# Risk factors in the development of severe acute malnutrition in vulnerable children under five years of age living in Region B and surrounding referral areas of the City of Johannesburg, South Africa

by

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**DECLARATION**

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## ABSTRACT

**Background:** Malnutrition is still a serious problem, both globally and in South Africa, and has significant consequences for survival, disease prevalence, healthy development, and economic productivity.[1] It is important to have an understanding of the risks, causes, extent and distribution of diseases in order to work on strategies for improving a population's health.[2]

There have been several studies investigating the risk factors for malnutrition in young children. However, few looked specifically at risk factors associated with SAM[3,4,5] and few were conducted in South Africa. Risk factors for malnutrition vary in different settings and few epidemiological patterns are consistent globally.[6] Therefore, specific populations need to be identified that need context-specific approaches.[7]

**Objective:** To determine which risk factors are associated with the development of SAM in vulnerable children under five years of age who reside in region B and surrounding referral areas of the City of Johannesburg.

**Methods:** A descriptive, cross-sectional study with an analytical component and a quantitative approach was undertaken. Children under the age of five years who were admitted to Rahima Moosa Mother and Child Hospital were eligible for inclusion. Data was collected by performing anthropometrical measurements and collating data from a series of questionnaires that the participant's mother or caregiver answered. These questionnaires had sections pertaining to socioeconomic and demographic factors, family health and dynamics, nutritional history, food security, feeding habits, medical history and birth history.

**Results:** The study population consisted of 159 participants, comprising 53 children in each of the following groups: diagnosis of SAM, moderate malnutrition and a well-nourished control group. The disease-related factors associated with SAM Human were: Immunodeficiency Virus (HIV) infection [$n = 14$, 13.2% ($p < 0.01$)]; acute gastroenteritis [$n = 32$, 60.38%($p < 0.05$)]; diarrhoea in the past year [77.36%; $n = 41$ ($p < 0.05$)]; dehydration on admission [$n = 31$, 58.49% ($p < 0.01$)]; and previous malnutrition diagnosis [$n = 7$, 13.21% ($p < 0.05$)]. Dietary-related risk factors associated with SAM included the inappropriate choice of replacement feeds after early cessation of breastfeeding [$n = 6$, 20% ($p < 0.05$)]; and early and late

introduction of complementary foods [$n = 15$, 31.25% ($p < 0.01$) and $n = 8$, 16.67% ($p < 0.01$)]. Exclusive breastfeeding between four and six months was protective against SAM [$n = 14$, 30.43% ($p < 0.05$)].

Underlying causes of malnutrition that were associated with SAM were immunisations not being up-to-date [n=14, 26.42% ($p < 0.05$)]; Vitamin A doses missed [$n = 26$, 49.06%($p < 0.01$)]; no deworming in the past year [$n = 28$, 93.33% ($p < 0.05$)]; having more than three children in the house [$n = 10$; 18.87% ($p < 0.05$)]; and an age of 12–24 months [$n = 26$, 49.06% ($p < 0.01$)]. All these factors were associated with moderate malnutrition (but had a lower prevalence compared to the SAM group), except for: exclusive breastfeeding for less than four months or more than six months; inappropriate replacement feeds after early breastfeeding cessation; and immunisations, Vitamin A, and deworming schedules that were not up-to-date.

**Recommendations:** In order to be most effective, interventions need to occur in the first 1 000 days of life. These interventions include aspects relating to: 1) infant and young child feeding (including breastfeeding and complementary feeding guidelines); 2) promotion of healthy practices and the use of health services; 3) prevention and treatment of micronutrient deficiencies; 4) prevention and treatment of SAM; 5) promotion of good sanitation; and 6) maternal nutrition.

