions

It was assumed that the unintended pregnancy rate in these communities are high and that the malnutrition prevalence among children aged 6 to 36 months is also elevated.

1.7 Limitations

This study was subject to time and financial constraints.

1.8 Brief Outline of Thesis

Chapter 1 provides a brief introduction to the research study and motivates the aims and objectives of the study, while Chapter 2 presents a review of the literature regarding the current situation of pregnancies, malnutrition and the concept of pregnancy intention. Chapter 3 describes the methodology used in this research study and Chapter 4 incorporates a draft journal article intended for submission to Maternal and Child Health, entitled "Unintended Pregnancy and Malnutrition in Young Children from Vulnerable Peri-

Urban Communities of the Western Cape, South Africa”. In Chapter 5, a general discussion and summary of the results of the research is provided, along with a conclusion of the thesis and recommendations.

CHAPTER 2 – LITERATURE REVIEW

2.1 The Current Situation

Recently released figures report that the worldwide estimate of unintended pregnancies from 2010 to 2014 were 44%. Furthermore, the estimate for Africa was 39%, with the Southern African region having the highest rate of 66% of unintended pregnancies¹⁴. Research in Sub-Saharan Africa further shows that 28% of pregnancies in women aged 15 to 49 years are unintended. Of these cases, 44% include women and adolescents below 25 years⁹.

In South Africa, unintended pregnancies occur frequently in both adults and adolescents, with rates of planned pregnancies being reported as 44.6% in 2008 and 34.7% in 2012. Only 22.4% of low-income women countrywide reported planned pregnancies¹⁰. Among teenage girls in the Eastern Cape Province of South Africa, a lower socio-economic status was shown to be a risk factor for both unplanned and unwanted pregnancies¹⁵. In a cross-sectional study done in South Africa among 3123 participants, consisting of 97.5% black African girls, 19.2% had an adolescent (aged 12 to 19 years old) pregnancy of which 74.1% indicated that the pregnancy was unwanted¹⁶. Such statistics are concerning, considering that adverse consequences of unwanted pregnancies tend to be more severe than for those of unplanned pregnancies¹⁷. Unintended pregnancies are thus reported to have adverse effects on various childhood outcomes, including increased odds for low birth weights and preterm births¹⁸. Low birth weight is further associated with foetal growth restriction and impaired childhood cognitive and motor development¹⁹, while preterm birth takes place before 37 weeks of pregnancy and is the leading cause of new-born deaths in children below 5 years old²⁰.

During 2012, the South African Nutritional Health and Nutrition Examination Survey (SANHANES-1) reported a prevalence of 47% undernutrition among children up to 3 years old, including stunting of 26.9% among boys and 25.9% among girls²¹. Other research in South Africa further reported the highest prevalence of stunting among black and coloured children²². There was no significant difference between vulnerable black African children and children of mixed ancestry, with respect to mean weights, mean heights, overweight and obesity; however, girls of mixed ancestry were significantly more stunted, underweight and experiencing wasting than black African girls²¹.

A growing body of evidence points to the significance of nurturing care during the first 1000 days of life (namely, from conception to 2 years old). This time period in the life cycle

provides a crucial window of opportunity for optimal nutrition, which could improve a child's ability to grow and learn and thus improve overall health, cognitive capacity and school performance¹². This could lead to improved health and socio-economic circumstances on an individual and national scale. Improving the quality of women's and girls' preconception nutritional intake is therefore of utmost importance, but when a pregnancy is unintended, the opportunity for optimal nutrition beginning at conception may be missed. The possible positive impact of these first 1000 days may thus be diminished, resulting in life-long, intergenerational consequences.

The Commission on Social Determinants of Health (CSDH), set up by the World Health Organization (WHO), conceptualised the CSDH framework (figure 2.1) which include various social determinants of health inequities (also called structural determinants) and the social determinants of health (also called intermediary determinants). The social determinants of health inequities include political and socio-economic factors, for example governance, public policies, and cultural and social values. Furthermore, material circumstances, psychosocial circumstances, and behavioural and biological factors are included in the CSDH framework²³. Many of these social determinants of health inequities and health affect the occurrence of both malnutrition and unintended pregnancies on different levels. For example, cultural and social values could impact whether unintended pregnancies occur which could affect the socio-economic position, including education, which again could affect the intermediary determinants of which material circumstances are one. All these determinants could have a detrimental effect on the nutritional status of a child born from an unintended pregnancy.

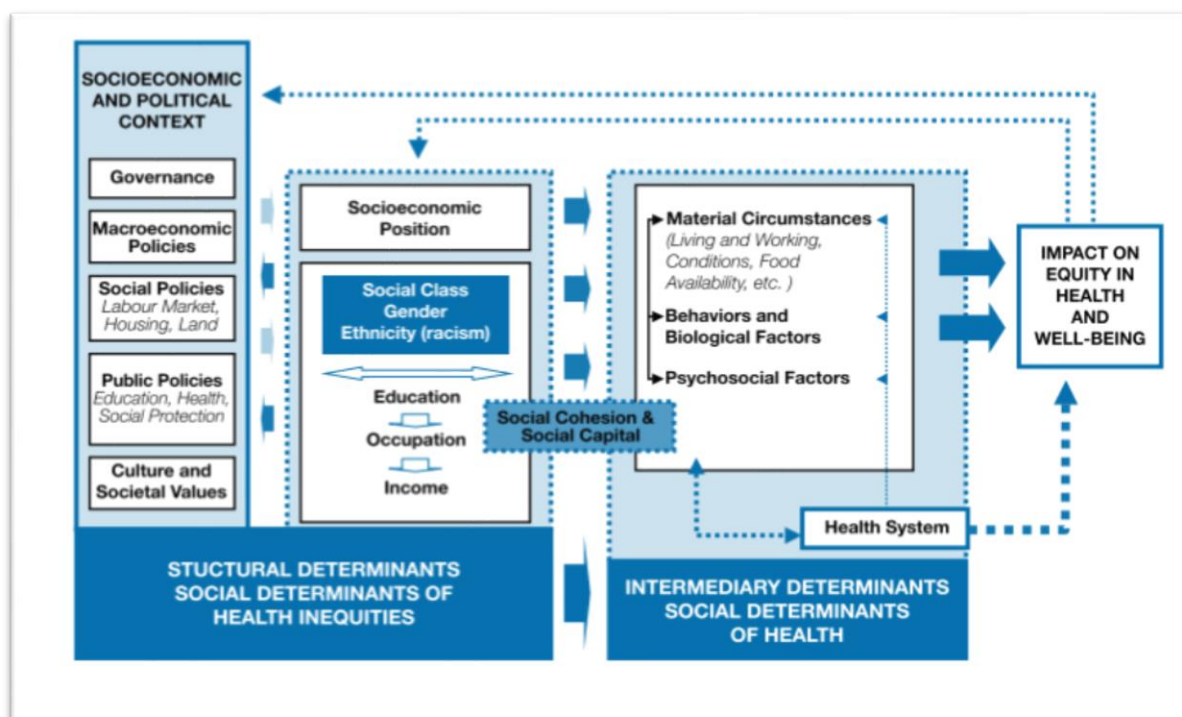


Figure 2.1: The Commission on Social Determinants of Health (CSDH) Framework²³

Furthermore, previous research in vulnerable communities of South Africa has investigated various socio-economic (wealth and household food security), biological (age and gender), maternal (education, age, Body Mass Index [BMI], perceptions and autonomy) and child health (history of breastfeeding and diarrhoea) risk factors associated with undernutrition²⁴. Evidence on the association between unintended pregnancy and undernutrition or even overweight or obesity in children born from such unintended pregnancies are, however, lacking in South Africa, even though the rate of these challenging pregnancies is high.

In addition, in a recent study done in Ethiopia, it was evident that the risk factors influencing stunting varied considerably within the various age groups (under 6 months; 6 to 23 months; and 24 to 59 months)²⁵. Most research has been conducted in the developed nations, including the United States of America, where correlations have been found between unintended pregnancies and later initiation of antenatal care^{26,27}. Marston and Cleland came to the conclusion that one can expect an unintended pregnancy to have more negative outcomes for a child than an intended pregnancy²⁸.

It is furthermore well known that most mothers are intricately involved in the outcome of their children's nutritional status through food preparation, hygiene, feeding practices, health and psychological care²⁹. Thus, Tomlinson commented that understanding early child-caregiver interactions forms a crucial part of the development and growth of infants³⁰. Moreover,

recent research suggests that there is a positive association between maternal autonomy and a healthy child nutritional status³¹ and that young women and those with a lower socio-economic status have less maternal autonomy³². One could, therefore, expect that the nutritional status of the children would be negatively affected in communities with high unintended pregnancy rates, especially among younger women with subsequent lower maternal autonomy. A recent study in Bangladesh reported that children conceived unwantedly were more likely to be stunted, wasted or underweight, when compared to those from a wanted pregnancy³³.

Ultimately, in vulnerable communities, the question arises whether an “added mouth to the table” could have an adverse effect on the food security of the household and, therefore, on the nutritional status of an unplanned child. Research in South Africa indicate that, among most young mothers, even though the pregnancy was unintended, most find a way to care for the child³⁴. Also, in a recent study in Columbia, it was reported that some adolescents said that their pregnancies were initially unwanted, but that, after feeling the baby in the womb, the pregnancies became an act of love and they accepted the unborn child³⁵. Most of these adolescents came from single-parent, women-headed households with low food security³⁵.

The pressing importance of decreasing under-5 child malnutrition, especially stunting and wasting, has been elevated on the international agenda. Francesco Branca, director of the Department of Nutrition for Health and Development, World Health Organization, and colleagues stated that, “investment in nutrition is crucial to future efforts to improve the health of women, children, and adolescents; the potential human, societal, and economic gains from such investment are substantial”³⁶. Child malnutrition has subsequently been appropriately highlighted in the Sustainable Development Goals of September 2015, specifically in Goal 2: “End hunger, achieve food security and improved nutrition, and promote sustainable agriculture” and included in the accompanying World Health Assembly (WHA) targets, as indicated in Table 2.1³⁷.

Table 2.1: World Health Assembly Nutrition Targets 2025³⁷

World Health Assembly target	Baseline year/s	Baseline status	Target for 2025
40% reduction in the number of children under five who are stunted	2012	162 million	~100 million
50% reduction of anaemia in women of reproductive age (pregnant and non-pregnant)	2011	29%	15%
30% reduction in low birth weight	2008-2011	15%	10%
No increase in childhood overweight	2012	7%	7%
Increase the rate of exclusive breastfeeding (EBF) in the first six months up to at least 50%	2008-2012	38%	50%
Reduce and maintain childhood wasting to less than 5%	2012	8%	<5%

In their analysis of the Demographic and Health Surveys of 64 low-income and middle-income countries, Roth et al.³⁸ found that the most prominent underlying causes of postnatal linear growth faltering are community-wide exposures to which almost all of the children in the community are exposed, as opposed to individual-level exposures. They have thus called for research into community-level determinants of child health in low-income countries to be prioritised. Unintended pregnancies could be an individual- or community-level exposure that could be undermining children's anthropometric status and thus their health.

From the literature, it is clear that there is a need to investigate whether there is indeed an association between the high rate of unintended pregnancies in vulnerable communities in South Africa and the prevalence of malnutrition in young children born from such pregnancies. The proposed research study could help clarify whether the high rate of unintended pregnancies in vulnerable communities potentially influence the nutritional status of children aged 6 to 36 months and investigate which other social determinants of health might influence the situation. If unintended pregnancies are indeed associated with the malnutrition of children aged 6 to 36 months, the research findings would stress the importance of identifying these unintended pregnancies early on as high-risk pregnancies. Priority prenatal and postnatal nutritional and mentoring interventions could subsequently possibly reduce such outcomes of malnutrition among these children.

2.2 *Malnutrition Defined*

Malnutrition incorporates all nutritional disorders of deficiency (undernutrition); excess nutrition (overnutrition); and imbalanced nutrition, including imbalances in energy intake, macronutrient and micronutrient deficiencies and unhealthy dietary patterns³⁹. Various anthropometric measures may be used to evaluate the nutritional status in infants and children, including weight, length (in infants under 2 years)/height, mid-arm circumference, head circumference and body composition through skinfold-thickness or dual energy x-ray absorptiometry (DXA). Of these measurements, weight and length/height are most commonly used in infants and children as they are easy to use, cost-effective and non-invasive.

The nutritional status of infants and children, based on anthropometric measures, has been classified by the WHO in 2006 (Table 2.2) using growth standards that illustrate normal early childhood growth under optimal environmental conditions. This categorisation system entails the use of z-scores or Standard Deviation (SD) scores to describe the child nutritional status at all areas of the distribution. It can also be used to determine summary statistics and assess children worldwide, regardless of ethnicity, socio-economic status or type of feeding⁴⁰.

Table 2.2: Indicators of Child Nutritional Status⁴⁰

Nutritional Status	Indicator compared to median of WHO child growth standards
Obese	Weight-for-length/height or BMI-for-age >3 SD of the median
Overweight	Weight-for-length/height or BMI-for-age >2 SD and ≤ 3 SD of the median
Moderately Underweight	Weight-for-age <-2 SD and ≥ -3 SD of the median
Severely Underweight	Weight-for-age <-3 SD of the median
Moderate Acute Malnutrition	Weight-for-length/height or BMI-for-age ≤ -2 SD and ≥ -3 SD of the median
Severe Acute Malnutrition	Weight-for-length/height or BMI-for-age <-3 SD of the median, or severe wasting, or presence of nutritional oedema.

Nutritional Status	Indicator compared to median of WHO child growth standards
Moderate Stunting	Length/Height-for-age ≤ -2 SD and ≥ -3 SD of the median
Severe Stunting	Length/Height-for-age < -3 SD of the median
Moderate Wasting	Weight-for-length/height ≤ -2 SD and ≥ -3 SD of the median
Severe Wasting	Weight-for-length/height < -3 SD of the median

As mentioned earlier, malnutrition incorporates both undernutrition, which includes stunting, wasting, underweight and micronutrient deficiencies or insufficiencies, which is a lack of important vitamins and minerals) and overnutrition (including both overweight and obesity)³⁹. Using the WHO growth standards, children's anthropometric measurements can be translated into sex- and age-specific z-scores: weight-for-age (WAZ), height-for-age (HAZ), weight-for-height (WHZ) and BMI-for-age.

Stunting is an indication of chronic or recurrent undernutrition and is defined as HAZ equal or below -2 SD or severe stunting which is below -3 SD. It is defined by the WHO as a public health problem when 20% or more of the population is affected³⁶. Underweight is defined as WAZ equal or below -2 SD and wasting, which is an indication of acute undernutrition mainly due to hunger and/or disease, is defined as WHZ equal or below -2 SD, with severe wasting being -3 SD. Wasting becomes a public health problem when 5% or more of the population is affected³⁶. Overweight is defined as WHZ / BMI-for-age equal or above $+2$ SD and obesity as WHZ / BMI-for-age equal or above $+3$ SD. Overweight is known to be caused by an excessive, unbalanced intake of energy or nutritional substances and is often combined with a sedentary lifestyle.

2.3 Multi-Level Causes of Malnutrition

The well-known original United Nations Children's Fund (UNICEF) conceptual framework portrays the causes of malnutrition (UNICEF, 1990). In 2013, UNICEF released a conceptual framework of the determinants of maternal and child undernutrition⁴¹ (Figure 2.2) which built on subsequent reports and the original conceptual framework. This framework illustrates the

cycle of intergenerational poor nutrition, illness and poverty that many, especially those living in developing countries, are trying to break out of.

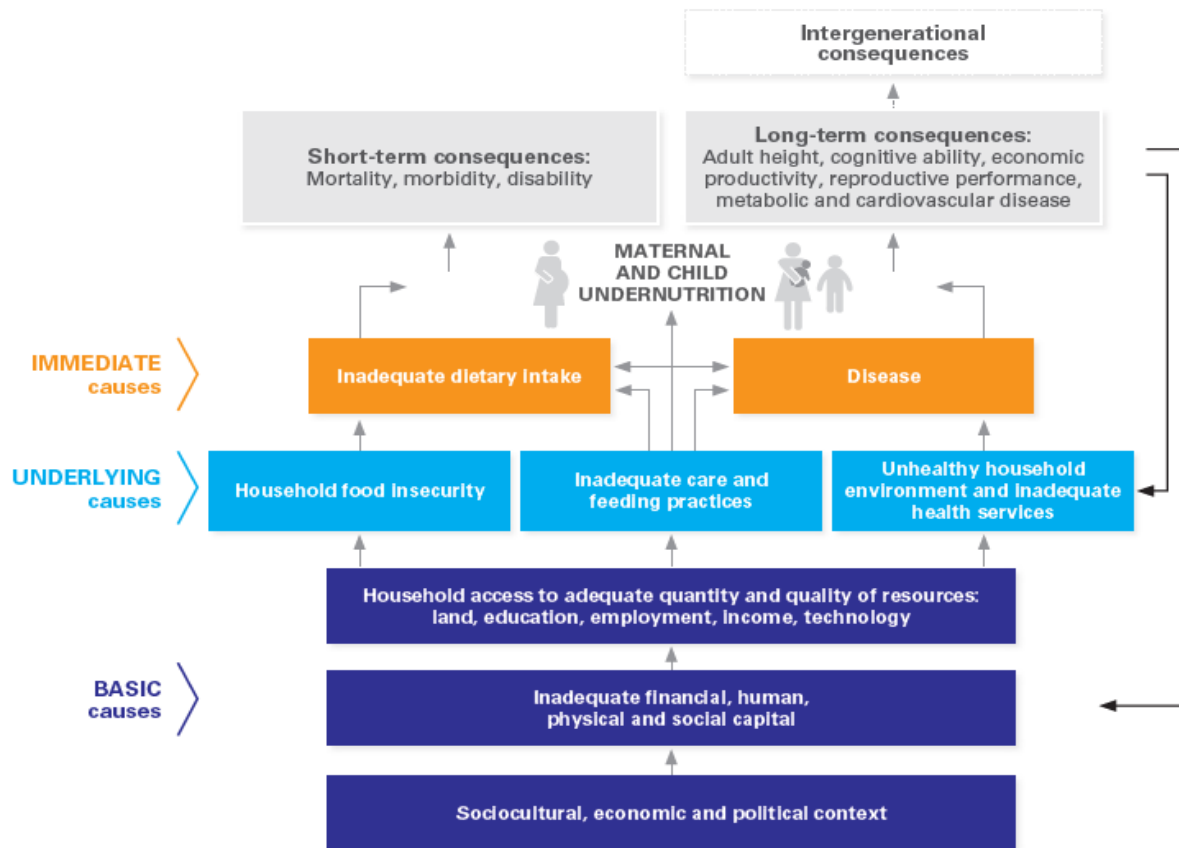


Figure 2.2: Conceptual Framework of the Determinants of Maternal and Child Undernutrition⁴¹

These determinants of maternal and child malnutrition are furthermore multi-dimensional and organised into three levels: immediate causes, underlying causes and basic causes. Each level will be discussed in the sections to follow.

2.3.1 Immediate Causes of Maternal and Child Malnutrition

The immediate causes are those that affect the mother or child on an individual level, namely inadequate nutrition and the presence of disease. These two immediate causes can also affect each other. For example, a disease could lead to poor appetite and thereby decrease food intake or a disease could affect the absorption of macro- or micronutrients and thereby lead to an inadequate nutritional status. Alternatively, inadequate nutrition can cause disease, for instance where a deficient Vitamin A intake leads to poor immune function which, in turn, leads to infectious diseases, such as measles or diarrhoea.

The nutritional status of the mother or child may or may not be affected by their HIV status, depending on their compliance with their anti-retroviral medication (ARVs). Research has confirmed these conflicting results⁴². This potential impact of an HIV status on the nutritional status must be given due consideration, considering that the South African HIV prevalence rate in 2012, especially among adolescent girls and young women aged 15 to 24 years, was 11.4%⁴³. Also, a national prevalence rate of 29.7% was observed in 2013 among pregnant women, with a prevalence of 18.7% in the Western Cape area⁴⁴.

In addition to affecting the mother's health, smoking, alcohol and drug use during pregnancy may further directly affect the growth of the unborn child. The use of such substances may, in turn, lead to an inadequate intake of maternal nutrition, affecting the nutritional intake of the unborn child as well as the absorption of nutrients in the child. As discussed earlier, inadequate maternal nutrition will have a lasting impact on an infant's nutritional status¹⁹ and this can be further impacted by maternal age⁴⁵, weight^{45,46} and stature.

Various factors relating to the nutritional intake of a child, namely the lack of early initiation of breastfeeding, non-EBF⁴⁵ and the type and amount of complementary feeding, have further been linked to child undernutrition.

2.3.2 Underlying Causes of Maternal and Child Malnutrition

Fuelling the factors described in Section 2.3.1 are: insufficient access to affordable, diverse, nutrient-rich food (household food insecurity); inappropriate maternal care and childcare practices, recently termed nurturing care⁴⁷ which can be due to maternal depression or adolescent pregnancy; inadequate health services (including immunisation coverage of infants); and an unhealthy environment, including unsafe water, lacking sanitation and poor hygiene practices. The interplay between these factors must not be underestimated, as the lack of appropriate health services during a period of psychological stress or the presence of Post-Traumatic Stress Syndrome, can affect the ability of a mother to care for and nourish her child⁴¹, or being an adolescent mother could lead to inadequate childcare practices, resulting in malnutrition of the child.

For example, a recent case-control study in Uganda⁴⁸ found that infants, between 1 and 5 years of age, of depressed mothers are more prone to being underweight and stunted, compared to those of mothers who are not depressed. The depressive state of the mother

thus affects the ability of the mother to care for and nourish her child by reducing her interest in the child⁴⁹.

In addition, maternal agency or autonomy have been linked to child feeding, hygiene and nutritional status⁵⁰, leading to inadequate childcare and feeding practices.

Smoking, alcohol and drug use after the birth of a child can further indirectly affect the nutritional status of the child through inadequate childcare and feeding practices by the mother who is addicted to such substances.

The birth weight and gender of the child have furthermore been shown to correlate with child undernutrition, with male children being more stunted than their female counterparts⁴⁵.

Water, sanitation and hygiene (WASH) interventions have shown a benefit on the growth in the length of children under 5 years of age^{51,52}. The pathway for this benefit is believed to be via the reduction in pathogen exposure, leading to fewer infections and less inflammation with an associated decrease in nutrient losses⁴⁶. Similar to the WASH pathway, the immunisation status of the child has been associated with good preventative healthcare, leading to fewer infections.

In recent studies done in various developing countries of South Asia, with a high rate of early childbearing and high-order births (in other words having many children) and, therefore, poor planning of births, it was shown that the risk for being stunted or underweight was significantly higher for a child in a birth order above 3 and with an interval between births of below or equal to 24 months^{52,53}.

Adolescent malnutrition also comes into play as an important determinant of childhood malnutrition, especially in countries which have a high unintended pregnancy rate, such as South Africa. Various researchers^{36,54} have motivated for improving nutritional quality throughout the life course, with special emphasis on adolescent girls as they can become mothers. This approach fits well with a life course approach, as most teenage girls will become bearers of the future generation at some stage of their lives.

Such a life course approach was already proposed in 2004 by Darnton-Hill, Nishida and James⁵⁵ to clarify how these factors affect nutrition in the various life stages (Figure 2.3). Although the intergenerational impact of malnutrition was not clearly understood at the time

and was, therefore, not included, this framework does indicate the timing of the three underlying causes of malnutrition during the life course stages (as also demonstrated in the UNICEF 2013 framework), namely food, care and health. Also, in addition to preventing adolescent pregnancy and encouraging pregnancy spacing, appropriate measures should thus be undertaken to ensure that pregnant and lactating teenage mothers are adequately nourished³⁶.

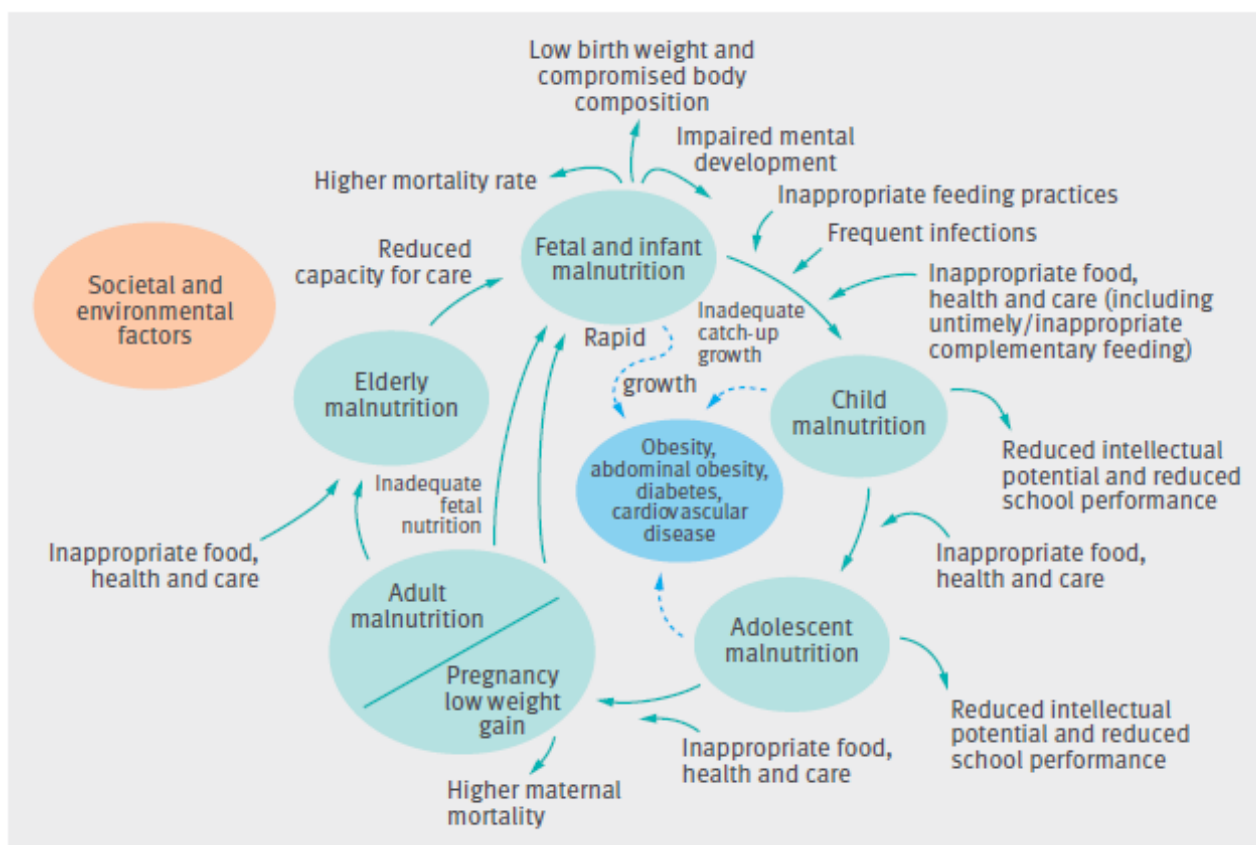


Figure 2.3: Nutrition through the Life Course – Proposed Causal Links⁵⁶

Moreover, Upadhyay et al.⁵⁷ recently concluded that there is an association between pregnancy intention and childhood stunting. Their findings are consistent with some previous studies which also reported a link between the two in developing countries^{58,59}. However, other research concluded that there is no existing association between stunting and pregnancy intention²⁸. Thus, it is possible that unintended pregnancies lead to inadequate care and feeding practices, implicit to the causes of malnutrition in the UNICEF conceptual framework.

2.3.3 *Basic Causes of Maternal and Child Malnutrition*

The most basic causes of undernutrition are complex and situated in the sociocultural, economic and political context of a nation. These causes induce inadequate financial, human, physical and social capital through underdevelopment and a low socio-economic status which influence the adequacy of a household's access to quantity and quality of resources, land, education, employment, income and technology, as described by the UNICEF conceptual framework. A recent study in Nepal confirmed that infrastructure can indeed be a strong predictor for stunting⁴⁶.

Over the past two decades, it has become clear that policies on the national and political level have the ability to influence maternal and child nutrition on an individual level by changing the aspects of the food environment. An example of such policies affecting individuals include the types of foods that are commercially available and their accessibility due to their prices³⁶.

A low SES has also been linked to stunting and underweight⁵², but the mechanisms involved are complex, as a child growing up in such circumstances may contract an illness earlier due to poor hygiene, crowded spaces and an inability to access a health facility at the due time. Such factors could decrease dietary intake and reduce nutrient absorption, when the child has increased metabolic demands⁶⁰.

Research has also confirmed that low maternal education⁴⁶ and community-level education⁴⁵ are strongly associated with stunting in various countries.

In addition, the extensive COHORTS study considered whether improvements in two basic causes of malnutrition (namely economic and environmental conditions, including nutrition and hygiene) over a period of time resulted in children being taller than their mothers on average⁶¹. South Africa and other developing countries were included in the study. The findings confirmed that improvements in economic and environmental conditions indeed resulted in children being taller than their mothers.

Cash transfer programmes, such as the unconditional Child Support Grant (CSG) in South Africa, provide monetary assistance to the poor to increase the household income and ensure better nutrition and care for children of 15 years and younger. Various research studies^{41,62} have found evidence that the CSG enhances the nutritional status of South

African children, especially in reducing stunting. Moreover, to further enhance the impact of the CSG and expand the possible nutritional advantages to the first 1000 days, a proposal was made by researchers of a qualitative study in South Africa that vulnerable pregnant women should also be included as beneficiaries of the CSG⁶³.

2.4 Impact of Malnutrition

Undernutrition have been shown to impact health in the immediate, medium and long term, as described in the UNICEF's 2013 conceptual framework of the determinants of maternal and child undernutrition⁴¹, as presented in Figure 2.2. Of all the forms of undernutrition, evidence has contributed a widely shared understanding that stunting has the most dire and long-term consequences on generations. Therefore, stunting should be the central focus and indicator of choice when measuring childhood malnutrition. For this reason, height-for-age has replaced the composite indicator of weight-for-age which underestimates undernutrition when overweight or obesity is present in the same population⁶⁴.

The immediate consequences of stunting, being part of the spectrum of undernutrition, relate to health problems through a weaker immune system and a higher risk of developing diarrheal diseases or acute respiratory infections in young children as well as developmental outcomes, such as a delay in motor skills⁵⁷, leading to concurrent higher economic costs for childcare⁶⁵. Consequently, stunting and underweight increase child mortality and morbidity, giving rise to 20% of child deaths related to malnutrition.

Also, in the long term, stunting has been associated with an increased risk for developing non-communicable diseases, including high blood pressure, obesity, diabetes and heart disease during adulthood⁶⁶. It is further associated with impaired cognitive and social development which impacts worker productivity, thereby creating a national financial burden and weakened economic growth⁶⁴. Further to this, research has demonstrated that stunting has intergenerational consequences⁴¹ and, therefore, leaves a cruel heritage.

Also, overweight and obesity in children and adolescents have various immediate physical and mental health implications and both are major risk factors for cardiovascular disease, diabetes and premature death in adults. Antithetical to this, it is well known that stunting in children is a risk factor for overweight or obesity in adulthood as well as for developing cardiovascular disease or diabetes in later life, if children consume an energy-dense diet and live a sedentary lifestyle⁶⁷. This coexistence of stunting or undernutrition with overweight

and obesity or diet-related non-communicable diseases, within individuals, households and populations and across the life course is commonly referred to as the “double burden of malnutrition”³⁹.

2.4.1 Overweight and Obesity in the Context of the Double Burden of Malnutrition

Various countries, especially low- and middle-income countries (LMICs), have fallen prey to the double burden of malnutrition, whereby stunting, childhood undernutrition and obesity have increased simultaneously. Childhood obesity in such settings has been under-diagnosed due to it being perceived as part of being healthy⁶⁷. This has particularly been found in countries that experience accelerated socio-economic development and nutrition transition, resulting in concurrent inadequate nutrition and excessive weight gain⁶⁸. For example, Du Plessis et al.⁶⁹ found the presence of the double burden of malnutrition among mother/caregiver-young child (under 5 years of age) pairs within communities in the Western Cape Province, South Africa who are experiencing nutrition transition.

An increased risk for obesity in later life may be preceded by a history of stunting, low birth weight and disproportionate weight gain in earlier life⁷⁰. It is, therefore, important to promote, protect and support appropriate infant and young child feeding to prevent undernutrition or stunting in the short term, while also preventing obesity and non-communicable diseases in later life. The WHO recently published a guideline, called “Guideline: Assessing and managing children at primary health-care facilities to prevent overweight and obesity in the context of the double burden of malnutrition”³⁹, in which recommendations are made to reduce overweight and obesity in low- and medium-resource settings where the double burden of malnutrition is most prevalent.

2.4.2 The Stunting Syndrome

Prendergast and Humphrey⁷¹ term the various pathological changes that are manifested in growth restriction and that are associated with increased morbidity and mortality and impaired physical, neurodevelopmental and economic ability as the “stunting syndrome”. The main challenge in alleviating stunting lies in the cyclic nature thereof, since women who were stunted as children are more prone to bear stunted children and so the intergenerational cycle of poverty could continue⁷¹.

Different factors have been identified which affect child growth at various stages of development and it is important to identify which key factors affect child growth at what

period of the life cycle. For example, the critical period for optimal development from conception to two years of age (known as the first 1000 days) has been identified as an important time window of opportunity to improve long-term child health. Related to this, growth failure of children in developing countries within the first 1000 days has been shown to be an important determinant of adult height outcomes⁶¹.

Figure 2.4 by Prendergast and Humphrey⁷¹ describes which factors are associated with stunting at each stage of the life cycle. Knowing which factors are more prone to interventions at which specific life cycle stages can facilitate more focussed timing of interventions, leading to a more pronounced impact on the pathological changes found in the stunting syndrome.

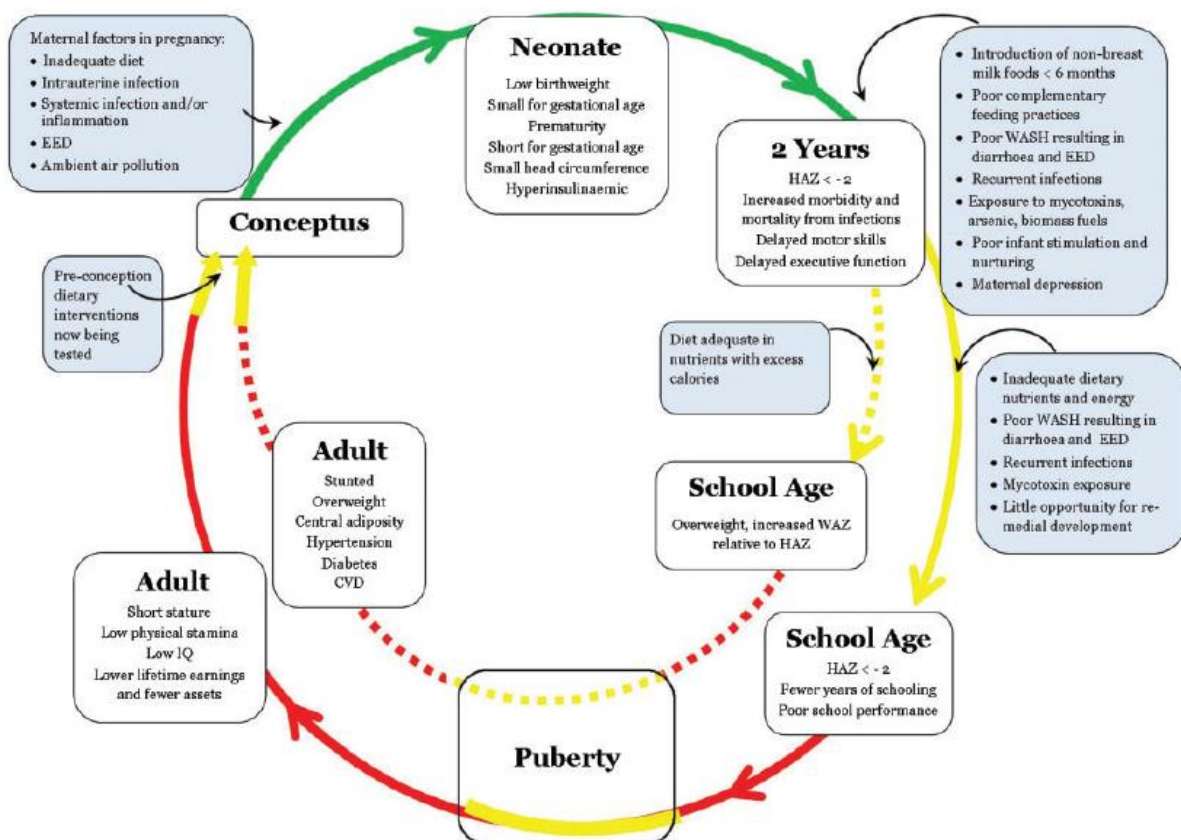


Figure 2.4: The Stunting Syndrome⁷¹

As seen in Figure 2.4, the green pathway signifies the period between conception and 2 years, which is the most responsive time for interventions against stunting. Immediate causes related to inadequate maternal or infant nutrition and health influence this time period most.

The yellow pathway denotes the stage after age 2 years and during puberty, when a child experiences a growth spurt. During this stage, some catch-up in linear growth may occur if nutrition and health are sufficient. If this is not the case, stunting may continue. Alternatively, if energy intake is excessive, overweight or obesity, coupled with stunting and its consequential chronic diseases (known as the double burden of disease), may be forthcoming. It is, however, not yet clear whether this linear catch-up growth has any effect on the cognition and immune function components of the stunting syndrome and further neuroscience and child development research has been requested by researchers to clarify this issue⁷².