**OPSOMMING**

**Agtergrond**: Wanvoeding is nog steeds 'n ernstige probleem, beide Internasionaal en in Suid-Afrika en het beduidende gevolge vir oorlewing, die voorkoms van siektetoestande, gesonde ontwikkeling en ekonomiese produktiwiteit.[1] Dit is belangrik om die risiko's, oorsake, omvang en verspreiding van siektes te verstaan om sodoende aan strategieë te kan werk vir die verbetering van ‘n bevolking se gesondheid.[2]

Daar is verskeie studies wat die risikofaktore vir wanvoeding by jong kinders ondergesoek het en slegs ‘n paar van die studies het die risikofaktore wat verband hou met Ernstige Akute Wanvoeding (EAW) ondersoek[3,4,5] Weinige navorsing is in Suid-Afrika uitgevoer. Risikofaktore vir wanvoeding verskil in verskillende omgewings en daar is min epidemiologiese patrone wat wêreldwyd konstant is.[6] Vir die rede moet spesifieke bevolkings wat konteks-spesifieke benaderings benodig, geidentifiseer word.[7]

**Doel**: Om te bepaal watter risikofaktore verband hou met die ontwikkeling van EAW in kwesbare kinders jonger as vyf jaar oud wat in die stad Johannesburg woon.

**Metodes**: 'n Beskrywende, deursnit studie met ‘n analitiese komponent an kwantitatiewe benadering is onderneem. Kinders onder die ouderdom van vyf jaar wat in Rahima Moosa Mother and Child Hospital opgeneem is, is in aanmerking geneem vir insluiting. Data is ingesamel deur die uitvoering van antropometriese metings en deur die samevatting van 'n reeks vraelyste wat die deelnemer se moeder/versorger beantwoord het. Hierdie vraelyste het afdelings met betrekking tot sosio-ekonomiese en demografiese faktore, die familie se gesondheid en dinamika, voedings geskiedenis, voedselsekuriteit, eetgewoontes, mediese geskiedenis en geboorte geskiedenis.

**Resultate**: Die studie populasie het bestaan uit 159 deelnemers met 53 kinders in elk van die volgende groepe: 'n diagnose van EAW, matige wanvoeding en 'n goed gevoede kontrolegroep. Menslike Immuniteitsgebrekvirus (MIV) infeksie ($n = 14$, 13.2%, $p < 0.01$); akute gastro-enteritis [$n = 32$, 60.38% ($p < 0.05$)]; diarree in die afgelope jaar [$n = 41$, 77.36% ($p < 0.05$)]; dehidrasie met opname [$n = 31$,

58.49% ($p < 0{,}01$)]; en 'n vorige wanvoeding diagnose [$n = 7$, 13.21% ($p < 0.05$)] was die siekte-verwante faktore wat verband hou met EAW. Dieet-verwante risikofaktore wat verband hou met EAW het ingesluit: 'n onvanpaste keuse van 'n voeding ná vroeë beëindiging van borsvoeding [$n = 6$, 20% ($p < 0.05$)] asook vroeë en laat bekendstelling aanvullende voedsels [$n = 15$, 31.25% ($p < 0{,}01$), en $n = 8$, 16.67% ($p < 0.01$)] Eksklusiewe borsvoeding tussen vier en ses maande was beskermend teen EAW [$n = 14$, 30.43% ($p < 0.05$)]. Onderliggende oorsake van wanvoeding wat verband hou met SAM is immunisering wat nie op datum is nie [$n = 14$, 26.42% (p <0.05)]; onvoldoende Vitamien A dosisse [$n = 26$, 49.06% ($p < 0.01$)]; geen ontwurming in die laaste jaar [$n = 28$, 93.33% ($p < 0.05$)]; meer as drie kinders in die huis [$n = 10$; 18.87% ($p < 0.05$)]; en 'n ouderdom tussen 12 en 24 maande [$n = 26$, 49.06% ($p < 0.01$)]. Al hierdie faktore is ook geassosieer met matige wanvoeding (maar kom minder voor in vergelyking met die EAW groep), behalwe vir: eksklusiewe borsvoeding vir minder as vier maande of langer as ses maande; onvanpaste vervangingsvoeding ná vroeë staking van borsvoeding; en immuniserings-, vitamien A-, en ontwurming-skedules wat nie op datum was nie.