The short yellow pathway before conception reflects evidence that dietary interventions targeting stunted women during the preconception period can improve birth outcomes. The red pathway, which represents the time period during most of the school-going stage as well as adulthood, signifies the period when the stunting syndrome appears unresponsive to interventions⁷¹.

Clearly, the timing of interventions in relation to the life cycle stages are important for interventional impact. However, the sensitivity of the condition to change can also be crucial. For example, recent research suggests that early-life growth faltering due to community-wide determinants is much more of a public health problem in LMICs than previously thought³⁸.

2.4.3 The Role of Positive Deviance and Nurturing Care in Preventing Malnutrition

The idea of Positive Deviance (PD) was first termed by Marian Zeitlin in 1990, in a book entitled "Positive Deviance in Nutrition", referring to the study of children, called positive deviants, who display above-average growth in vulnerable communities⁷³. Some have proposed that childhood malnutrition could be alleviated at the community level by identifying and promoting the different factors that assist these positive deviants to grow healthily, instead of focussing on all of the odds stacked against them⁷⁴.

Various studies have since analysed PD in relation to the short-term impact on anthropometric status (namely underweight and wasting) as well as the long-term effect of stunting. For example, where WAZ was measured, studies⁶² concluded that child feeding and childcare practices impacted PD. Also, with HAZ measures, PD was correlated with factors such as optimal infant and young child feeding practices expressed through maternal

information seeking behaviours; mothers acknowledging the crucial role of maternal health; and social support that includes mother-health worker relationships⁷⁵.

The Philani Mentor Mother programme⁷⁶ is an active programme in a vulnerable Xhosa community in Cape Town. It significantly rehabilitates children who experienced wasting (namely, low WAZ) with PD mothers mentoring those mothers of children experiencing wasting by teaching them coping mechanisms. These mechanisms include early breastfeeding; correct infant and young child feeding and sleeping habits; improved organisational and disciplinary skills in the home; protecting the child from sources of infection, accidents and trauma; and seeking care when needed.

Furthermore, the SUN movement has described women as “the key agents of change for nutrition” and advocates increased autonomy and empowerment of women in relation to marriage, pregnancy, income expenditure, nutrition knowledge and overall decision making⁷⁷.

The recently published document, “Nurturing Care for Early Childhood Development: A framework for Helping Children Survive and Thrive to Transform Health and Human Potential”⁴⁷, again highlights the threats to children’s development during the various stages of pregnancy, during birth and when they are new-borns, infants and toddlers. It also describes the set of conditions that affect children’s health, nutrition, security and safety, responsive caregiving and opportunities for early learning. These components of nurturing care are described as follows:

1. Good health of both the mother/caregiver and child;
2. Adequate nutrition for both the mother and child;
3. Responsive caregiving that nurture social interactions that stimulate connections in the brain;
4. Opportunities for early learning beginning at conception through epigenesis; and
5. Security and safety – making the defenceless young feel safe and secure.

Such engaging and protecting environments create the factors that enable children to be positive deviants. However, for these optimal environments to be realised, the mother/caregiver should be empowered to create the environment. The Philani Mentor Mother programme⁷⁶, as discussed previously, is a successful example of such an

empowering intervention. These interventions have the potential to create more positive deviant children that can break the intergenerational cycle of poverty.

2.5 The Concept of Pregnancy Intention

2.5.1 Overview of Current Situation of Unintended Pregnancies

Over the years there has been an increasing awareness of the importance of appropriately-timed pregnancies and unplanned pregnancies have become a key public health indicator of maternal and child health^{78,79}. Preventing unintended pregnancies and the associated adolescent pregnancies are thus one of the leading health indicators of various global public health organisations⁸⁰, including the United Nations Population Fund (UNFPA), UNICEF, United Nations Population Division, World Bank, WHO and the United States' Healthy People 2020: National Health Promotion and Disease Prevention Objectives⁸¹, as such pregnancies have historically been associated with undesirable maternal behaviour and poor infant health.

However, recently, the inconsistency of the findings assessing the impact of unintended pregnancies on mothers and their offspring has been questioned as a result of two distinct issues:

1. The methodological challenges associated with measuring the intention of pregnancy, and
2. Distinguishing between pregnancy intention and the complex demographic and socio-economic characteristics that affect maternal behaviour and child health outcomes⁸².

In developed countries, such as Belgium, 83% of pregnancies that resulted in birth was planned, 15% were ambivalent and only 2% of were unplanned⁸³. In contrast, in national research done in South Africa, it was found that 66% of all pregnancies were unintended, with rates among younger women being even higher⁸⁴. Another study documented pregnancies at an anti-retroviral therapy clinic in Johannesburg, South Africa where 62% of the pregnancies were unplanned and 54% ended in either elective or spontaneous abortion.

This creates a high burden of termination of pregnancy, where 26% of all pregnancies and 38% of unplanned pregnancies end in abortion⁸⁵. Furthermore, the South African Department of Health (DoH) reported the official termination of pregnancy (TOP) figures for

2016 to 2017 as a total of 105358, of which 19551 took place in the Western Cape. Such figures exclude illegal abortion figures and it was unknown by the DoH whether private abortion-providers' figures were included⁸⁶. Recent research done in South Africa, estimated total costs for abortion service provision in the public sector over a 1-year period in 2016/2017, to be \$11.4 Million⁸⁷. These TOPs could be placing a high economic burden on the South African economy, as they occur in the public health sector and is, therefore, funded by taxpayer money. This money could have been used more effectively; for instance, in improving the nutritional state of vulnerable communities.

Moreover, in a three-wave, cross-sectional survey done in 2002, 2008 and 2011 among a nationally representative sample of the South African youth in Grades 8 to 11, 10.9% of the girls reported to have been pregnant at least once and 11.1% of boys reported that they have made a girl pregnant. Of those adolescent girls who reported to have had sex, the overall prevalence rate of having been pregnant once was 20.5%, with 5.9% having had an abortion, and those who had sex at the age of 13 years or younger was at 7.7%. Even though the rate of sexual intercourse decreased by 2011, the rate of girls falling pregnant, among those that practised sex, increased over this time period even though contraceptives were made freely available in South African government clinics and hospitals⁸⁸.

2.5.2 Risk Factors Associated with Unintended Pregnancies

Knowledge and awareness of the associating factors of unintended pregnancies are necessary to determine the appropriate interventions to curb such pregnancies. Various studies worldwide have found that young, minority and low-income, vulnerable women have disproportionately high unintended pregnancy and abortion rates^{9,10,15,16,83,89}. Furthermore, some studies have found a higher association of unintended pregnancy among single or unmarried women of non-Caucasian origin of whom many already have a higher parity as well as a lower socio-economic status^{88,90,91}.

As clearly laid out by Coovadia et al.⁹², the roots of a high extra-marital pregnancy rate among those below 21 years in South Africa have been deeply ingrained in the vulnerable communities through decades of exclusive social, political and economic policies.

Furthermore, adolescent unintended pregnancies have been associated with unsafe sexual practices in early adolescent years due to socio-demographic, familial and relational characteristics, poverty, a lack of school or career goals and transactional sex with older

partners, especially among the 15-to-19-year-old group^{16,93}. Coerced conception has been described by researchers, where African girls are persuaded to conceive and thereby “prove their love”⁹⁴. Furthermore, UNFPA South Africa reported in their latest figures that the adolescent birth rate among 15-to-19-year-old women is 46 per 1000⁹⁵. This is less than the 56 per 1000 average of the less developed regions defined by them, but substantially more than the 18 per 1000 of the more developed regions. In another study of South African girls younger than 20 years done in 2012, only 8.7% of pregnancies were planned¹⁰. Moreover, girls who have two or more sexual partners are also more prone to having a teenage pregnancy than those with one partner. This is of great concern, as the rate of girls who have two or more sexual partners in a nationally representative sample was reported as 34.9% in 2011⁸⁸. More than a third of adolescent girls could therefore be at an increased risk for teenage pregnancies.

In addition, the findings of a South African study on adolescent pregnancies found an association between experience of early trauma and early pregnancy, with cumulative trauma being more important than a single event¹⁵. Such findings could have important implications on the population of South Africa, where 31.9% of women reported lifetime experiences of traumatic events, 42.3% reported being symptomatic for PTSD in the preceding week and the total prevalence of lifetime PTSD was found to be 13.6%²¹. The most frequently reported traumatic event is family-related trauma events, followed by events associated with personal assaults and “other traumatic events”²¹.

2.5.3 Consequences of Unintended Pregnancies

Unplanned pregnancies have a varied impact on the mothers, children and societies and have been associated with various negative maternal and child health outcomes, such as higher substance abuse and cigarette use during pregnancy²⁷ as well as higher stress rates during pregnancy⁹⁰. Late, insufficient or absent preconceptual and prenatal care (for example, folic acid supplementation, sufficient nutritional intake and smoking cessation) has been linked with unintended pregnancies in developed countries, resulting in fewer opportunities to benefit from such interventions²⁷. It was, however, noted that the effect of unintended pregnancies on delayed antenatal initiation differ in developing countries, with results being mixed⁵⁸. Researchers in Kenya noted that the use of maternal health services vary considerably due to socio-economic status, ethnicity, geographical region, demographic reasons⁹⁶ and access to these services⁵⁸.

The following detrimental child health outcomes resulting from unintended pregnancies have been reported:

- Low birth weights;
- Preterm births¹⁸;
- Increased infant mortality⁵⁸;
- Initiating breastfeeding later and earlier cessation thereof; and
- Increased rates of child and maternal violence and high post-partum and maternal depression⁹⁰.

Some studies have also found an increased association of unintended pregnancies with adverse birth outcomes and development delay⁹⁷ and impaired neonatal and psychosocial maternal health⁹⁸, while others found no effect of pregnancy intention or planning on neonatal or maternal outcomes^{83,97}.

The consequences of unintended pregnancies in adolescent girls below 19 years can be even more detrimental. Teenage pregnancies have been associated with a range of adverse maternal and infant health outcomes, even though research rarely differentiates on the basis of whether the teenage pregnancy was intended or unintended. In South Africa, however, where 74.1% of pregnancies in women of 18 to 24 years of age have been indicated to be unwanted¹⁶, one can assume that most teenage pregnancies are unintended. Also, in a comprehensive, multi-country, cross-sectional study done in 29 LMICs in Africa, Asia, Latin America and the Middle East, it was found that an adolescent mother aged 10 to 19 years has a higher risk of eclampsia, puerperal endometritis, systemic infections, low birth weights, preterm delivery and severe neonatal conditions than mothers aged 20 to 24 years⁹⁹. This study and others concluded that the factors affecting child survival may be associated with the poor socio-economic status of the adolescent mothers more than with their age at childbirth¹⁰⁰.

The longer term social and economic consequences of teenage pregnancies have also been described in studies from South Africa, where such pregnancies have been linked to poorer educational outcomes¹⁰¹, such as the mother dropping out of school, even though schooling and pregnancy have been found to be partially compatible in South Africa¹⁰². It was further noted that teenage pregnancies display marked social patterning, with African and mixed

race, rural residence and lower educational levels being high risk factors for teenage pregnancies¹⁰³.

Generational teenage pregnancies, where the child of a teenage mother becomes a teenage parent as well, have also been described in South Africa. These outcomes have been found to be due to social and economic factors rather than the maternal age¹⁰⁴. It is furthermore more common among African and mixed races. Research describes the mothers and grandmothers as being pleased with or even encouraging extra-marital teenage pregnancies and regarding infertility as a much more serious problem than that of a teenage pregnancy⁹⁴.

Another study, conducted in Soweto, South Africa reported that 23% of pregnancies in girls of 13 to 16 years old and 14.9% of those in girls aged 17 to 19 years old ended in abortion¹⁰⁵. Global figures released in 2010 further indicate that about 86 million pregnancies were unintended, of which 33 million resulted in unplanned births, 41 million in abortions and the remaining 11 million in miscarriages¹⁰⁶. Also, as mentioned above, those pregnancies that result in abortion can greatly increase the financial cost to the healthcare system as well as for the women themselves¹⁰⁷. Besides these financial costs, there are also other potential detrimental health, personal or emotional consequences to the women, such as increased risk for breast cancer¹⁰⁸.

2.5.4 Terminology Relating to Measuring Pregnancy Intention

Historically, pregnancy intention was described¹⁰⁹ using questions about the wanted-ness and timing of a pregnancy, where unintended (also known as unplanned) pregnancies encompassed unwanted and mistimed pregnancies. According to researchers, pregnancies were classified as follows:

- If the pregnancy was described by the woman as a pregnancy that came sooner than the woman wanted, it was classified as “mistimed”.
- If the woman did not want to have any or more children for the rest of her life, the pregnancy was classified as “unwanted”.
- If a pregnancy was desired at the time of conception, it was described as “wanted”, “planned” or “intended”.
- If a woman was unsure about the pregnancy intention, it was classified as being of “ambivalent” status.

Due to permissive lifestyle changes, such as later marriage, increased extra-marital relationships, earlier initiation of sexual activity and a decline in the stigma attached to illegitimate children, these classifications have changed over time¹¹⁰.

Moreover, conclusions about pregnancies have often been obtained from dichotomous questions about whether the pregnancy was planned or by tallying unwanted and mistimed pregnancies, even though becoming pregnant is not always a conscious choice⁷⁸. The differences in the measurement and classification of pregnancy intention obscure the comparison of the research studies⁹⁷. Research on what British women understood regarding the terms that describe pregnancy intention concluded that the understanding of the terms differs substantially. They recommended that the terms not be used in isolation, but rather form part of more discreet questions¹¹¹. Santelli et al.¹¹² thus rightly describe pregnancy intendedness as a “complex concept ... encompassing affective, cognitive, cultural and contextual dimensions”.

Barrett, Smit and Wellings¹¹³ specified that many studies started to question whether it was even possible to fit women’s pregnancy intention into these dichotomous classifications. Others^{109,114} have also commented on the steadfastness and stability of individual pregnancy intention questions and thus the limitations of their predictive value. Therefore, the need for a more accurate measure of pregnancy intention, with an ability to capture the more intricate feelings and attitudes regarding conception, is also highlighted¹¹⁵.

Moreover, various studies done in the United States of America reported that a high proportion of women did not use contraception, even though they did not intend to become pregnant¹⁰⁹. British women also felt that the intention to become pregnant and ceasing to use contraception were not sufficient criteria to define a pregnancy as intended¹¹¹. In South Africa, a national survey reported that modern contraceptive use is 41% among all women of childbearing potential between 15 and 49 years of age, while 66% of these women reported that they have had unintended pregnancies⁸⁴.

2.5.5 London Measure of Unplanned pregnancy

The London Measure of Unplanned pregnancy (LMUP) was developed in 2004 as a six-item measure that considers various areas of pregnancy intention. These are expressed intentions; desire for motherhood; contraceptive use; preconceptual preparations; personal circumstances or timing; and partner influences¹¹³. Each item is scored with points from 0

to 2. Pregnancy intention rises with each point accumulation. The authors further recommend that a broad preliminary interpretation of scores of 0 to 3 be categorised as unplanned, those of 4 to 9 be categorised as ambivalent, and those of 10 to 12 be categorised as planned. According to Moro et al.¹¹⁵, this measure does not hypothesise that women have fully formed childbearing plans, that women's intentions are necessarily congruent with their actions or that women are universally rational and see fertility as within their control. However, this measure has excellent psychometric properties¹¹³ and has been validated in a low-income population in the United States of America¹¹⁵ as well as in Malawi¹¹⁶.

Goossens et al.⁸³ concluded that most research studies considering the circumstances surrounding unintended pregnancies have been inconclusive as a result of various methodological challenges around the classification of the pregnancies. The researchers felt that pregnancy intention is a complex construct that is oversimplified when analysed as categorical variables. They, therefore, recently did a study, using the LMUP. Thus, instead of analysing pregnancy intention as a categorical variable as suggested by the authors¹¹⁷, they analysed the intention as a continuous variable, where a lower score ranking indicated a less planned pregnancy⁸³. The LMUP questionnaire was furthermore completed within five days of the birth of the infant.

It should be noted that the LMUP questionnaire has been used at a variety of settings, both prenatally and postnatally.

2.5.6 Prospective versus Retrospective Reporting

Some studies have explored the measurement of pregnancy intention as a prospective measurement¹¹⁴, while others have viewed it as a retrospective measurement⁸⁵. Both of these differently-timed measurements have their own varied limitations.

Researchers have concluded that retrospective measures are prone to recall bias and ex-post rationalisation, whereby the infants who were originally unwanted or mistimed are later reported as wanted at the time of measuring the pregnancy intention. Thus, researchers have warned against a systematic under-reporting of unwanted births due to the bias⁵⁸.

However, prospective measures, such as an adapted LMUP, have been used to illuminate the possible recall bias that accompanies most retrospective measures. The timing of these

prospective measures are still important, as measuring the pregnancy intention at the time of pregnancy testing may produce different results to those that would be obtained if the woman was not anticipating a pregnancy result and considering their intentions regarding a pregnancy¹¹⁴.

A South African prospective study⁸⁵ among HIV positive women reported an unplanned pregnancy rate of 62%, with 47% of these pregnancies not being carried to term. Fortunately, the study protocol included regular pregnancy tests and did not rely on self-reporting of the pregnancies, otherwise almost half of the pregnancies could have been unreported. The pregnancy intention was measured at baseline as well as at each study visit throughout the study period. If this study had been designed as a retrospective study, only those pregnancies that were carried to term would have been evaluated for pregnancy intention which could have led to biased conclusions in the research studies.

2.5.7 Ambivalence toward Pregnancy

Measures of pregnancy intention have been used widely in developing countries as a denominator for the unmet contraceptive need. A woman with an unmet contraceptive need has been described as a woman who wants to limit or space future pregnancies, but is exposed to the risk of pregnancy, without using contraception¹⁰⁹.

Recently, more studies correlate insufficient contraceptive use with pregnancy ambivalence, where ambivalence is described as “having conflicting attitudes, beliefs, emotions or behaviours regarding avoiding pregnancy or having a baby”^{83,118}. Therefore, various studies indicate that ambivalence toward pregnancies seem to be frequent in women with a lower SES and is associated with low use of effective contraception^{114,119,120}. Some studies have even reported that women in fragile socio-economic environments often view motherhood as a way of evading the reality of poverty and a way of attaining personal fulfilment, especially in low-income adolescents who struggle with hopelessness and low self-worth^{121,122}. Studies in young, African-American women also showed that only when a woman wants to expressly avoid a pregnancy or unmistakably wants to conceive does her attitude significantly alter her behaviour¹²⁰.