**Aanbevelings**: Vir intervensies om effektief te wees moet dit plaasvind in die eerste 1 000 dae van lewe. Hierdie intervensies sluit aspekte in wat verband hou met: 1) voeding van babas en jong kinders (insluitend borsvoeding en riglyne vir aanvullende voeding); 2) die bevordering van gesonde gewoontes en die gebruik van gesondheidsdienste; 3) die voorkoming en behandeling van tekorte aan mikronutriënte; 4) voorkoming en behandeling van EAW; 5) die bevordering van goeie sanitasie; 6) en die voeding van die moeder.

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## CONTRIBUTIONS

The principal researcher, Jessica Ferguson, developed the protocol. The principal researcher planned the study, undertook data collection, captured the data for analyses, analysed the data with the assistance of the bio-statistician (Maxwell Chirehwa), interpreted the data and drafted the thesis. Dr E Van Niekerk and Dr L Steenkamp (supervisors) provided input at all stages and revised the protocol and thesis.

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| | | |
|---|---|---|
| AGE | – | Acute gastroenteritis |
| ANC | – | Antenatal Care |
| BFHI | – | Baby-Friendly Hospital Initiative |
| BMI | – | Body mass index |
| ESPGHAN | – | The European Society for Paediatric Gastroenterology Hepatology and Nutrition |
| FBDG | – | Food Based Dietary Guidelines |
| FPL | – | Food Poverty Line |
| GHI | – | Global Hunger Index |
| GMP | – | Growth monitoring and promotion |
| HCT | – | HIV Counselling and Testing |
| HDDS | – | Household Dietary Diversity Score |
| HIV | – | Human immunodeficiency virus |
| IMCI | – | Integrated Management of Childhood Illness |
| INP | – | Integrated Nutrition Programme |
| IYCF | – | Infant and Young Child Feeding |
| MAM | – | Moderate acute malnutrition |
| MBFI | – | Mother-Baby-Friendly Initiative |
| MDG | – | Millennium Development Goal |
| MUAC | – | Mid-upper arm circumference |
| NFCS | – | National Food Consumption Survey |
| NFCS-FB-1 | – | National Food Consumption Survey Fortification Baseline |
| NFHS | – | National Family Health Survey |
| PMTCT | – | Prevention of Mother-to-Child Transmission |
| PEM | – | Protein Energy Malnutrition |
| RDP | – | Reconstruction and Development Programme |
| RTHB | – | Road to Health Booklet |
| SAM | – | Severe acute malnutrition |
| SANHANES | – | South African National Health and Examination Survey |

| | | |
|---|---|---|
| SAVACG | – | South African Vitamin A Consultative Group |
| SD | – | Standard deviation |
| SDG | – | Sustainable Development Goal |
| SSA | – | Sub-Saharan Africa |
| TB | – | Tuberculosis |
| UBPL | – | Upper-Bound Poverty Line |
| UNICEF | – | The United Nations Children's Fund |
| USAID | – | The United States Agency for International Development |
| UTD | – | Up-to-date |
| WHO | – | World Health Organization |

## LIST OF DEFINITIONS

| | |
|---|---|
| Malnutrition | Any deviation in growth or development[7] |
| Moderate malnutrition | One or more of the following parameters: < – 2 Standard deviation (SD): weight for age, length/height for age, and weight for length/height.[8,9,10,11,12,13,14] |
| Moderately stunted | A height/length for age less than –2 SD, but greater than –3 SD[15,16] |
| Moderately underweight | A weight for age less than –2 SD, but greater than –3 SD[15,16] |
| Moderately wasted | A weight for height/length less than –2 SD, but greater than –3 SD[15,16] |
| Severe acute malnutrition | One or more of the following parameters: < –3 SD weight for length/height, mid-upper arm circumference (MUAC) < 11.5 cm, and pitting bilateral oedema.[3,4,5] |
| Severe malnutrition | One or more of the following parameters: < –3SD: weight for age, length/height for age, and weight for length/height.[8,13,6] |
| Severely stunted | A height/length for age less than –3 SD[15,16] |
| Severely underweight | A weight for age less than –3 SD[15,16] |
| Severely wasted | A weight for height/length less than –3 SD[15,16] |
| Under five mortality rate | The risk of dying between birth and 5$^{th}$ birthday, per 1 000 live births[17] |