Some researchers have categorised pregnancies with unsure or ambivalent intentions as unintended pregnancies, since the mothers did not positively report that they intended to get pregnant¹⁸. Others have rather grouped intended and ambivalent pregnancy intention

together, as they concluded that ambivalence is associated with increased pregnancy-related risk-taking¹²¹. Some have also reminded their readers that the strength of a women's desires may alternate between avoiding and achieving pregnancy¹²³ and that focussing on the intention of a women to become pregnant implies that her intentions count the most⁸³, while the socio-economic and relationship power-dynamics may, in fact, be more determinative in whether or not a woman becomes pregnant¹¹².

In summary, it can be said that the determinants of maternal and child malnutrition are multi-dimensional and create a cycle of intergenerational poor nutrition, illness and poverty that is difficult to break. Poor nutrition tends to manifest in the form of the double burden of malnutrition, simultaneously incorporating stunting, childhood undernutrition and obesity.

Some positive deviant children have displayed above-average growth in vulnerable communities, notwithstanding the challenges. Also, childhood malnutrition can be alleviated at the community level by identifying and promoting the different factors that are assisting these positive deviants to growth healthily.

Furthermore, with an increasing awareness of the importance of appropriately-timed pregnancies, unintended pregnancies have become a key public health indicator of maternal and child health. Since the unintentional pregnancy rate is so high among vulnerable communities in South Africa, there is a need to investigate whether there is a link between pregnancy intention and the prevalence of malnutrition in young children born from such pregnancies.

CHAPTER 3 – METHODS

This chapter describes the study design, the study setting and the data collection and analysis methods.

3.1 Study Design

The research was conducted as an observational, cross-sectional study with an analytical component.

3.2 Study Population

The target population for the research was situated in the vulnerable peri-urban communities of Mbekweni and Dalvale area of Paarl East, with predominantly African and mixed ancestry populations, respectively. Recruiters from the local communities raised awareness about the study at early childhood development centres, churches and in the general communities. Volunteer sampling was thus used.

Verification of the infants' age, birth weight and gestational age was recorded from the child's Road-to-Health booklet; while the mother's age and identification details were gathered from her identity document.

The inclusion criteria were as follows:

- Mothers aged 12 to 49 years, with a child who is aged between 6 and 36 months at the time of data collection, with valid documentation (including mother's identity document and child's Road-to-Health booklet), were included.
- Only biological mothers were included, as the questionnaire includes questions specific to the time of conception and pregnancy.
- Only literate mothers were included, as the questionnaire was self-administered.
- Children born at full term (≥ 37 weeks gestation) was included in the study, as premature birth can have an effect on the nutritional status of a child.
- Children with a birth weight of 1.5 kg and more were included.

The sample size consisted of 72 mother-and-child pairs.

3.3 Data Collection

The researcher and a trained research assistant collected data from July 2017 to February 2018 at a research centre based in Mbekweni. The researcher, who is a dietitian, trained the research assistant in the collection of anthropometric measurements, using the standard procedures, as described by Cogill¹²⁴, as well as in the facilitation of the self-administered questionnaire. Validity and reproducibility exercises were also done for weight and height assessments. During the data collection, supervision and retraining was done regularly by the researcher.

The biological mother of each child completed the self-administered questionnaire (see Addendum A), after written informed consent was provided by the mother or grandmother, as applicable. In the questionnaire, the respondents provided information regarding themselves, their child and their household. A play area with toys close to the mothers was available for the children to occupy them, while the mother completed the questionnaire. Each child also received an educational toy to take home as an incentive for participation. The birth date, gender, gestational age at birth, birth weight, HIV status at birth and immunisation coverage of each child were recorded from the Road-to-Health booklets of the children. All the measurements and data collection were done in a separate, closed-off area to ensure privacy.

Furthermore, the self-administered questionnaire included the validated Household Food Insecurity Access Scale (HFIAS)¹²⁵, the Socio-economic score (SES)¹²⁶, the LMUP questionnaire¹¹³, the Centre for Epidemiologic Studies Depression Scale (CES-D)¹²⁷, PCL Post-traumatic Stress Disorder (PTSD) Checklist¹²⁸ and other applicable questions. The HFIAS has previously been used in vulnerable communities in South Africa¹²⁹ and incorporates three areas, namely experiencing anxiety and uncertainty about household food supply; insufficient diet quality; and insufficient food intake in the preceding 30 days¹²⁵. The SES included various measures of economic status, social status and employment status¹³⁰. In the HFIAS, a higher score is associated with higher food insecurity, while, in the SES, a higher score is linked to a higher socio-economic status. The intendedness of the pregnancy was measured with the LMUP questionnaire, as is described in Section 2.5.5.

The questionnaire was translated from English into Afrikaans and Xhosa and was verified through back-translation. A Xhosa/English/Afrikaans-speaking research assistant was furthermore available during the questionnaire completion and was trained to use

appropriate responses to any questions the respondents could have to avoid inter-observer variations.

All the study procedures were completed on one day and the participants were reimbursed for their time and travel expenses, as per the ethics guidelines.

3.4 Ethics

Ethical approval was obtained from the Health Research Ethics Committee of Stellenbosch University (Ref. no. S16/10/194) before any research began. All measurements and data collection were done in a separate observation room to ensure privacy. Also, confidentiality was ensured by not recording any personal identification data on record.

All communication with the respondents was done in the language of the respondents' choice, being Afrikaans, Xhosa or English. Written informed consent (see Addendums B and C) in the preferred language was also obtained from the biological mother before any study-related procedures commenced.

The participants were furthermore questioned by the researcher to ensure that they understood the Informed Consent Form (ICF).

3.5 Analysis of Data

The main hypothesis of the study was the equivalence of the LMUP score, indicating pregnancy intention, irrespective of the current nutritional status of the child. For this purpose, margins of equivalence, taken as two units on the LMUP scale, were decided on. For the testing of the hypothesis of equivalence, a two-one-sided statistical test (TOST) was used. This was implemented by calculating the 90% confidence interval for the difference and confirming whether the limits were within the equivalence margins. The level of significance was set at 0.05.

Null Hypothesis: The pregnancy intention, measured by the LMUP score, is different between mothers with children with a normal nutritional status versus mothers with children with under- or overnutrition.

Alternative Hypothesis: The pregnancy intention, measured by the LMUP score, is equivalent between the nutrition groups.

In this study, malnutrition as an outcome was defined as either stunting, wasting, underweight, overweight or obesity, as according to the WHO 2006 growth reference standards¹³¹.

MS Excel was used to capture the data, whereafter it was analysed with STATA 15 software¹³². The WHO Anthro Software Version 3.2.2 (2011)¹³³ was then used to analyse and express the children's anthropometric measurements into sex- and age-specific z-scores: WAZ, HAZ, WHZ and BMI-for-age. Stunting was defined as HAZ equal or below -2 SD, underweight as WAZ equal or below -2 SD, wasting as WHZ equal or below -2 SD, overweight as WHZ / BMI-for-age equal or above +2 SD and obesity as WHZ / BMI-for-age equal or above +3 SD (Refer to Table 2.2). The anthropometric status was then grouped into a normal or abnormal status, with the latter including both under- and overnutrition as forms of malnutrition. These two groupings of malnutrition were evaluated for equivalence to the LMUP score.

The descriptive statistics calculated included the means, standard deviations, medians and proportions. LMUP was used as a continuous variable and the descriptive statistics of the scores were calculated across various subgroups. The difference in LMUP between the subgroups, such as being the first child or there being a presence of PTSD (normal, >30, >50), was compared, using quantile regression. This was done since some of the subgroups were small and a single high value of LMUP could influence the mean score. Using the quantile regression thus enabled median score comparison. A multiple quantile regression model, with selected covariates, was furthermore used to evaluate adjusted differences.

As a secondary analysis, a multiple quantile regression model of LMUP on various descriptive factors was done, without the nutritional status information included, due to the finding of equivalence of LMUP between the nutrition subgroups. The LMUP score was plotted against the age and a Locally Weighted Scatterplot Smoothing (Lowess) non-parametric smoother was used to estimate the mean score over the age to reflect any non-linear associations. This was also done for other continuous variables. The Lowess is a popular tool used in regression analysis that creates a smooth line through a scatter plot to assist in identifying relationships between variables and foreseeing trends¹³⁴.

A further secondary analysis was done, comparing the descriptive factors with the anthropometric status, using Pearson's Chi² and Fischer's exact for categorical data.

CHAPTER 4 – ARTICLE

Unintended Pregnancy and Malnutrition in Young Children from Vulnerable Peri-Urban Communities of the Western Cape, South Africa

(To be submitted to Maternal & Child Nutrition. The Results and Discussion sections will be shortened for Journal submission purposes.)

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4.1 Abstract

Introduction: South Africa has a high rate of unintended pregnancies among vulnerable women. No literature was previously available in South Africa on whether there is a link between unintended pregnancies and malnutrition in young children.

Methods: Pregnancy intention of eligible mothers (n=72) were measured retrospectively. These mothers were literate, aged 12 to 49 years, with a full-term born child who is aged 6-36 months, with a birth weight of 1.5 kg or more. A two-one-sided statistical test was used to measure the impact of pregnancy intention on the child's current nutritional status in two vulnerable, peri-urban communities in the Western Cape. Other determinants of health and their effect on the children's nutritional status were also investigated.

Results: From the sample population, 39% of the pregnancies were categorised as "Unplanned", 46% as "Ambivalent" and only 15% as "Planned". Pregnancy intention and the current anthropometric status of the child were not associated [CI: -1.86 to 1.86]. In these vulnerable communities, 69% (n=49/71) of the households were severely food insecure, but only 11.1% were stunted. Women receiving their main income from the Child Support Grant had a significantly lower pregnancy intention than those women receiving their main income from either family or the child's father (Prob > F =0.0038). Maternal levels of depression and post-traumatic stress disorder was high.

Discussion: In contrast to worldwide results, this research concludes that unintended pregnancies did not contribute to malnutrition in the studied vulnerable peri-urban communities. Even though the bulk of the pregnancies were unintended, it seems as if most of the mothers found a way to care for the child.

4.2 Significance

Improving nutritional quality and the emotional wellbeing of all women of childbearing potential presents a key opportunity to improve the future generations' health and mitigate the risk of adverse long-term economic outcomes. Future mothers should also be empowered through nurturing care to make decisions in the best interest of their children, regardless of whether the pregnancies were planned or unplanned.

Key words:

Unintended pregnancies; malnutrition; vulnerable communities; determinants of health

4.3 Introduction

In South Africa, unintended pregnancies occur frequently in both adults and adolescents, with rates of planned pregnancies recorded as declining from 44.6% in 2008 to 34.7% in 2012. Only 22.4% of low-income women countrywide were reported to have planned pregnancies in 2012¹⁰. Among teenage girls in the Eastern Cape Province of South Africa, a lower socio-economic status was shown to be a risk factor for both unplanned and unwanted pregnancies¹⁵. Unintended pregnancies are thus reported to have adverse effects on various childhood outcomes, including increased odds for low birth weights and preterm births¹⁸.

Research in vulnerable communities of South Africa has investigated various socio-economic (wealth and household food security), biological (age and gender), maternal (education, age, Body Mass Index[BMI], perceptions and autonomy) and child health (history of breastfeeding and diarrhoea) risk factors associated with undernutrition²⁴. Evidence on the association between unintended pregnancy and undernutrition or even overweight or obesity in children born from such unintended pregnancies are, however, lacking in South Africa, even though the rate of these challenging pregnancies is high. A recent study in Bangladesh reported that children conceived unwantedly were more likely to be stunted, wasted or underweight, when compared to those from a wanted pregnancy³³.

Ultimately, in vulnerable communities, the question arises whether an “added mouth to the table” could have an adverse effect on the food security of the household and, therefore, on the nutritional status of an unplanned child. Research in South Africa indicate that, among most young mothers, even though the pregnancy was unintended, most find a way to care for the child³⁴.

Moreover, the pressing importance of decreasing under-5 child malnutrition, especially stunting and wasting, has been elevated on the international agenda. Child malnutrition has subsequently been appropriately highlighted in the Sustainable Development Goals of September 2015, specifically in Goal 2: End hunger, achieve food security and improved nutrition, and promote sustainable agriculture. It is also included in the accompanying World Health Assembly (WHA) targets³⁷.

In their analysis of the Demographic and Health Surveys of 64 low-income and middle-income countries, Roth et al.³⁸ found that the most prominent underlying causes of postnatal

linear growth faltering are community-wide exposures to which almost all of the children in the community are exposed, as opposed to individual-level exposures. They have thus called for research into community-level determinants of child health in low-income countries to be prioritised. Unintended pregnancies could be an individual- or community-level exposure that could be undermining children's anthropometric status and thus their health. Some have proposed that childhood malnutrition could be alleviated at the community level by identifying and promoting the different factors that support the so-called "positive deviants" who grow healthily despite their circumstances. This could potentially be more effective than focussing on all of the odds stacked against vulnerable children⁷⁴.

From the literature, it is clear that there is a need to investigate whether there is indeed an association between the high rate of unintended pregnancies in vulnerable communities in South Africa and malnutrition in young children born from such pregnancies. Also, over years, there has been an increasing awareness of the importance of appropriately-timed pregnancies and unplanned pregnancy have become a key public health indicator of maternal and child health^{78,79}.

Some researchers have categorised pregnancies with unsure or ambivalent intentions as unintended pregnancies, since the mothers did not positively report that they intended to get pregnant¹⁸. Others have rather grouped intended and ambivalent pregnancy intention together, as they concluded that ambivalence is associated with increased pregnancy-related risk-taking¹²¹. Some have also reminded their readers that the strength of a women's desires may alternate between avoiding and achieving pregnancy¹²³ and that focussing on the intention of a women to become pregnant implies that her intentions count the most⁸³, while the socio-economic and relationship power-dynamics may, in fact, be more determinative in whether or not a woman becomes pregnant¹¹². Also, transactional sex and coerced conception have proved to be challenges that especially adolescent girls are facing in these vulnerable communities^{16,93}.

This paper aims to compare the anthropometric status in children aged 6 to 36 months who were conceived unintentionally with those from intended pregnancies in vulnerable communities from the Western Cape Province. The research reported here tests the alternative hypothesis that pregnancy intention, measured by the London Measure of Unplanned Pregnancy (LMUP) score, is equivalent between the children's nutrition groups.

It also investigates which other social determinants of health are associated with malnutrition in these children.

4.4 Methods

4.4.1 Study Design and Sample

The research was conducted as an observational, cross-sectional study with an analytical component.

The target population for the research was situated in the vulnerable communities of Mbekweni and Dalvale area of Paarl East, with predominantly African and mixed ancestry populations, respectively. Recruiters from the local communities raised awareness about the study at early childhood development centres, churches and in the general communities. Volunteer sampling was thus used.

Eligible women included literate, biological mothers aged 12 to 49 years, with a full-term born child aged between 6 and 36 months, at the time of data collection, who weighed 1.5 kg or more at birth. The sample size for the study consisted of 72 mother-and-child pairs.

Ethical approval was obtained from the Health Research Ethics Committee of Stellenbosch University (Ref. no. S16/10/194) before any research began. Confidentiality was also ensured by not recording any personal identification data on record.

4.4.2 Data collection

Data collection was performed from July 2017 to February 2018 at a health centre in the community. Anthropometric status was measured, using the standard procedures, as described by Cogill¹²⁴. Validity and reproducibility exercises were also done for weight and height assessments.

All communication and documentation with the respondents were provided in the language of the respondents' choice, being Afrikaans, Xhosa or English (the three most prominent languages of the Western Cape Province). Written informed consent was also obtained from the biological mother or her consenting mother, if she was younger than 18 years, before any study-related procedures commenced.

The birth date, gender, gestational age at birth, birth weight, HIV status at birth and immunisation coverage of each child were recorded from the Road-to-Health booklets of the

children. All the measurements and data collection were done in a separate room to ensure privacy.

A self-administered questionnaire, with various tests, was used, as detailed in Table 4.1. The questionnaire was completed by the biological mother of each child, incorporating the validated Household Food Insecurity Access Scale (HFIAS)¹²⁵, the Socio-economic score (SES)¹²⁶, the LMUP questionnaire¹¹³, the Centre for Epidemiologic Studies Depression Scale (CES-D)¹²⁷, PCL Post-traumatic Stress Disorder (PTSD) checklist¹²⁸ and other applicable questions. The HFIAS has previously been used in vulnerable communities in South Africa¹²⁹ and incorporates three areas, namely experiencing anxiety and uncertainty about household food supply; insufficient diet quality; and insufficient food intake in the preceding 30 days¹²⁵. The SES included various measures of economic status, social status and employment status¹³⁰. In the HFIAS, a higher score is associated with higher food insecurity, while in the SES, a higher score is linked to a higher socio-economic status. The pregnancy intention was measured with the LMUP questionnaire.

Table 4.1: Determinants of Health Measures Included in the Data Collection Tools

Domain	Measure
Infant anthropometry	Length/height and weight of infant
Infant health information	Birth date, gender, gestational age at birth, birth weight and birth order Breastfeeding status, exclusivity and duration HIV status at birth Immunisation coverage
Household-level determinants	Household Food Insecurity Access Scale (HFIAS) Socio-economic score (SES) Child Support Grant (CSG) received

Domain	Measure
	Main source of income Household hygiene
Maternal health	HIV status Smoke, alcohol and drug use ante- and postnatally Centre for Epidemiologic Studies Depression Scale (CES-D) PCL Post-traumatic Stress Disorder (PTSD) Checklist
Pregnancy intention	The London Measure of Unplanned Pregnancy (LMUP)

The questionnaire was translated from English into Afrikaans and Xhosa¹ and was verified through back-translation.

The participants were reimbursed for their time and travel expenses.

4.4.3 Analysis of Data

The main hypothesis of the study was the equivalence of the LMUP score, indicating pregnancy intention, irrespective of the current nutritional status of the child. For this purpose, margins of equivalence, taken as two units on the LMUP scale, were decided on. For the testing of the hypothesis of equivalence, a TOST was used. This was implemented by calculating the 90% confidence interval for the difference and confirming whether the limits were within the equivalence margins.

¹ English, Afrikaans and Xhosa are the three official languages of the Western Cape.

Null Hypothesis: The pregnancy intention, measured by the LMUP score, is different between mothers with children with a normal nutritional status versus mothers with children with under- or overnutrition.

Alternative Hypothesis: The pregnancy intention, measured by the LMUP score, is equivalent between the nutrition groups.

In this study, malnutrition as an outcome was defined as either stunting, wasting, underweight, overweight or obesity, as according to the World Health Organisation (WHO) 2006 growth reference standards¹³¹.