## BRIEF OUTLINE OF THE THESIS

This thesis is divided into the following chapters:

**Chapter one – Literature review:** This chapter puts the problem of malnutrition into perspective by looking at its prevalence both globally and locally. In order to understand the problem of malnutrition, and why it needs to be addressed, the short and long-term consequences of malnutrition are discussed. The conceptual framework of malnutrition is explored, identifying the immediate, underlying and basic causes of malnutrition, as defined by the United Nations Children's Fund (UNICEF). This is followed by an in-depth look at various studies that have been conducted in determining the factors associated with malnutrition. Finally, a description is given of the current interventions and programmes in South Africa that aim to address malnutrition.

**Chapter two – Methodology:** This chapter starts by outlining the aims and objectives of the study. Details regarding the study plan, the study population and the methods of sample selection are described. This is followed by a detailed description of methods of data collection, including those relating to anthropometric measurements and the measuring tools (questionnaires).

**Chapter three – Results and discussion:** This chapter starts with a description of the study sample. It looks at the factors that were found to be associated with malnutrition. The results are presented in the format of an article, titled: Risk factors associated with severe acute malnutrition in children under five years old residing in the City of Johannesburg. The article includes a brief literature review, a summary of the methodology and, finally, reports and discusses the significant results.

**Chapter four – Conclusions and recommendations**: This chapter gives a brief outline of the study and addresses the study objectives. General conclusions and recommendations are given, based on the results. Finally, any further research recommendations and limitations of the study are discussed.

# CHAPTER 1

# LITERATURE REVIEW

# 1. CHAPTER 1: LITERATURE REVIEW

## 1.1 Introduction

This review describes malnutrition from a global and national perspective, considering and comparing the prevalence of malnutrition. To further understand the importance of preventing malnutrition, the consequences of malnutrition are explored. Various anthropometric indices are used to define the different forms of malnutrition. The review expands on the conceptual framework of malnutrition, as developed by The United Nations Children's Fund (UNICEF). The different causes of malnutrition are used as an outline when summarising studies that describe the risk factors of malnutrition. Finally, the review reports on current South African interventions aimed at combatting malnutrition.

The fourth Millennium Development Goal (MDG) was to reduce the global under-five mortality rate by two-thirds between 1990 and 2015.[18] In 1990, the worldwide under-five mortality rate was 88 deaths per 1 000 live births.[17] By 2010, This figure had decreased to 57 deaths per 1 000 live births.[17] However, the under-five mortality rate in South Africa in 1990 and 2010 was 60 and 57 deaths per 1 000 live births respectively,[17] indicating that despite efforts, current strategies seem to be ineffective in significantly reducing the under-five mortality rate in South Africa.[19]

Excluding the neonatal period, more than one third of all deaths under five years of age can be attributed to underlying undernutrition.[19] This is more common in low-income countries because of the higher prevalence of malnutrition and infectious diseases.[20] All degrees of malnutrition raise the risk of mortality, but the more severe the degree of malnutrition, the greater the risk.[1] It is estimated that 7% of deaths in children under the age of five is due to severe acute malnutrition (SAM),[21] making it one of the top three causes of nutrition-related deaths in children in this age group.[7]

The MDGs were supposed to have been met by the end of 2015. However, when it became apparent that they were unlikely to be achieved, a new set of goals, the Sustainable Development Goals (SDGs), were developed to replace the MDGs.[22] The second SDG is to end hunger, achieve food security and improved nutrition, and

promote sustainable agriculture.[22] This goal's target is to end all forms of malnutrition by 2030,[22] which may have a significant effect on the under-five mortality rate.