MS Excel was used to capture the data, where after it was analysed with STATA 15 software¹³². The WHO Anthro Software Version 3.2.2 (2011)¹³³ was then used to analyse and express the children's anthropometric measurements as sex- and age-specific z-scores: weight-for-age (WAZ), height-for-age (HAZ), weight-for-height (WHZ) and BMI-for-age. Stunting was defined as HAZ equal or below -2 Standard Deviations (SD), underweight as WAZ equal or below -2 SD, wasting as WHZ equal or below -2 SD, whilst overweight was defined as WHZ/BMI-for-age equal or above +2 SD and obesity as WHZ/BMI-for-age equal or above +3 SD. Anthropometric status was then grouped into a normal or abnormal status. These two groups of anthropometric status were evaluated for equivalence to the LMUP score.

The descriptive statistics calculated included the means, standard deviations, medians and proportions. LMUP was used as a continuous variable and the descriptive statistics of the scores were calculated across various subgroups. The difference in LMUP between the subgroups, such as being the first child or there being a presence of PTSD (normal, >30, >50), was compared, using quantile regression. This was done since some of the subgroups were small and a single high value of LMUP could influence the mean score. Using the quantile regression thus enabled median score comparison. A multiple quantile regression model, with selected covariates, was furthermore used to evaluate adjusted differences.

As a secondary analysis, a multiple quantile regression model of LMUP on various descriptive factors was done, without the nutritional status information included, due to the finding of equivalence of LMUP between the nutrition subgroups. The LMUP score was plotted against the age and a Locally Weighted Scatterplot Smoothing (Lowess) non-

parametric smoother was used to estimate the mean score over the age to reflect any non-linear associations. This was also done for other continuous variables.

A further secondary analysis was done, comparing the descriptive factors with the anthropometric status, using Pearson's Chi² and Fischer's exact for categorical data.

4.5 Results

4.5.1 Description of the Study Population

The average age of the sample child population was 18 months (aged 6 to 33 months), while the average maternal age at birth of the participating child was 27 years, varying from 15 to 43 years. The percentage mothers stratified according to the maternal age was as follows: 19.4% aged 12-<20 years, 22.2% aged 20-<25 years, and 58.4% aged 25-<49 years. Of the mothers, 72.2% (n=50) was self-classified as African and 27.8% (n=20) as of mixed ancestry, while those of the children were 76.4% (n=55) African and 23.6% (n=17) of mixed ancestry. The gender of the sample population of the infants was 55.6% (n=40) male and 44.4% (n=32) female. Of the children, 36.1% (n=26) were first-borns; 15.3% (n=11) had siblings under the age of 5 years, and 2.8% (n=2) had siblings who were lost due to abortion before the birth of the participating child. See Table 4.2 for the population characteristics.

Table 4.2: Characteristics of the Study Population

Characteristic	N (%)	Characteristic	N (%)
Maternal age		Child age	
Mean (years)	27	Mean (months)	18
12-<20 years	14 (19.4)	6-<12 months	20 (27.8)
20-<25 years	16 (22.2)	12-<24 months	30 (41.6)
25-<49 years	42 (58.4)	24-<36 months	22 (30.6)
Race of Mother		Race of Child	
African	52 (72.2)	African	55 (76.4)
Mixed-Ancestry	20 (27.8)	Mixed-Ancestry	17 (23.6)
Residence Area		Gender of child	
Mbekweni	60 (83.3)	Female	32 (44.4)
Dalvale	12 (16.7)	Male	40 (55.6)
First Child		Siblings aged < 5 yrs	
No	46 (63.9)	No	61 (84.7)
Yes	26 (36.1)	Yes	11 (15.3)

4.5.2 Anthropometric Status

Of the sampled children, 73.6% (n=53) had a normal anthropometric status. The prevalence of malnutrition was 26.4% (n=19), consisting of 16.7% (n=12) undernutrition and 9.7% (n=7) overnutrition. Undernutrition was represented by 2.8% (n=2) wasting and 11.1% (n=8) stunting. One child was severely stunted, but also overweight. Another child was severely stunted and underweight. In the over-nourished group, 8.3% (n=6) were overweight and 2.8% (n=2) were obese.

Figure 4.1 illustrates the non-linear association found between the ages of the sampled population and the anthropometric status. Those children aged 12 to 28 months were more prone to malnutrition.

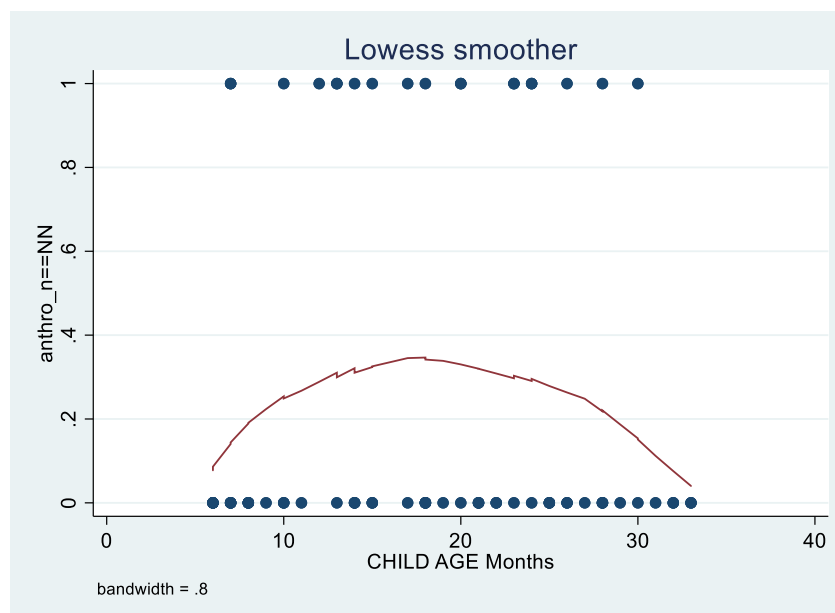


Figure 4.1: Non-Linear Association between Malnutrition and Children Aged 12 to 28 months

4.5.3 Determinants of Health

A low birth weight (<2.5 kg) was observed in 5.6% (n=4) of the children. At the birth of the participating child, 31.9% (n=23) of the mothers and 2.8% (n=2) of the children were HIV positive. The children's immunisations were up to date in 93.1% (n=67) of the children. Fifty-seven (79.1%) children were breastfed, with most (98.3%; n=56/57) starting in hospital and 49.1% (n=28/57) still breastfeeding at the time of the study.

A CSG was received by 88% (n=63) of the total sampled children, of whom 54% (n=34/63) received it before three months of age. The CSG was furthermore indicated as the main income in the household for 63% (n=42/68) participants. There was no association between

receiving a CSG and the anthropometric status ($p=0.189$). In those receiving a CSG, 24% ($n=15/63$) were malnourished, with respectively 53% ($n=8/15$) being stunted, 13% ($n=2/15$) experiencing wasting and 33% either being overweight or obese. In those not receiving a grant, 44% ($n=4/9$) were malnourished, consisting of half being stunted and the other half being overweight.

Household hygiene was reported to be acceptable in 77.8% ($n=56$) of the cases. In these vulnerable communities, 69% ($n=49/71$) of the households were severely food insecure, 16.9% ($n=12/71$) were moderately food insecure and 2.8% ($n=2/71$) were mildly food insecure. Only 11.3% ($n=8/71$) were food secure.

PTSD, when using a PCL cut-off score of 30, was prevalent in 56.9% ($n=41$) of the mothers. Also, 74.6% ($n=53/71$) of the mothers were diagnosed with current depression.

Of the mothers, 73.6% ($n=53$) reportedly never smoked and 68.1% ($n=47/69$) indicated never using alcohol during the pregnancy of the child under study. Of those who did smoke, 2.8% ($n=2$) smoked more than four cigarettes a day while pregnant and 8.7% ($n=6/69$) reported alcohol use of twice or more times a week during the reported pregnancy. Two mothers (2.9%; $n=2/70$) also reported daily drug use during the pregnancy and another two (2.9%; $n=2/70$) reported using drugs a few times during the pregnancy.

During the research period, 72.2% ($n=52$) of the mothers reported never smoking and 5.6% ($n=4$) reported smoking more than four cigarettes a day. Also, 62% ($n=44/72$) reported never using alcohol, while 8.5% ($n=6/72$) reported using alcohol twice or more times a week. Of those who used alcohol, most (85.2%; $n=23/27$) reported a higher than normal alcohol use. Current drug use, including up to weekly use of both Cannabis (“dagga”) and Crystal Methamphetamine (“tik”), was reported by two mothers (2.9%; $n=2/69$).

No associations were found when performing a multiple logistic regression of the anthropometric status, malnutrition, on the health determinants, for the age of the child, low birth weight of the child (OR 0.56, 95% CI 0.19, 1.70; $p=0.306$), low socio-economic status (OR 0.89, 95% CI 0.77, 1.03; $p=0.109$), severe food insecurity at the household level (OR 1.66, 95% CI 0.80, 3.48; $p=0.176$) or PTSD of the mother.

4.5.4 Pregnancy Intention

From the sample population, 39% (n=28) of the pregnancies were categorised as “Unplanned”, 46% (n=33) as “Ambivalent” and 15% (n=11) as “Planned”. First-born children constituted 36.1% (n= 26) of the sample and, of these, only 11.5% (n=3) were born from planned pregnancies, with 46.2% (n=12) being unplanned. Of the 41.6% (n=30) of mothers with a maternal age below 25 years, 43.3% (n=13) had unplanned pregnancies. None of the pregnancies from mothers below 20 years was planned.

The infants born from an ambivalent pregnancy intention had a slightly lower birth weight than those of an unplanned or planned pregnancy intention. As shown in Figure 4.2, there was, however, a minimal difference in the median birth weight between the LMUP groups: unplanned pregnancies P50=3.25 kg; ambivalent pregnancies P50=3.06kg; and planned pregnancies P50=3.38kg. The difference was, however, not significant ($p=0.3794$).

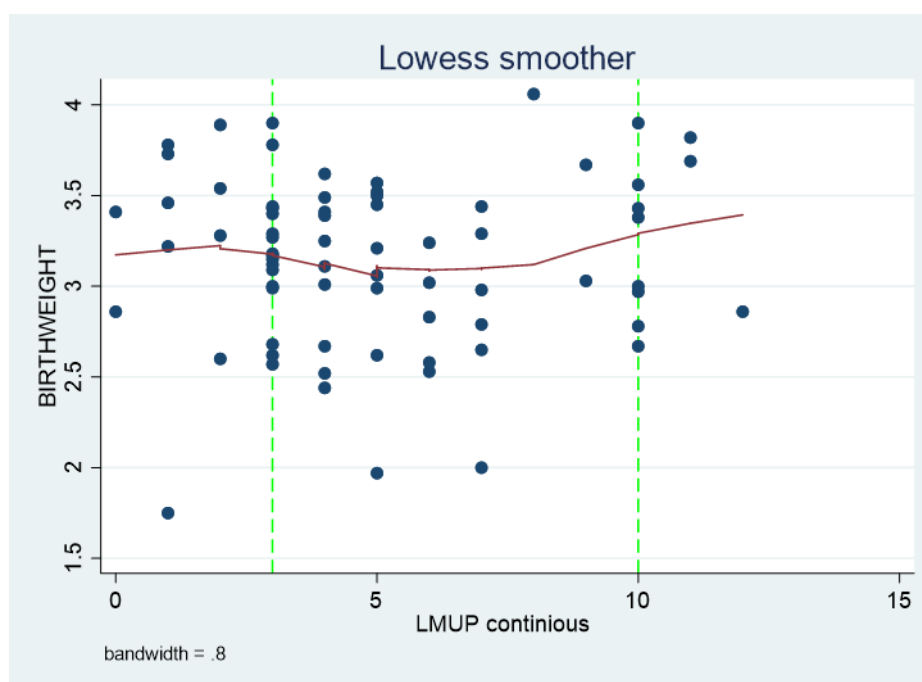


Figure 4.2: Lower Birth Weight from Ambivalent Pregnancies, Compared to Unplanned and Planned Pregnancies in the Sampled Children

There was also no association between the SES and the pregnancy intention. The main source of income was associated with the LMUP score. There was a difference between the main income from the CSG versus the main income from the child’s father and family (Prob > F=0.0199). Those who received their main income from the child grant scored two points lower on their median LMUP score than those who received their main income from other sources. This was significantly lower than for women receiving their main income from either

their family or the child's father (Prob > F =0.0038), but it was not significantly different from women earning their own salary (p=0.132).

There was a significant association between the LMUP score and HFIAS (p=0.0402). The women from households with severe food insecurity (HFIAS=4) had lower LMUP scores than those women from food secure households. However, this difference was not significant (p=0.112).

Being a first child was not significantly associated with the LMUP score (p=0.299).

The pregnancy intention between low birth weight and normal birth weight babies could not be determined due to the sample size of the children with a low birth weight being too small.

The estimate median difference in the LMUP score between the normal anthropometric status group and the abnormal anthropometric status group (malnourished) was zero, with 90% CI: -1.86 to 1.86. Since this confidence limit falls within the equivalence margins of -2 to +2, one can accept the alternative hypothesis of equivalence and conclude that pregnancy intention and the current anthropometric status of the children are not associated.

The results of a multiple quantile regression model of pregnancy intention on various factors are given in Table 4.3.

Table 4.3: Multiple Quantile Regression Model of Pregnancy Intention on Various Factors

LMUP score	Coef	Standard Error	T	P> t 	95% CI
Maternal age < 20	-2	0.9	-2.01	0.049	-4.07 -0.1
Child grant received	-2	1.2	-1.63	0.108	-4.4 0.4
Severe HFIAS	1	0.9	1.13	0.262	-0.8 2.8
PTSD	0	0.9	0.00	1.000	-1.8 1.8

No Depression	0	1.0	0.00	1.000	-2.1 2.1
Mbekweni	0	1.2	0.00	1.000	-2.3 2.3

N=70; Pseudo R²=0.0952

The multiple quantile regression was done without the nutritional status information included, due to the finding of equivalence of pregnancy intention between the nutrition subgroups. This indicated that young women below 20 years reported significantly lower LMUP scores for the pregnancy of the participating child ($p=0.049$; Difference in score -2.95% CI -4.00, -0.01).

4.6 Discussion

This study conducted in the two vulnerable, peri-urban communities in the Western Cape found that there was no association between pregnancy intention, measured by the London Measure of Unplanned Pregnancy (LMUP) score, and anthropometric status of the children born from unplanned pregnancies. The pregnancy intention was equivalent between the children's nutrition groups. Thus, such unplanned pregnancies, as well as those pregnancies that were ambivalently conceived did not lead to increased malnutrition in the offspring.

The respondents reported low rates of planned pregnancies with only 15% of the children being born from planned pregnancies. An unexpected majority of the mothers had conflicting feelings about their pregnancies, which are reported as 46% ambivalent and 39% unplanned pregnancies. The longitudinal Drakenstein Child Health Study (DCHS)¹³⁵ done in some of the same communities as this current research, reported an overall unplanned pregnancy rate of 65.6%; however, a different measure was used to measure pregnancy intention which was categorised as only planned or unplanned. Due to the differences in the measurement and classification of pregnancy intention between these studies, they cannot be directly compared⁹⁷.

Ambivalent pregnancy intention has, however, been reported frequently in women with a low SES and is associated with low use of effective contraception^{114,119,120}. Some studies have even reported that women in fragile socio-economic environments often view motherhood as a way of evading the reality of poverty and as a way of attaining personal

fulfilment, especially in low-income adolescents who struggle with hopelessness and low self-worth^{121,122}. Also, studies in young, African-American women showed that only when a women wants to expressly avoid a pregnancy or unmistakably wants to conceive does her attitude significantly alter her behaviour¹²⁰.

The absence of planned pregnancies in the maternal age group below 20 years in this research was even less than the low planned pregnancy rate in another study of South African girls in the same age group, where only 8.7% of the pregnancies were categorised as planned¹⁰. Proportionally, 19.4% births were to women below 20 years, comparing well to a previously reported 19.2% of teenage pregnancies in South Africa¹⁶. No infants born from teenage pregnancies in this analysis was of low birth weight, and none of these pregnancies were planned. This is somewhat surprising, considering a systematic review, consisting mostly of studies done in the United States of America, which reported increased odds for low birth weight among unintended pregnancies¹⁸. Research regarding teenage pregnancy outcomes in Cape Town, South Africa also reported doubled odds of mixed ancestry teenage mothers giving birth to low birth weight infants. This was, however, not the case in African children¹³⁶. This finding may point to a new phenomenon of overweight teenage mothers bearing normal weight babies. This was, however, not measured and remains speculative. Nonetheless, with adolescent childbearing being common in many LMICs, continued and strengthened measures are needed to encourage mothers in delaying a first pregnancy until the late teenage years or, preferably, until the early twenties, as other maternal and child health outcomes could be affected negatively by teenage pregnancies.¹³⁷

The rate of 43.3% unplanned pregnancies among mothers with a maternal age below 25 years compares well with the previously reported 44% in Sub-Saharan Africa⁹.

With only 11.5% (n=3) of the first-born children being born from planned pregnancies in a community that offers ample access to free contraception at local public health clinics and non-profit wellness clinics, one must question the appropriateness of labelling pregnancies according to whether it was consciously desired and planned, as these notions do not necessarily resonate with the women. In light of this, others have also challenged the notion of focussing on unintended pregnancies as an outcome of primary interest when the women's social circumstances are far removed from planning a pregnancy¹³⁸. In this current cohort, six mothers partook concurrently in the study with their teenage daughters, who were also mothers at the time of study, with the teenage daughter's child being older than the

same daughter's own baby sibling. This seems to be a generally occurring practice. One does, however, have to allow for the possibility that issues of interpersonal violence, power dynamics and partner/inter-personal relationships may play an important role in conceiving. The progress in the overall women's empowerment in these cultures and societies may also ultimately reduce these effects¹⁸.

The stunting rate in this community was 11%, compared to a recent national stunting rate of 22% in children under 5 years, as reported in the South African Early Childhood Review of 2016¹³⁹, even though 69% of the mothers reported a HFIAS score indicating severe food insecurity. The stunting rate, however, was consistent with the stunting rate of 13% at age 12 months, as reported by a cohort of the longitudinal DCHS which was also done in Mbekweni and another area, consisting of a predominantly mixed ancestry population¹⁴⁰. The high rate of severe food insecurity correlates well with the mothers indicating that 61.8% of them received a CSG as their main income, indicating their lack of substantial household income. Furthermore, the South African Early Childhood Review also noted that "close to 35% of pregnant women stayed in households that ran out of money to buy food for five or more days in the 30 days prior to the survey"¹³⁹. It also reported that 15% of the children in the Western Cape lived in households where the children suffer from hunger¹³⁹ which is higher than the national average. Moreover, in the Drakenstein Municipality, which is the local municipal district where the research was conducted, 7.6% of the households reportedly skipped a meal in the 12 months prior to the survey¹⁴¹, referring to a person in the household not eating a meal because there was not enough food for the household.

The severe household food insecurity, therefore, seems evident. However, the low rate of undernutrition in this sample could be due either to some positive deviance factors among the sample or a result of overreporting on the severity of food insecurity. As the latter case has been reported by previous studies^{142,143}, the possibility of overreporting due to the expectation of food aid cannot be ruled out, even though food aid was not provided in this current study. However, resilience has previously been noted in this community in cohorts of the DCHS¹⁴⁴.