Malnutrition is, therefore, a critical public health issue and the primary and secondary prevention of childhood malnutrition is vital.[23] Primary prevention includes interventions aimed at preventing malnutrition in well-nourished individuals (e.g. health education), whereas secondary prevention involves early diagnosis and treatment of individuals with malnutrition, preventing further progression and development of complications.[24]

Although it is important to address malnutrition in general, SAM results in a higher mortality rate, and therefore needs effective prevention and control if childhood mortality rates are to be reduced.[7] Most cases of SAM can be prevented by economic development and public health measures.[23] In order to develop and implement effective public health programmes, it is necessary to describe the nutritional status of vulnerable children, investigate causes of malnutrition and determine risk factors relevant to the particular population.[23]

## 1.2 Prevalence of malnutrition

### 1.2.1 Global perspective

In 2015, a joint dataset was released by UNICEF, the World Health Organisation (WHO) and World Bank Group, which contains global and regional child malnutrition indicators from 1990 to 2014.[25] Globally, the prevalence of stunting was 39.6% in 1990, and 23.8% in 2014, with the numbers of affected children decreasing from 254.5 million to 158.6 million. Although there is a decline, it is not decreasing quickly enough.[25] More than half of the world's stunted children live in Asia, and more than one-third live in Africa.[25] There has been slow progress in sub-Saharan Africa (SSA) in addressing the prevalence of stunting, with reported rates of 48.9% and 35.7% in 1990 and 2014 respectively.[25] However, even though the prevalence has decreased, the total number of stunted children has increased in SSA from 44.8 million in 1990 to 57.2 million in 2014.[26]

The global prevalence of underweight was 25% in 1990 and 14.3% in 2014 (160.5 million and 95.5 million children affected respectively).[26] SSA's underweight prevalence was 30% in 1990 and 19.6% in 2014. Although the prevalence of

underweight has decreased, as with stunting, the overall number of underweight children has increased from 27.5 million to 31.4 million.[26]

There were an estimated 50 million wasted children (approximately one in every 13 children) in 2014, with a wasting rate of 7.5%.[25] Nearly one-third of the children (16 million) were severely wasted, resulting in a global prevalence of 2.4%.[25] A prevalence of less than 5% of wasted children under five years old in a region is considered acceptable, whereas 5% to <10% is considered poor, 10% to <15% is serious, and ≥15% is critical.[25] Anything ≥10% falls above the public health emergency line for wasting.[25] The sub-region of Southern Asia, with the highest prevalence of 14.2%, is above this line.

All sub-regions in Africa fall in the poor category, with western Africa having the highest prevalence (9%), which is very close to the public health emergency line.[25] Southern Africa has a 5.4% prevalence, which is classified as poor.[25]

In 2014, SSA had an 8.3% prevalence of wasting, and a 2.7% prevalence of severe wasting.[26] Both figures are above the global prevalence of wasting and severe wasting. Although this prevalence had decreased since 1990, the rapid population growth has meant that the number of wasted children in this region has increased.[27]

### 1.2.2 South African perspective

#### 1.2.2.1 Nutritional status of South African children

In 2010, South Africa had an under-five mortality rate of 57 per 1 000, which ranked South Africa as number 51 of 196 countries worldwide.[17] In terms of undernutrition rates, four important studies have been conducted in recent years looking at the nutritional status of South African children: the South African Vitamin A Consultative Group (SAVACG) (1994),[28] the National Food Consumption Survey (NFCS) of 1999,[29] the National Food Consumption Survey Fortification Baseline (NFCS-FB-1) (2005),[30] and the South African National Health and Examination Survey (SANHANES) (2012).[31] The table below shows the results of these studies regarding prevalence of underweight, stunting, wasting and severe wasting. Although the SANHANES was conducted on children aged 0–14 years, it also reported the data separately for children under five years of age.[31]

Table 1.1**: Malnutrition rates in South Africa, according to various nationwide studies**

| STUDY | Year | $n$ | Age of participants | % Underweight | % Stunted | % Wasted | % Severely wasted |
|---|---|---|---|---|---|---|---|
| **SAVACG**[28] | 1994 | 11 430 | 6–71 months | 9.3 | 23 | 2.6 | 0.4 |
| **NFCS**[29] | 1999 | 2 894 | 1–9 years | 10.3 | 21.6 | 3.7 | 0.8 |
| **NFCS-FB-1**[30] | 2005 | 2 413 | 1–9 years | 10 | 20 | - | - |
| **SANHANES**[31] | 2012 | 4 583 | 0–14 years | 5.8 | 15.4 | 2.9 | 0.8 |
| **SANHANES**[31] | 2012 | 1 756 | <5 years | 5.5 | 21.6 | 2.5 | - |

SAVACG: South African National Health and Examination Survey; NFCS: National Food Consumption Survey; NFCS-FB-1: National Food Consumption Survey Fortification Baseline; SANHANES: South African National Health and Examination Survey

Two of the aforementioned studies (NFCS and NFCS-FB-1) were done six years apart with an identical study population age group, namely 1–9 years old. Results show similar rates of underweight and stunting.[29,30] When comparing the SAVACG and SANHANES (for children <5 years of age) data, it seems that although the prevalence of underweight has improved (9.3% vs. 5.5%), the rates of stunting and wasting have not decreased sufficiently (23% vs. 21.6% and 2.6% vs. 2.5% respectively).[28,31] The prevalence of stunting should typically decrease along with the prevalence of underweight (since stunted children are normally also underweight), which is not evident here. If underweight prevalence decreases without stunting prevalence decreasing, there would likely be an increase in overweight, which is the case in South Africa (10.6% in 2005[30] vs. 18.1% in 2012[31]).

The SAVACG (1994) and the SANHANES-1 (2012) presented the prevalence of underweight, stunting, wasting and severe wasting per province (Table 1.2).[28,31]

Table 1.2 **: Prevalence of malnutrition per province**

| Province | % Underweight | | % Stunting | | % Wasting | | % Severe wasting | |
|---|---|---|---|---|---|---|---|---|
| | 1994 | 2012 | 1994 | 2012 | 1994 | 2012 | 1994 | 2012 |
| **Northern Cape** | 15.6 | 17.0 | 22.8 | 18.7 | 2.5 | 11.5 | 0.1 | 7.4 |
| **Western Cape** | 7.0 | 5.9 | 11.6 | 15.75 | 1.3 | 1.7 | 0.0 | 0.34 |
| **Eastern Cape** | 11.4 | 3.8 | 28.8 | 18.6 | 3.2 | 2.4 | 0.6 | 0.65 |
| **KwaZulu-Natal** | 4.2 | 2.4 | 15.6 | 14.0 | 0.7 | 1.2 | 0.1 | 0.05 |
| **Mpumalanga** | 7.3 | 7.0 | 20.4 | 18.0 | 1.7 | 2.3 | 0.4 | 0.51 |
| **Limpopo** | 12.6 | 5.7 | 34.2 | 11.5 | 3.8 | 4.6 | 0.5 | 0.61 |
| **Gauteng** | 5.6 | 5.0 | 11.5 | 11.0 | 1.2 | 2.0 | 0.0 | 0.0 |
| **North West** | 13.2 | 11.5 | 24.7 | 20.7 | 4.5 | 6.8 | 0.6 | 1.65 |
| **Free State** | 13.6 | 4.6 | 28.7 | 20.8 | 4.5 | 1.6 | 0.8 | 0.25 |

The Northern Cape had the highest prevalence of underweight children in both 1994 and 2012 (15.6% and 17% respectively).[28,31] The prevalence of wasting (2.5% to 11.5%) and severe wasting (0.1% to 7.4%) in the Northern Cape had increased dramatically from 1994 to 2012, making it the province with the highest prevalence of both wasting and severe wasting in 2012.[28,31]

In both 1994 and 2012, Gauteng's prevalence of underweight (5.6% and 5%), stunting (11.5% and 11%), wasting (1.2% and 2%) and severe wasting (<0.05% and <0.05%) were below the average national figures.[28,31] However, while relatively low, these figures had not improved from 1994 to 2012.