In addition, researchers of the DCHS done in the same communities, have observed that black African children, when compared to mixed ancestry infants, have better nutritional status and are described as being taller and weighing more from birth and lasting throughout

infancy¹⁴⁰. There was, however, no statistical difference between the nutritional status of the children in these two ethnic groups in this study.

Other positive deviance factors that might have influenced the unexpected lower stunting rate could include the meals received by the children at creches or households receiving multiple child grants due to numerous children staying in one household. Additional environmental or genetic factors may also influence the growth of the children¹⁹ and further investigation is warranted. No statistically significant infant, maternal, nutritional, environmental or socio-demographic factors impacting pregnancy intention could be identified in the cohort.

Interestingly, in this sample, children aged 12 to 28 months were more prone to malnutrition than those younger or older. Yet, data from birth cohorts of low- and middle-income countries (LMICs), including South Africa, concluded that all of the cohorts had growth restriction (decreased HAZ) between 12 and 24 months¹⁴⁵. Although this did not necessarily constitute stunting, it did indicate a depleted nutritional state. This could be the result of various cumulative factors, namely increased morbidity in unhygienic environments which causes an increased risk for parasitic infections and/or diarrhoea; decreasing or a cessation of breastfeeding; and an inadequate diet, contributing to multiple micronutrient deficiencies. Previous research on a global scale suggests that community-wide factors in LMICs are the predominant causes of postnatal stunting. This supports the emerging prioritisation of research and action on community-level determinants of child growth (for example, nutrition-sensitive programmes) in these countries. These researchers have argued that the key community-level factors are communal (such as an inadequate public sanitation infrastructure) which makes it unmeasurable at the individual child or household level³⁸.

Various determinants of health were reflected in the nutritional status of the infant sample population. Nearly 80% of the mothers reported breastfeeding their infants and almost all of them initiated breastfeeding in the hospital. This figure correlates well with the breastfeeding initiation rate of 89% reported in a recent national report¹³⁹. The exclusive breastfeeding (EBF) rate of more than half of the infants sampled at 4 months is most probably overreported, considering the results of only 13% EBF at 6 months previously reported in the same community¹⁴⁶.

Maternal rates of depression and PTSD were high at 74.6% and 56.9%, respectively. These figures are exceptionally high in comparison to the 39% depression rate found in 2011 among pregnant women in urban, informal settlements of Cape Town¹⁴⁷, but not surprising considering the high prevalence of exposure to violence in and outside the home in these communities¹³⁵. Furthermore, some literature states that there are very limited maternal mental health services currently offered to mothers in the public health system¹³⁹. These detrimental psychosocial factors did, however, not have a significant impact on the nutritional status of the sampled children. Yet, this adversity and lack of support can impair the capacity of families to provide nurturing care for young children⁴⁷.

It has previously been reported⁵³ that having well-planned births (through the better timing, spacing and planning of the births and through the use of contraception) can reduce undernutrition, especially stunting and underweight, in children. This study concludes, however, that unintended pregnancies did not contribute to malnutrition. Considering that the unintentional pregnancy rate is so high among vulnerable communities in South Africa, programmes and policies should accommodate better nutrition among all women of childbearing age in these communities, especially for adolescent girls, where none of the pregnancies seem to be consciously planned. Improving the quality of these women's and girls' preconception nutritional intake, as well as their intake during pregnancy, could boost progressive maternal and child health outcomes. Previous research furthermore reported that health outcomes could be more dependent on the circumstances and emotions surrounding the pregnancy, rather than the pregnancy intention^{112,123}. Instead of only focussing on preventing unplanned pregnancies, nutritional and emotional support for all women and girls of childbearing potential should be promoted. This could be done by a nutrition-sensitive intervention, like linking basic health services (HIV testing, pregnancy testing and antenatal services) with nutritional, social and psychological support for these women and girls. By protecting and supporting all mothers-to-be, regardless of their pregnancy intention, and promoting nurturing care among them, resilience of the communities and health systems can be enhanced.

4.7 Conclusion and Recommendations

Unintended pregnancies did not contribute to malnutrition in the vulnerable communities studied. Although many of the pregnancies were unintended, it seems as if most of the participants found a way to care for the child. The importance of maternal nutritional wellbeing before pregnancy and during gestation in delivering a healthy infant has long been

recognised¹⁴⁸. Improving nutritional quality and the mental wellbeing of all women of childbearing potential, therefore, presents a key opportunity to improve the future generations' health and mitigate the risk of adverse long-term economic outcomes. Future mothers should also be empowered to make decisions in the best interest of their children, regardless of whether the pregnancies were planned or unplanned. This could be done through mother mentoring groups that include improving organisational and disciplinary skills at home; protecting children from sources of infection, accidents and trauma; and seeking care when needed.

4.8 Study Limitations

Although the sample was small and the findings may not be representative of all communities in South Africa, most of the mothers in this sample and other similar communities in South Africa use the public health system. In this regard, the sample communities could be regarded as representative of many other communities in South Africa and other LMICs¹³⁵.

As the participants were recruited, possible volunteering bias could be expected.

Due to the LMUP being completed retrospectively (up to more than three years after the mother became pregnant), it is possible that the mothers reported the pregnancy intention differently due to post-birth rationalisation. This could possibly have had an effect on the high ambivalence reported in relation to pregnancy planning.

Considering the personal nature of the questionnaire, one could also have expected that the mothers would be reluctant to disclose embarrassing information. It was, however, explained to all the mothers before they completed the questionnaire that all the information would be kept confidential to minimise this risk.

4.9 Role of the Funding Source

The funders of the study had no role in the study design, data collection, data analysis, data interpretation or writing of the report.

4.10 Acknowledgments

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CHAPTER 5 – SUMMARY OF FINDINGS, CONCLUSION AND RECOMMENDATIONS

5.1 Summary of Findings

This study aimed to determine the anthropometric status in children aged 6 to 36 months in the vulnerable communities of Mbekweni and Dalvale in the Western Cape Province, South Africa. The study assessed whether the sampled children were born from an unintended or intended pregnancy. Furthermore, the relationship between the pregnancy intention and the anthropometric status of the children was explored.

A secondary analysis was performed to determine the socio-economic risk factors associated with malnutrition in these children. The data was analysed to assess the household food security, hygiene and HIV status of the mother-child pair as well as the maternal biological and behavioural factors, rates of depression and PTSD. The immunisation status of the children was also obtained as well as the birth weight of the participating children.

The main findings of the study indicated no association between the pregnancy intention and anthropometric status of the children born from unplanned pregnancies. Hence, even though unplanned and ambivalent pregnancies were a common phenomenon in these communities, they did not significantly increase malnutrition among the infants and young children.

An unexpected majority of the mothers had conflicting feelings about their pregnancies, which are reported as 46% ambivalent and 39% unplanned pregnancies. The respondents also reported low rates of planned pregnancies, with no planned pregnancies reported in the mothers with a maternal age below 20 years.

Even though 69% of the mothers reported a HFIAS score indicating severe food insecurity, the stunting rate in the community was 11% which was lower than expected. The high rate of severe food insecurity correlates well with the mothers indicating that 61.8% of them received the Child Grant as their main income, indicating their lack of substantial household income. The severe household food insecurity, therefore, seems evident. The low rate of undernutrition in this sample is either due to some positive deviance factors among the sample or is a result of overreporting on the severity of food insecurity. No statistically significant infant, maternal, nutritional, environmental or socio-demographic factors could be identified in this cohort.

Interestingly, in this sample, children aged 12 to 28 months were more prone to malnutrition than those younger or older. This could be the result of various cumulative factors, namely increased morbidity in unhygienic environments which causes an increased risk for parasitic infections and/or diarrhoea; decreasing or a cessation of breastfeeding; and an inadequate diet, contributing to multiple micronutrient deficiencies.

The state of mental health is concerning, as indicated by the high rates of depression and PTSD among the mothers, signalling the need for support of a nutrition-sensitive intervention, as maternal depression will likely co-exist with sub-optimal infant and young child feeding practices, such as non-EBF¹¹. Linking basic health services, like HIV testing, pregnancy testing and antenatal services, with social and psychological support for women could also help alleviate such high rates of mental disease¹⁴⁹.

The secondary results further indicate that at least three of the five components of the nurturing care framework⁴⁷ were found in this study to be lacking in these vulnerable communities. The components found to be lacking are: nutrition is inadequate as indicated by the high rate of severe food insecurity; responsive caregiving could be limited by the high rate of adolescent pregnancies and depression among the mothers; and safety and security seem insufficient as indicated by the high rate of PTSD among the mothers. The first two components mentioned in the nurturing care framework correspond with the underlying causes: household food insecurity and inappropriate maternal and childcare practices, as mentioned in the adapted 2013 UNICEF conceptual framework⁴¹ of the determinants of maternal and child undernutrition.

From this, it is clear that the children in these communities are the most vulnerable in their own homes, even though some PD factors (most likely at a community level) seem to have a protective effect on the nutritional status of the children. These PD factors could include various nutrition-sensitive programmes and approaches^{19,149} that are implemented in these communities, including: social safety nets, such as the non-conditional CSG and the school feeding programme. Furthermore, it could also include the core maternal and child nutrition and health interventions, such as those advocated for in the DoH's Integrated Nutrition Programme and Integrated Management of Childhood Illnesses approach at the local primary healthcare clinics. The absence of low birth weight babies among the adolescent mothers in this study may point to a new phenomenon of overweight teenage mothers bearing normal weight babies, as indicated in Chapter 4.

5.2 Hypotheses Acceptance / Rejection

The alternative hypothesis of equivalence can be accepted. Thus, we can conclude that the pregnancy intention and current anthropometric status of the children under study were not associated.

5.3 Conclusion

Unintended pregnancies do not contribute to malnutrition in the vulnerable communities studied. Although many of the pregnancies were unintended, it seems as if most of the participants found a way to care for the child. The importance of maternal nutritional wellbeing before pregnancy and during gestation in delivering a healthy infant has long been recognised¹⁴⁸. Improving nutritional quality and the mental wellbeing of all women and girls of childbearing potential, therefore, presents a key opportunity to improve the future generations' health and mitigate the risk of adverse long-term economic outcomes. Future mothers should also be empowered and supported to make decisions in the best interest of their children, regardless of whether the pregnancies were planned or unplanned.

5.4 Recommendations

The high unintended pregnancy rate in South Africa warrants the improvement of nutritional quality and the emotional wellbeing of all women and girls of childbearing potential. A range of policies, programmes and interventions are required at the different stages of life to this effect. Black et al.¹⁹ introduced a framework for actions to achieve optimum foetal and child nutrition and development and by introducing these nutrition-sensitive interventions, the underlying determinants of malnutrition can be addressed. These programmes include agriculture and food safety, social safety nets, early childhood development (ECD) initiatives, maternal mental health, women's empowerment, child protection, schooling, WASH initiatives, and health and family planning services¹⁴⁹.

Therefore, agricultural initiatives, such as homestead food production systems, could boost food security and household incomes and improve access to higher quality diets. The current land reform and redistribution taking place in South Africa further could bolster the access to land in these communities, if they are guided by sound principles¹⁵⁰. Also, by including women in land ownership, the women can become empowered to the benefit of household nutrition and healthcare¹⁵¹. Urban agriculture has, however, proved to be ineffective in alleviating poverty and food insecurity in Cape Town, even though policies that encourage this have already been put in place¹⁵².

Based on the data, social safety nets, such as the CSG, seem to be effective in buffering households at least partially against severe food insecurity. Further financial incentives that are conditional on participation in health education and healthcare visits have also been effective in previous programmes¹⁵³ and could prove beneficial in these vulnerable communities as well.

ECD include nurturing the mother, even before the child is conceived, and thus enhancing the capacity of families to provide nurturing care to their future young as nurturing care depends on thriving families. Home-based ECD activities implemented by community health workers have also been mentioned in the Lancet series of 2017 as an opportunity that should be pursued to build parenting capacity⁷².

The health and wellbeing of a mother before, during and after a pregnancy determine her ability to support the health and development of her child¹¹. The aim should, therefore, be to obtain optimal health, nutritional status and weight before pregnancy¹⁵⁴. Maternal mental health interventions could further alleviate the underlying causes of child undernutrition¹⁴⁹. Consequently, the promotion of good mental health and the treatment of mental health problems should be integrated into national reproductive and child health programmes⁵⁷.

Programmes which involve roleplaying to better negotiate skills have been proposed to build up self-esteem and empower young women to make healthy life decisions, especially with regard to their sexuality⁹³. These intervention programmes, coupled with the promotion of effective contraceptive use and EBF, could increase the age of adolescents at first pregnancy as well as inter-pregnancy intervals, while reducing family size¹⁵³. These are all important steps towards preventing the adverse outcomes of adolescent pregnancies on maternal and child health.

The recently published document entitled “Nurturing Care for Early Childhood Development: A Framework for Helping Children Survive and Thrive to Transform Health and Human Potential”⁴⁷ supports the improvement of the health of potential mothers, before they become pregnant. Such improvements in the health of mothers may alleviate transgenerational transmission of adverse health and economical outcomes. The document advocates for the protection and support of mothers and families to optimise the physical, emotional, social and cognitive circumstances of infants to not only survive, but to thrive. This empowerment of mothers/caregivers will enable them to make decisions that are in the

best interest of their unborn and born children so that they are able to provide nurturing care to them.

Nutrition initiatives among adolescent girls and women of reproductive age should thus be integrated with other maternal and child health interventions as well as community and school-based platforms¹⁵⁴. Such nutritional interventions should focus on the long-term nutritional status of the potential mother¹⁵⁵ and could include multi-micronutrient supplementation or fortification in vulnerable communities¹⁵⁴. Mass fortification of staple foods, including micronutrient-fortified flour and mealie meal, have long been mandatory in South Africa, enriching the diets of especially vulnerable communities. Home fortification of foods consumed by all vulnerable women of childbearing potential in the form of micronutrient powders or food-based fortified lipid spreads could be an additional nutrition-enrichment strategy.

Effective programmes, however, need political commitment; national policies and evidence-based programmes; trained and skilled community workers, collaborating with the communities; effective communication and advocacy; and multi-sectoral, integrated service delivery⁴¹. Academic institutions and qualified dietitians/nutritionists should therefore ensure that they instil and acquire the necessary skills to promote nutrition as a multi-sectoral opportunity essential to achieving sustainable development.

5.5 Future Research

Further research should explore the state of the mental health problems among all adolescent girls and women of childbearing potential, for example the effect of Interpersonal Violence, Depression and PTSD in mothers on providing nurturing care to their children.

Research into the infant and young child feeding practices, infant stimulation and nurturing care practices in vulnerable communities should also be undertaken.

Other positive deviance factors that might influence the unexpected lower stunting rate, namely coping household mechanisms, meals received by the children at creches and the average number of child grants received in one household, should furthermore be investigated.

Current mother mentoring groups include improving organisational and disciplinary skills at home; protecting children from sources of infection, accidents and trauma; and seeking care

when needed. Further investigation into these and other environmental or genetic factors that may influence the growth of children are also warranted.

5.6 Study Limitations

Although the sample was small and the findings may not be representative of all other communities in South Africa, most of the mothers in this sample and other similar communities in South Africa use the public health system. In this regard, the sample community could be regarded as representative of many other communities in South Africa and other LMICs¹³⁵.

As the participants were recruited, possible volunteering bias could be expected.

Due to the LMUP being completed retrospectively (up to more than three years after the mother became pregnant), it is possible that the mothers reported the pregnancy intention differently due to post-birth rationalisation. This could possibly have had an effect on the high ambivalence reported in relation to pregnancy planning.

Considering the personal nature of the questionnaire, one could also have expected that the mothers would be reluctant to disclose embarrassing information. It was, however, explained to all the mothers before they completed the questionnaire that all the information would be kept confidential to minimise this risk.

Furthermore, due to the small sample population and the participants volunteering to partake in the study, the generalisation of the study results are limited.

In this research, as in a previous South African study⁸⁵, only those pregnancies that were carried to term could be evaluated for pregnancy intention and this could have introduced biased conclusions.

The high rate of severe food insecurity could have been overreported by the mothers in the hope of getting food assistance. However, this is highly unlikely as 61.8% of the mothers indicated that the CSG is their main income, implying that their food insecurity correlates with their lack of a substantial income.

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ADDENDUMS

Addendum A: Self-Administered Questionnaire

1. Informed Consent Form:

Done in what language? English Xhosa Afrikaans Done by : ____ Date: ____/____/2017

2. Demographics of mother:

Date of mother's birth (from ID) ____/____/____(yyyy / mm / dd)

Mother's current age: ____ years Mother's age at birth of this child: ____ years

Race of mother: Black Coloured (mixed ancestry) Area of residence: Mbekweni Dalvale
 Other

3. Demographics of child:

Date of birth of target child (from Road-to-Health booklet) 201__ / __ / ____(yyyy / mm / dd)

Current Age of child: ____ months (if below 6 months or above 36 months →exclude mother-child pair)

What is the child's gender? Male Female Race of child: Black Coloured (mixed ancestry)

Is this child her first child? Yes No → If not, please complete the table below for all children < 5 years:

Nr	Name	Age	Alive	Dead
1				
2				
3				
4				
5				

4. **Gestational Age at Birth** (from Road-to-Health booklet): ____ weeks (if below 37 weeks →exclude)

5. **Birth weight** (from Road-to-Health booklet): __ , __ kg (if below 1,5 kg →exclude)

6. **Immunisation coverage of child** (from Road-to-Health booklet)

Up-to-date for age Not up-to-date for age

7. **Known HIV status at birth of child:** (from Road-to-Health booklet)

- child: positive negative unknown

- mother: positive negative unknown

8. **Breastfeeding status:**

Was child breastfed? No Yes If yes → when did you start breastfeeding? In hospital At home

Are you still breastfeeding? No Yes

If no → How old was child when you stopped breastfeeding? ___ weeks/months

How old was the child when you first started giving him/her other drinks or something to eat?

___ weeks/months → Conclusion: How long breastfed exclusively? < 4 months ≥ 4 months

9. Child support grant access for child:

Is mother receiving Child support grant for this child? Yes No →if yes, age when first received CSG? ___ What was age of child at uptake? < 3 months ≥ 3months

10. Child Anthropometry:

Weight of mother & child: ___ ___ ___ , ___ kg - Weight of mother ___ ___ ___ , ___ kg = Child weight: ___ ___ ___ , ___ kg

Height 1 of child: ___ ___ ___ , ___ cm Height 2 of child: ___ ___ ___ , ___ cm Final height of child: ___ ___ ___ , ___ cm

Used: Infantometer Stadiometer Done by : ___ ___ ___ Date: ___ ___ / ___ ___ ___ /2017

SELF-ADMINISTERED QUESTIONNAIRE

READ: These questions are confidential, so please answer all questions honestly. This survey asks questions about you and your child who was selected to be in this research with you. All the questions in this survey that ask about "your child" are referring to this child who was selected to be in the research with you.