The Western Cape had the lowest prevalence of stunting in 1994 (11.6%); however, this increased to 15.8% in 2012.[28,31] The Eastern Cape had a fairly high prevalence of both underweight and stunting in 1994 (11.4% and 28.8% respectively), but this had decreased significantly to 3.8% and 18.6% respectively in 2012.[28,31] KwaZulu-Natal had the lowest prevalence of both underweight and wasting in 1994 and 2012.[28,31] From 1994 to 2012, the prevalence in the Free State of underweight

(13.6% and 4.6%), stunting (28.7% and 20.8%), wasting (4.5% and 1.6%) and severe wasting (0.8% and 0.25%) all decreased.[28,31] Limpopo had relatively high prevalence of both underweight (12.6%) and stunting (34.2%) in 1994. In fact, of all the provinces, in 1994 Limpopo had the highest stunting prevalence.[28,31] However, these figures decreased drastically from 1994 to 2012 (underweight: 12.6% to 5.7%; stunting: 34.2% to 11.5%).[28,31]

Three of the studies compared rural to urban dwelling (SAVACG, NFCS, SANHANES-1) and all found a higher prevalence of stunting, underweight and wasting in rural areas, compared to urban areas.[28,29,31] However, NFCS found that severe wasting was higher in an urban setting.[29]

This data reveals that malnutrition is still a major problem in South Africa. According to the SAVACG (for 6–71 months), in 1994 the prevalence of severe wasting (one of the criteria for SAM) was 0.4%, and according to the SANHANES (for 0–14 years), in 2012 prevalence was 0.8%.[28,31] These figures show an increase in SAM, but it is likely that these figures are understated, since they only used weight-for-length/height as a diagnostic criteria, and not mid-upper arm circumference (MUAC) of <11.5 cm or bilateral oedema.

The South African Medical Research Council developed a report on the trends and causes of under-five mortality in South Africa from 1997 to 2007.[32] It found that protein-energy malnutrition (PEM), the former term for SAM, caused 6–9.5% of deaths in children aged 1–4 years between 1997 and 2007, and 1.7% of deaths in infants between 1997 and 2005.[32]

#### 1.2.2.2 Food security and poverty in South Africa

The Global Hunger Index (GHI) rates the severity of hunger in South Africa as moderate (GHI of 5.8).[31] The NFCS of 1994 found that half of all households experienced hunger, while one in four were at risk of hunger and one in four were food-secure.[29] The more recent NFCS-FB-1 of 2005 found that half of all households experienced hunger, with one in three households being at risk of hunger and one in five being food-secure.[30] The SANHANES (2012) showed that these figures had improved slightly, and found that 26% experienced hunger, 28.3% were at risk of hunger and 45.6% were food-secure.[31] This study found that most of those experiencing hunger lived in urban informal and rural formal settings.[31]

In 2014, Statistics South Africa released a report on poverty trends in South Africa.[33] Two measures it reports on are the Food Poverty Line (FPL) and the Upper-Bound Poverty Line (UBPL). People below the FPL cannot purchase adequate food for a sufficient diet, and people below the UBPL cannot purchase adequate food and non-food items.[33] It reported that, in 2011, 45.5% of people (23 million) fell below the UBPL, and 20.2% (10.2 million) fell below the FPL.[33] When the level of poverty was compared across age groups, it was found that an alarming 55.7% of children were living below the poverty line.[33] A comparison of the different provinces revealed that although Gauteng had one of the lowest percentages of people living below the poverty line, its large population meant that it had one of the highest total number of people living under the poverty line.[33]

The poverty gap is another measure that looks at how far away from the poverty line households are, thus revealing the depth of poverty.[33] The poverty gap for UBPL and FPL in 2011 was 19.6% and 6.2% respectively.[33] The Statistics South Africa report also referred to the Gini coefficient, which measures the inequality in a country.[33] South Africa had a score of 0.69 based on income data, which is among the highest and therefore most unequal in the world.[33]

## 1.3 Consequences of malnutrition

It has already been stated that malnutrition, and especially SAM, has a detrimental effect on the under-five mortality rate of a population. However, there are many other short- and long-term consequences of malnutrition, ranging from biological factors, to social and environmental factors.[34] All these issues highlight the importance of identifying risk factors to help in the prevention of SAM.