Tick (✓) one response unless otherwise stated.

If you need help, feel free to ask the assistant.

SES SCORE

Question		Score
1.1 Income: What is your combined household income (before tax deductions) PER YEAR?	<input type="checkbox"/> Less than R10 000 <input type="checkbox"/> R10 000 – R20 000 <input type="checkbox"/> R20 000 – R40 000 <input type="checkbox"/> R40 000 – R60 000 <input type="checkbox"/> R60 000 – R100 000 <input type="checkbox"/> More than R100 000	1 2 3 4 5 6
1.2. What is the main source of income for your household? If other, please provide further details	<input type="checkbox"/> own salary <input type="checkbox"/> income from baby's father <input type="checkbox"/> child grant <input type="checkbox"/> contribution by other family members <input type="checkbox"/> other _____ _____ –	
2.1 Employment: Are you currently employed? 2.2 If yes, please indicate the nature of your employment (e.g. teacher, nurse, student, factory worker, manager) If the baby's father is providing you with an income (see question 1.2), answer questions 2.3 and 2.4:	<input type="checkbox"/> Yes <input type="checkbox"/> No _____ _____ –	
2.3 Is the baby's father currently employed? 2.4 If yes, please indicate the nature of his employment (e.g. teacher, nurse, student, factory worker, manager)	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Not applicable _____ –	
3. Education: What is your highest level of education reached? Tick (✓) one response:	<input type="checkbox"/> 0 years (No Grades) Never went to school <input type="checkbox"/> 1-6 years(Grades 1-6 / Sub A-Std 4) didn't complete primary school)	

	<input type="checkbox"/> 7 years (Grade 7 / Std 5) (completed primary school) <input type="checkbox"/> 8-11 years (Grades 8-11 / Stds 6-9) Some secondary education (didn't complete high school) <input type="checkbox"/> 12 years (Grade 12 / Std 10) Secondary education (completed senior school) <input type="checkbox"/> 13+ years Tertiary education (completed university /technikon / college) <input type="checkbox"/> Don't know	
4. Assets: Which of these items do you have in your home? (mark as many as necessary)	<input type="checkbox"/> Tap water inside home <input type="checkbox"/> Flush toilet inside home <input type="checkbox"/> Electricity <input type="checkbox"/> Telephone (landline) <input type="checkbox"/> Television <input type="checkbox"/> Computer <input type="checkbox"/> Car	
5. Housing: How would you describe your dwelling?	<input type="checkbox"/> Shack <input type="checkbox"/> Wendy house or backyard dwelling <input type="checkbox"/> Traditional dwelling or tent <input type="checkbox"/> Flat / apartment <input type="checkbox"/> Town house / semi-detached house <input type="checkbox"/> Freestanding brick house <input type="checkbox"/> Other (specify) _____	
6. How many people sleep in the same room with you at night when you are at home?	<input type="checkbox"/> one <input type="checkbox"/> two <input type="checkbox"/> three <input type="checkbox"/> four <input type="checkbox"/> five <input type="checkbox"/> more than five <input type="checkbox"/> none	

Household Hygiene Practices

READ: Below are some questions. Please tick (✓) which best describe what you do.

Question	Answer options	Score
1. When do you wash your hands? <i>(Please tick <u>all</u> that apply)</i>	<input type="checkbox"/> Before food preparation <input type="checkbox"/> Before eating <input type="checkbox"/> Before feeding the child	

	<input type="checkbox"/> None of the above	
2. Do you always use soap when you wash your hands?	<input type="checkbox"/> Yes <input type="checkbox"/> No	
3. If not, on what occasions do you use soap to wash your hands?	<input type="checkbox"/> Before food preparation <input type="checkbox"/> Before eating <input type="checkbox"/> Before feeding the child <input type="checkbox"/> None of the above	

HFIAS Scale

READ: Below are some questions about your household. Please tick (✓) which best describes how you felt DURING THE PAST FOUR WEEKS. Choose only one answer.

Nr	Question	Answer options	Code
1.	In the past four weeks, did you worry that your household would not have enough food?	<input type="checkbox"/> No (skip to nr 2) <input type="checkbox"/> Yes (complete nr 1.a)	... __
1.a	How often did this happen?	<input type="checkbox"/> Rarely (once or twice in the past four weeks) <input type="checkbox"/> Sometimes (three to ten times in the past four weeks) <input type="checkbox"/> Often (more than ten times in the past four weeks)	... __
2.	In the past four weeks, were you or any household member not able to eat the kinds of foods you	<input type="checkbox"/> No (skip to nr 3) <input type="checkbox"/> Yes (complete nr 2.a)	... __

	preferred because of a lack of resources?		
2.a	How often did this happen?	<input type="checkbox"/> Rarely (once or twice in the past four weeks) <input type="checkbox"/> Sometimes (three to ten times in the past four weeks) <input type="checkbox"/> Often (more than ten times in the past four weeks)	... __
3.	In the past four weeks, did you or any household member have to eat a limited variety of foods due to a lack of resources?	<input type="checkbox"/> No (skip to nr 4) <input type="checkbox"/> Yes (complete nr 3.a)	... __
3.a	How often did this happen?	<input type="checkbox"/> Rarely (once or twice in the past four weeks) <input type="checkbox"/> Sometimes (three to ten times in the past four weeks) <input type="checkbox"/> Often (more than ten times in the past four weeks)	... __
4.	In the past four weeks, did you or any household member have to eat some foods that you really did not want to eat because of a lack of resources to obtain other types of food?	<input type="checkbox"/> No (skip to nr 5) <input type="checkbox"/> Yes (complete nr 4.a)	... __
4.a	How often did this happen?	<input type="checkbox"/> Rarely (once or twice in the past four weeks) <input type="checkbox"/> Sometimes (three to ten times in the past four weeks) <input type="checkbox"/> Often (more than ten times in the past four weeks)	... __

5.	In the past four weeks, did you or any household member have to eat a smaller meal than you felt you needed because there was not enough food?	<input type="checkbox"/> No (skip to nr 6) <input type="checkbox"/> Yes (complete nr 5.a) __
5.a	How often did this happen?	<input type="checkbox"/> Rarely (once or twice in the past four weeks) <input type="checkbox"/> Sometimes (three to ten times in the past four weeks) <input type="checkbox"/> Often (more than ten times in the past four weeks) __
6.	In the past four weeks, did you or any other household member have to eat fewer meals in a day because there was not enough food?	<input type="checkbox"/> No (skip to nr 7) <input type="checkbox"/> Yes (complete nr 6.a) __
6.a	How often did this happen?	<input type="checkbox"/> Rarely (once or twice in the past four weeks) <input type="checkbox"/> Sometimes (three to ten times in the past four weeks) <input type="checkbox"/> Often (more than ten times in the past four weeks) __
7.	In the past four weeks, was there ever no food to eat of any kind in your household because of lack of resources to get food?	<input type="checkbox"/> No (skip to nr 8) <input type="checkbox"/> Yes (complete nr 7.a) __
7.a	How often did this happen?	<input type="checkbox"/> Rarely (once or twice in the past four weeks) <input type="checkbox"/> Sometimes (three to ten times in the past four weeks) <input type="checkbox"/> Often (more than ten times in the past four weeks) __
8.	In the past four weeks, did you or any household member go to	<input type="checkbox"/> No (skip to nr 9) __

	sleep at night hungry because there was not enough food?	<input type="checkbox"/> Yes (complete nr 8.a)	
8.a	How often did this happen?	<input type="checkbox"/> Rarely (once or twice in the past four weeks) <input type="checkbox"/> Sometimes (three to ten times in the past four weeks) <input type="checkbox"/> Often (more than ten times in the past four weeks)	... _ _
9.	In the past four weeks, did you or any household member go a whole day and night without eating anything because there was not enough food?	<input type="checkbox"/> No (questionnaire is finished) <input type="checkbox"/> Yes (complete nr 9.a)	... _ _
9.a	How often did this happen?	<input type="checkbox"/> Rarely (once or twice in the past four weeks) <input type="checkbox"/> Sometimes (three to ten times in the past four weeks) <input type="checkbox"/> Often (more than ten times in the past four weeks)	... _ _

LMUP Questionnaire

CIRCUMSTANCES OF PREGNANCY

READ: These questions are confidential, so please answer all questions honestly. Below are some questions that ask about your circumstances and feelings around the time you became pregnant with the child that was selected to take part in this research with you. Please think of that pregnancy when answering the questions below.

(Please tick (✓) the statement which most applies to you):

Question	Answer options	Score
1. In the month that I became pregnant.....	<input type="checkbox"/> I/we were not using contraception <input type="checkbox"/> I/we were using contraception, but not on every occasion <input type="checkbox"/> I/we always used contraception, but knew that the method had failed (i.e.	2 1 1

	broke, moved, came off, came out, not worked etc.) at least once <input type="checkbox"/> I/we always used contraception	0
2. In terms of becoming a mother (<i>first time or again</i>), I feel that my pregnancy happened at the.....	<input type="checkbox"/> right time <input type="checkbox"/> ok, but not quite right time <input type="checkbox"/> wrong time	2 1 0
3. Just before I became pregnant.....	<input type="checkbox"/> I intended to get pregnant <input type="checkbox"/> my intentions kept changing <input type="checkbox"/> I did not intend to get pregnant	2 1 0
4. Just before I became pregnant....	<input type="checkbox"/> I wanted to have a baby <input type="checkbox"/> I had mixed feelings about having a baby <input type="checkbox"/> did not want to have a baby	2 1 0
<i>In the next question, we ask about the child's father - this might be (or have been) your husband, a partner you live with, a boyfriend, or someone you've had sex with once or twice.</i> 5. Before I became pregnant....	<input type="checkbox"/> My partner and I had agreed that we would like me to be pregnant <input type="checkbox"/> My partner and I had discussed having children together, but hadn't agreed for me to get pregnant <input type="checkbox"/> We never discussed having children together	2 1 0
6. Before you became pregnant, did you do anything to improve your health in preparation for pregnancy? (Please tick <u>all</u> that apply)	<input type="checkbox"/> took folic acid <input type="checkbox"/> stopped or cut down smoking <input type="checkbox"/> stopped or cut down drinking alcohol <input type="checkbox"/> ate more healthily <input type="checkbox"/> sought medical/health advice	2 = 2 or more action s

	<input type="checkbox"/> took some other action, please describe <hr/>	1 = 1 action
	<input type="checkbox"/> I did not do any of the above before my pregnancy	0

CES-D Scale

READ: Please tick (✓) which best describes how often you felt or behaved this way DURING THE PAST WEEK. Choose only one answer.

Question	Answer options	Score
1. I was bothered by things that usually don't bother me.	<input type="checkbox"/> Rarely or none of the time (less than 1 day) <input type="checkbox"/> Some or a little of the time (1-2 days) <input type="checkbox"/> Occasionally or a moderate amount of time (3-4 days) <input type="checkbox"/> Most or all of the time (5-7 days)	0 1 2 3
2. I did not feel like eating; my appetite was poor.	<input type="checkbox"/> Rarely or none of the time (less than 1 day) <input type="checkbox"/> Some or a little of the time (1-2 days) <input type="checkbox"/> Occasionally or a moderate amount of time (3-4 days) <input type="checkbox"/> Most or all of the time (5-7 days)	0 1 2 3
3. I felt that I could not shake off the blues even with help from my family or friends.	<input type="checkbox"/> Rarely or none of the time (less than 1 day) <input type="checkbox"/> Some or a little of the time (1-2 days)	0 1

	<input type="checkbox"/> Occasionally or a moderate amount of time (3-4 days) <input type="checkbox"/> Most or all of the time (5-7 days)	2 3
4. I felt that I was just as good as other people.	<input type="checkbox"/> Rarely or none of the time (less than 1 day) <input type="checkbox"/> Some or a little of the time (1-2 days) <input type="checkbox"/> Occasionally or a moderate amount of time (3-4 days) <input type="checkbox"/> Most or all of the time (5-7 days)	0 1 2 3
5. I had trouble keeping my mind on what I was doing.	<input type="checkbox"/> Rarely or none of the time (less than 1 day) <input type="checkbox"/> Some or a little of the time (1-2 days) <input type="checkbox"/> Occasionally or a moderate amount of time (3-4 days) <input type="checkbox"/> Most or all of the time (5-7 days)	0 1 2 3
6. I felt depressed.	<input type="checkbox"/> Rarely or none of the time (less than 1 day) <input type="checkbox"/> Some or a little of the time (1-2 days) <input type="checkbox"/> Occasionally or a moderate amount of time (3-4 days) <input type="checkbox"/> Most or all of the time (5-7 days)	0 1 2 3
7. I felt that everything that I did was an effort.	<input type="checkbox"/> Rarely or none of the time (less than 1 day)	0

	<input type="checkbox"/> Some or a little of the time (1-2 days) <input type="checkbox"/> Occasionally or a moderate amount of time (3-4 days) <input type="checkbox"/> Most or all of the time (5-7 days)	1 2 3
8. I felt hopeful about the future.	<input type="checkbox"/> Rarely or none of the time (less than 1 day) <input type="checkbox"/> Some or a little of the time (1-2 days) <input type="checkbox"/> Occasionally or a moderate amount of time (3-4 days) <input type="checkbox"/> Most or all of the time (5-7 days)	0 1 2 3
9. I thought my life had been a failure.	<input type="checkbox"/> Rarely or none of the time (less than 1 day) <input type="checkbox"/> Some or a little of the time (1-2 days) <input type="checkbox"/> Occasionally or a moderate amount of time (3-4 days) <input type="checkbox"/> Most or all of the time (5-7 days)	0 1 2 3
10. I felt fearful.	<input type="checkbox"/> Rarely or none of the time (less than 1 day) <input type="checkbox"/> Some or a little of the time (1-2 days) <input type="checkbox"/> Occasionally or a moderate amount of time (3-4 days) <input type="checkbox"/> Most or all of the time (5-7 days)	0 1 2 3

11. My sleep was restless.	<input type="checkbox"/> Rarely or none of the time (less than 1 day) <input type="checkbox"/> Some or a little of the time (1-2 days) <input type="checkbox"/> Occasionally or a moderate amount of time (3-4 days) <input type="checkbox"/> Most or all of the time (5-7 days)	0 1 2 3
12. I was happy.	<input type="checkbox"/> Rarely or none of the time (less than 1 day) <input type="checkbox"/> Some or a little of the time (1-2 days) <input type="checkbox"/> Occasionally or a moderate amount of time (3-4 days) <input type="checkbox"/> Most or all of the time (5-7 days)	0 1 2 3
13. I talked less than usual.	<input type="checkbox"/> Rarely or none of the time (less than 1 day) <input type="checkbox"/> Some or a little of the time (1-2 days) <input type="checkbox"/> Occasionally or a moderate amount of time (3-4 days) <input type="checkbox"/> Most or all of the time (5-7 days)	0 1 2 3
14. I felt lonely.	<input type="checkbox"/> Rarely or none of the time (less than 1 day) <input type="checkbox"/> Some or a little of the time (1-2 days) <input type="checkbox"/> Occasionally or a moderate amount of time (3-4 days)	0 1 2

	<input type="checkbox"/> Most or all of the time (5-7 days)	3
15. People were unfriendly.	<input type="checkbox"/> Rarely or none of the time (less than 1 day) <input type="checkbox"/> Some or a little of the time (1-2 days) <input type="checkbox"/> Occasionally or a moderate amount of time (3-4 days) <input type="checkbox"/> Most or all of the time (5-7 days)	0 1 2 3
16. I enjoyed life.	<input type="checkbox"/> Rarely or none of the time (less than 1 day) <input type="checkbox"/> Some or a little of the time (1-2 days) <input type="checkbox"/> Occasionally or a moderate amount of time (3-4 days) <input type="checkbox"/> Most or all of the time (5-7 days)	0 1 2 3
17. I had crying spells.	<input type="checkbox"/> Rarely or none of the time (less than 1 day) <input type="checkbox"/> Some or a little of the time (1-2 days) <input type="checkbox"/> Occasionally or a moderate amount of time (3-4 days) <input type="checkbox"/> Most or all of the time (5-7 days)	0 1 2 3
18. I was sad.	<input type="checkbox"/> Rarely or none of the time (less than 1 day) <input type="checkbox"/> Some or a little of the time (1-2 days)	0 1

	<input type="checkbox"/> Occasionally or a moderate amount of time (3-4 days) <input type="checkbox"/> Most or all of the time (5-7 days)	2 3
19. I felt that people disliked me.	<input type="checkbox"/> Rarely or none of the time (less than 1 day) <input type="checkbox"/> Some or a little of the time (1-2 days) <input type="checkbox"/> Occasionally or a moderate amount of time (3-4 days) <input type="checkbox"/> Most or all of the time (5-7 days)	0 1 2 3
20. I could not get going.	<input type="checkbox"/> Rarely or none of the time (less than 1 day) <input type="checkbox"/> Some or a little of the time (1-2 days) <input type="checkbox"/> Occasionally or a moderate amount of time (3-4 days) <input type="checkbox"/> Most or all of the time (5-7 days)	0 1 2 3

Smoking history & Alcohol and Drug screening

SECTION A: READ: Please answer the following questions about when you were pregnant with the child that is taking part in this research with you.

Question	Answer options	Score
A1. How many cigarettes did you smoke when you were pregnant with this child? (Choose one)	<input type="checkbox"/> None <input type="checkbox"/> 1 to 4 cigarettes per day <input type="checkbox"/> 5-14 cigarettes per day <input type="checkbox"/> 15 or more cigarettes a day	
A2. How often did you drink alcohol when you were pregnant with this child? (Choose one)	<input type="checkbox"/> Never <input type="checkbox"/> Monthly or less	

	<input type="checkbox"/> 2-4 times a month <input type="checkbox"/> 2-3 times a week <input type="checkbox"/> More than 4 times a week	
A3. How often did you use drugs when you were pregnant with this child? (Choose one)	<input type="checkbox"/> Never <input type="checkbox"/> A few times <input type="checkbox"/> Weekly <input type="checkbox"/> Daily <input type="checkbox"/> Refuse to answer	

SECTION B: READ: Please answer the following questions about your smoking of cigarettes now.

Question	Answer options	Score
B1. How many cigarettes do you smoke now per day? (Choose one)	<input type="checkbox"/> None <input type="checkbox"/> 1 to 4 cigarettes per day <input type="checkbox"/> 5-14 cigarettes per day <input type="checkbox"/> 15 or more cigarettes a day	

SECTION C: READ: Please answer the following questions about your use of alcohol now

Question	Answer options	Score
C1. How often do you have a drink containing alcohol? (Choose one)	<input type="checkbox"/> Never <input type="checkbox"/> Monthly or less <input type="checkbox"/> 2-4 times a month <input type="checkbox"/> 2-3 times a week	1 2 3 4

	<input type="checkbox"/> More than 4 times a week	5
If answer if “never”, please move to question nr.C9		
C2. How many drinks containing alcohol do you have on a typical day when you are drinking? (Choose one)	<input type="checkbox"/> I don't drink	1
	<input type="checkbox"/> 1-2 drink(s) per day	2
	<input type="checkbox"/> 3-4 drinks per day	3
	<input type="checkbox"/> 5-6 drinks per day	4
	<input type="checkbox"/> 7-9 drinks per day	5
	<input type="checkbox"/> 10 or more drinks per day	6
C3. How often do you have six or more drinks on one occasion? (Choose one)	<input type="checkbox"/> Never	1
	<input type="checkbox"/> Less than monthly	2
	<input type="checkbox"/> Monthly	3
	<input type="checkbox"/> Weekly	4
	<input type="checkbox"/> Daily or almost daily	5
C4. What type of alcohol do you usually drink? You can choose more than one: (Check all that apply)	<input type="checkbox"/> Spirits	
	<input type="checkbox"/> Beer	
	<input type="checkbox"/> Wine	
	<input type="checkbox"/> Local brew	
C5. Have you ever felt that you should cut down on your drinking?	<input type="checkbox"/> Yes	1
	<input type="checkbox"/> No	0
C6. Have people annoyed you by criticizing your drinking?	<input type="checkbox"/> Yes	1

	<input type="checkbox"/> No	0
C7. Have you ever felt bad or guilty about your drinking?	<input type="checkbox"/> Yes	1
	<input type="checkbox"/> No	0
C8. Have you had a drink first thing in the morning to steady your nerves or get rid of a hangover?	<input type="checkbox"/> Yes	1
	<input type="checkbox"/> No	0
C9. Please indicate how often you have used the following drugs in the past six months:		
C9a. Marijuana (weed/dagga)	<input type="checkbox"/> Never	1
(Choose one)	<input type="checkbox"/> A few times	2
	<input type="checkbox"/> Weekly	3
	<input type="checkbox"/> Daily	4
	<input type="checkbox"/> Refuse to answer	8
C9b. Tik	<input type="checkbox"/> Never	1
(Choose one)	<input type="checkbox"/> A few times	2
	<input type="checkbox"/> Weekly	3
	<input type="checkbox"/> Daily	4
	<input type="checkbox"/> Refuse to answer	8

PTSD Checklist (PCL-C)

READ: Below is a list of problems and complaints that people sometimes have in response to stressful life experiences. Please read each one carefully, please tick (√) to indicate how much you have been bothered by that problem IN THE PAST MONTH.

Question	Answer options	Score
1. Repeated, disturbing memories, thoughts, or images of a stressful experience from the past?	<input type="checkbox"/> Not at all <input type="checkbox"/> A little bit <input type="checkbox"/> Moderately <input type="checkbox"/> Quite a bit <input type="checkbox"/> Extremely	1 2 3 4 5
2. Repeated, disturbing dreams of a stressful experience from the past?	<input type="checkbox"/> Not at all <input type="checkbox"/> A little bit <input type="checkbox"/> Moderately <input type="checkbox"/> Quite a bit <input type="checkbox"/> Extremely	1 2 3 4 5
3. Suddenly acting or feeling as if a stressful experience were happening again (as if you were reliving it)?	<input type="checkbox"/> Not at all <input type="checkbox"/> A little bit <input type="checkbox"/> Moderately <input type="checkbox"/> Quite a bit <input type="checkbox"/> Extremely	1 2 3 4 5

4. Feeling very upset when something reminded you of a stressful experience from the past?	<input type="checkbox"/> Not at all <input type="checkbox"/> A little bit <input type="checkbox"/> Moderately <input type="checkbox"/> Quite a bit <input type="checkbox"/> Extremely	1 2 3 4 5
5. Having physical reactions (e.g., heart pounding, trouble breathing, or sweating) when something reminded you of a stressful experience from the past?	<input type="checkbox"/> Not at all <input type="checkbox"/> A little bit <input type="checkbox"/> Moderately <input type="checkbox"/> Quite a bit <input type="checkbox"/> Extremely	1 2 3 4 5
6. Avoid thinking about or talking about a stressful experience from the past or avoid having feelings related to it?	<input type="checkbox"/> Not at all <input type="checkbox"/> A little bit <input type="checkbox"/> Moderately <input type="checkbox"/> Quite a bit <input type="checkbox"/> Extremely	1 2 3 4 5
7. Avoid activities or situations because they remind you of a stressful experience from the past?	<input type="checkbox"/> Not at all <input type="checkbox"/> A little bit <input type="checkbox"/> Moderately <input type="checkbox"/> Quite a bit <input type="checkbox"/> Extremely	1 2 3 4 5
8. Trouble remembering important parts of a stressful experience from the past?	<input type="checkbox"/> Not at all <input type="checkbox"/> A little bit	1 2

	<input type="checkbox"/> Moderately <input type="checkbox"/> Quite a bit <input type="checkbox"/> Extremely	3 4 5
9. Loss of interest in things that you used to enjoy?	<input type="checkbox"/> Not at all <input type="checkbox"/> A little bit <input type="checkbox"/> Moderately <input type="checkbox"/> Quite a bit <input type="checkbox"/> Extremely	1 2 3 4 5
10. Feeling distant or cut off from other people?	<input type="checkbox"/> Not at all <input type="checkbox"/> A little bit <input type="checkbox"/> Moderately <input type="checkbox"/> Quite a bit <input type="checkbox"/> Extremely	1 2 3 4 5
11. Feeling emotionally numb or being unable to have loving feelings for those close to you?	<input type="checkbox"/> Not at all <input type="checkbox"/> A little bit <input type="checkbox"/> Moderately <input type="checkbox"/> Quite a bit <input type="checkbox"/> Extremely	1 2 3 4 5
12. Feeling as if your future will somehow be cut short?	<input type="checkbox"/> Not at all <input type="checkbox"/> A little bit <input type="checkbox"/> Moderately <input type="checkbox"/> Quite a bit	1 2 3 4

	<input type="checkbox"/> Extremely	5
13. Trouble falling or staying asleep?	<input type="checkbox"/> Not at all	1
	<input type="checkbox"/> A little bit	2
	<input type="checkbox"/> Moderately	3
	<input type="checkbox"/> Quite a bit	4
	<input type="checkbox"/> Extremely	5
14. Feeling irritable or having angry outbursts?	<input type="checkbox"/> Not at all	1
	<input type="checkbox"/> A little bit	2
	<input type="checkbox"/> Moderately	3
	<input type="checkbox"/> Quite a bit	4
	<input type="checkbox"/> Extremely	5
15. Having difficulty concentrating?	<input type="checkbox"/> Not at all	1
	<input type="checkbox"/> A little bit	2
	<input type="checkbox"/> Moderately	3
	<input type="checkbox"/> Quite a bit	4
	<input type="checkbox"/> Extremely	5
16. Being "super alert" or watchful on guard?	<input type="checkbox"/> Not at all	1
	<input type="checkbox"/> A little bit	2
	<input type="checkbox"/> Moderately	3
	<input type="checkbox"/> Quite a bit	4
	<input type="checkbox"/> Extremely	5
17. Feeling jumpy or easily startled?	<input type="checkbox"/> Not at all	1

	<input type="checkbox"/> A little bit	2
	<input type="checkbox"/> Moderately	3
	<input type="checkbox"/> Quite a bit	4
	<input type="checkbox"/> Extremely	5

Addendum B: Informed Consent from Participant

PARTICIPANT INFORMATION LEAFLET AND CONSENT FORM

TITLE OF THE RESEARCH PROJECT:

Anthropometric status in children aged 6-36 months, born from intended and unintended pregnancies in disadvantaged communities from the Western Cape Province

REFERENCE NUMBER: S16/10/194

PRINCIPAL INVESTIGATOR: Adri Holm

ADDRESS: Be Part Yoluntu Centre, 4 Madikane street, Mbekweni

CONTACT NUMBER: Copyright

You are being invited to take part in a research project. Please take some time to read the information presented here, which will explain the details of this project. Please ask the study staff or investigator any questions about any part of this project that you do not fully understand. It is very important that you are fully satisfied that you clearly understand what this research entails and how you could be involved. Also, your participation is entirely voluntary and you are free to decline to participate. If you say no, this will not affect you negatively in any way whatsoever. You are also free to withdraw from the study at any point, even if you do agree to take part.

This study has been approved by the Health Research Ethics Committee at Stellenbosch University and will be conducted according to the ethical guidelines and principles of the international Declaration of Helsinki, South African Guidelines for Good Clinical Practice and the Medical Research Council (MRC) Ethical Guidelines for Research.

What is this research study all about?

This study will be conducted at Be Part Yoluntu Centre, Mbekweni and 240 mother-child units will be recruited.

The study aims to look at the link between the growth of a child and various factors that could influence this growth, for example socio-economic factors, intention of the pregnancy, receiving of a grant for the child and biological and mental factors of the mother.

First you will have to complete a form that ask you various questions about yourself, your child and your household. Some of the information may be sensitive, but if you agree to participate, it is important that you give the correct and true information. This form will be completed in privacy and none of the information will be shared with others. The form will also not have your name on it; only your participant number will be on the form. This will be done in order for the information to be kept confidential.

After you have completed the questionnaire, the research-assistant will weigh you and your child and take your child's height/length. This will be done on 1 day.

Why have you been invited to participate?

You have been invited to participate as you have a child that is aged between 6-36 months. Only mothers with a child between 6 to 36 months will be eligible to participate.

What will your responsibilities be?

You will be asked to answer all the questions on the form honestly and to assist the research-assistant when she is taking the weight and height of your child.

You will only have to visit the research site once, and will be asked to bring along your child's grandparent if you are below 18 years of age.

You will need to bring along your ID, as well as the Road-to-Health booklet, to the research site.

Will you benefit from taking part in this research?

As the research will investigate risk factors that could have an influence on the weight and height/length of your child, there is no direct benefit for your child, but you could be helping all children in the larger community by helping the researchers understand what factors contribute to malnutrition.

Are there any risks involved in your taking part in this research?

This research does not pose any significant risk to the participants. The only possible risk is where the mother herself is a minor and the nature of the self-administered questionnaire has some sensitive questions to complete. The completed questionnaires will however be kept confidential at all times and the participant's name will not be completed on the questionnaire. Subject identification numbers will be used at all times. All measurements and data collection will be done in a separate observation room and taken to ensure privacy.

If you do not agree to take part, what alternatives do you have?

You are under no obligation to take part in this study and you may visit your nearest clinic if you are worried about your child's height or weight.

Who will have access to your medical records?

All the information that is collected will be treated as confidential and will be protected. If it is used in a publication or thesis, the identity of the participant will remain anonymous, because participant identification numbers will be used and not names. Only the researcher will have access to the information.

Will you be paid to take part in this study and are there any costs involved?

No you will not be paid to take part in the study but your transport costs will be covered for the study visit. You will receive a re-imbusement of R30 for travel and an educational toy will be given to your child (that is participating in the research) while you are completing the questionnaire. The child can take the toy home with her/him. There will be no costs involved for you to take part in this study.

Is there anything else that you should know or do?

- You can contact Mrs Adri Holm at tel **Copyright** if you have any further queries or encounter any problems.
- You can contact the Health Research Ethics Committee at 021-938 9207 if you have any concerns or complaints that have not been adequately addressed by your study doctor.

- You will receive a copy of this information and consent form for your own records.

Declaration by participant

By signing below, I agree to take part in a research study entitled “Anthropometric status in children aged 6-36 months, born from intended and unintended pregnancies in disadvantaged communities from the Western Cape Province”

I declare that:

- I have read or had read to me this information and consent form and it is written in a language with which I am fluent and comfortable.
- I have had a chance to ask questions and all my questions have been adequately answered.
- I understand that taking part in this study is voluntary and I have not been pressurised to take part.
- I may choose to leave the study at any time and will not be penalised or prejudiced in any way.
- I may be asked to leave the study before it has finished, if the study doctor or researcher feels it is in my best interests, or if I do not follow the study plan, as agreed to.

Signed at Mbekweni on (date) 2017.

.....

.....

Signature of participant

Signature of witness

Declaration by investigator

I , Adri Holm declare that:

- I explained the information in this document to
- I encouraged her to ask questions and took adequate time to answer them.

- I am satisfied that she adequately understands all aspects of the research, as discussed above
- I did/did not (circle appropriate) use a interpreter. (If a interpreter is used then the interpreter must sign the declaration below.)

Signed at Mbekweni on (date) 2017.

.....

Signature of investigator

Signature of witness

Declaration by interpreter

I (name) declare that:

- I assisted the investigator, Adri Holm, to explain the information in this document to (name of participant) using the language medium of Afrikaans/Xhosa (circle appropriate).
- We encouraged her to ask questions and took adequate time to answer them.
- I conveyed a factually correct version of what was related to me.
- I am satisfied that the participant fully understands the content of this informed consent document and has had all her question satisfactorily answered.

Signed at Mbekweni on (date)2017.

.....

Signature of interpreter

Signature of witness

Addendum C: Informed Consent Form for Participant's Parent if Mother Is Younger Than 18 Years

PARTICIPANT INFORMATION LEAFLET AND CONSENT FORM

TITLE OF THE RESEARCH PROJECT:

Anthropometric status in children aged 6-36 months, born from intended and unintended pregnancies in disadvantaged communities from the Western Cape Province

REFERENCE NUMBER: S16/10/194

PRINCIPAL INVESTIGATOR: Adri Holm

ADDRESS: Be Part Yoluntu Centre, 4 Madikane street, Mbekweni

CONTACT NUMBER: Copyright

You are being invited to take part in a research project. Please take some time to read the information presented here, which will explain the details of this project. Please ask the study staff or investigator any questions about any part of this project that you do not fully understand. It is very important that you are fully satisfied that you clearly understand what this research entails and how you could be involved. Also, your participation is entirely voluntary and you are free to decline to participate. If you say no, this will not affect you negatively in any way whatsoever. You are also free to withdraw from the study at any point, even if you do agree to take part.

This study has been approved by the Health Research Ethics Committee at Stellenbosch University and will be conducted according to the ethical guidelines and principles of the international Declaration of Helsinki, South African Guidelines for Good Clinical Practice and the Medical Research Council (MRC) Ethical Guidelines for Research.

What is this research study all about?

This study will be conducted at Be Part Yoluntu Centre, Mbekweni and 240 mother-child units will be recruited.

The study aims to look at the link between the growth of a child and various factors that could influence this growth, for example socio-economic factors, intention of the pregnancy, receiving of a grant for the child and biological and mental factors of the mother.

Your daughter will have to complete a form that ask her various questions about herself, her child and her household. Some of the information may be sensitive, but if she agree to participate, it is important that she give the correct and true information. This form will be completed in privacy and none of the information will be shared with others. The form will also not have her name on it; only her participant number will be on the form. This will be done in order for the information to be kept confidential.

After your daughter have completed the questionnaire, the research-assistant will weigh her and her child and take her child's height/length. This will be done on 1 day.

Why have you been invited to participate?

You have been invited to participate as your daughter has a child that is aged 6-36 months. Only mothers with a child aged 6 to 36 months will be eligible to participate. Your daughter is younger than 18 years and therefor a parent of her needs to give permission for her to take part in the study. You have been invited in order to give this permission by signing this consent form, if you do agree that she can take part in the study.

What will your responsibilities be?

You will be asked to give written consent by signing this consent form, if you agree that your daughter may take part in this study. You will only have to visit the research site once and will be asked to bring along your ID to the research site.

Will you benefit from taking part in this research?

As the research will investigate risk factors that could have an influence on the weight and height/length of your grandchild, there is no direct benefit for your grandchild, but you could be helping all children in the larger community by helping the researchers understand what factors contribute to malnutrition.

Are there any risks involved in taking part in this research?

This research does not pose any significant risk to the participants. The only possible risk is where the mother herself is a minor and the nature of the self-administered questionnaire has some sensitive questions to complete. The completed questionnaires will however be kept confidential at all times and the participant's name will not be completed on the questionnaire. Subject identification numbers will be used at all times. All measurements and data collection will be done in a separate observation room and taken to ensure privacy.

If you do not agree to take part, what alternatives do you have?

You are under no obligation to take part in this study and you may visit your nearest clinic if you are worried about your grandchild's height or weight.

Who will have access to the medical records?

All the information that is collected will be treated as confidential and will be protected. If it is used in a publication or thesis, the identity of the participant will remain anonymous, because participant identification numbers will be used and not names. Only the researcher will have access to the information.

Will you be paid to take part in this study and are there any costs involved?

No you will not be paid to take part in the study but your transport costs will be covered for the study visit. You and your daughter will receive a total re-imbusement of R30 for travel and an educational toy will be given to your grandchild (that is participating in the research). The child can take the toy home with her/him. There will be no costs involved for you to take part in this study.

Is there anything else that you should know or do?

- You can contact Mrs Adri Holm at tel **Copyright** if you have any further queries or encounter any problems.
- You can contact the Health Research Ethics Committee at 021-938 9207 if you have any concerns or complaints that have not been adequately addressed by your study doctor.
- You will receive a copy of this information and consent form for your own records.

Declaration by participant's parent

By signing below, I agree that my daughter may take part in a research study entitled "Anthropometric status in children aged 6-36 months, born from intended and unintended pregnancies in disadvantaged communities from the Western Cape Province"

I declare that:

- I have read or had read to me this information and consent form and it is written in a language with which I am fluent and comfortable.
- I have had a chance to ask questions and all my questions have been adequately answered.
- I understand that taking part in this study is voluntary and I have not been pressurised to take part.
- I may choose to leave the study at any time and will not be penalised or prejudiced in any way.
- I may be asked to leave the study before it has finished, if the study doctor or researcher feels it is in my best interests, or if I do not follow the study plan, as agreed to.

Signed at Mbekweni on (date) 2017.

.....

.....

Signature of participant's parent

Signature of witness

Declaration by investigator

I, Adri Holm declare that:

- I explained the information in this document to.....
- I encouraged her to ask questions and took adequate time to answer them.
- I am satisfied that she adequately understands all aspects of the research, as discussed above

- I did/did not (circle appropriate) use a interpreter. (If a interpreter is used then the interpreter must sign the declaration below.)

Signed at Mbekweni on (date) 2017.

.....

Signature of investigator

Signature of witness

Declaration by interpreter

I (name) declare that:

- I assisted the investigator, Adri Holm, to explain the information in this document to (name of participant's parent) using the language medium of Afrikaans/Xhosa (circle appropriate).
- We encouraged her to ask questions and took adequate time to answer them.
- I conveyed a factually correct version of what was related to me.
- I am satisfied that the participant fully understands the content of this informed consent document and has had all her question satisfactorily answered.

Signed at Mbekweni on (date)2017.

.....

Signature of interpreter

Signature of witness