### 1.3.1 Short-term consequences

A poor intake of macronutrients and certain micronutrients, such as zinc, selenium, iron and antioxidant vitamins, can result in an increased frequency of infections and a deficient immunity.[35] Therefore, concurrent infections such as acute respiratory infection, diarrhoea, and gram-negative septicaemia often complicate SAM cases.[23] Not only do the morbidity rates increase, but malnutrition also increases the severity and duration of concurrent infections,[36] as well as the risk of mortality from diarrhoea, pneumonia, measles and other infectious diseases.[36,1,37] Malnutrition can result from repeated infections, which worsens a child's nutritional status at a time when their

nutritional needs are greatest.[27] This relationship between malnutrition and infection causes a cycle of deteriorating nutritional status and progressive illness.[27] With respect to hospital patients, malnutrition has a negative effect on wound healing and length of hospital stay, thereby increasing the consumption of hospital resources.[35]

### 1.3.2 Long-term consequences of malnutrition

On an individual level, malnutrition has a serious effect on functions such as growth, body composition, muscle strength, intellectual and developmental ability, and quality of life.[35] Childhood malnutrition causes severe physical and cognitive damage, thus violating a child's human rights.[38] It has been estimated that more than 200 million children do not reach their potential cognitive ability due to poverty, poor health and nutrition, and poor child care.[39] The development of an individual's brain and nervous system begins in pregnancy and is mostly complete by the time the child is two years old.[27] Undernutrition during this critical period affects brain development in multiple ways and may have long-term effects.[27] Even though the effects on development are more prominent in early childhood, they continue throughout life.[1] The effects can be far-reaching and result in a decrease in learning capacity, and an increase in non-communicable diseases in adulthood.[1]

Malnutrition has long-term consequences on a population as a group. Decreased growth and development potential in a population can result in the decline of a population's biosocial development and mental and physical well-being,[38] which could greatly affect its earning potential, technical capacity and economic growth.[40,39,41] The effect of malnutrition on the intellectual and economic growth of a population is a vicious cycle because later generations may also experience the negative effects, since mothers with a lower education are more likely to have malnourished children.[39] Ultimately, malnutrition can trap children, families, communities and nations in a cycle of poor nutrition, illness, and poverty which spans across generations.[27] Therefore, the better the nutritional status of a population's children, the healthier and more productive its future generations.[41]

## 1.4 Diagnosis and classification of malnutrition

Malnutrition in childhood is assessed using anthropometrical measurements, biochemical markers and screening for clinical signs.[27] In the early stages of malnutrition, a child's body will respond to inadequate dietary intake with a slower

rate of growth.[42] Once malnutrition reaches a moderate stage, it will have an even greater effect on growth and on biochemical values.[42] Biochemical values that may be affected include haemoglobin, haematocrit, erythrocyte count, mean corpuscular volume, glucose levels, electrolytes and alkalinity, total protein, transferrin, albumin, creatinine, c-reactive protein, lymphocyte count and serology.[43]

Most often, it is only at a severe level of malnutrition that clinical signs become evident,[42] which can include oedema, hair and skin changes, and wasting.[43] While biochemical abnormalities and clinical signs are useful for more advanced forms of malnutrition, anthropometric measurements have the advantage of being sensitive to the early stages of malnutrition.[44]

Anthropometry is the most universally acceptable, inexpensive, and non-invasive method of assessing nutritional status.[45] Anthropometric measurements can indicate health status and nutritional adequacy, and can be used to track growth and development over time.[46] Weight and height are the most common measurements, while MUAC is another measurement used for its simplicity.[47]

As measurements alone are of limited value, anthropometric indices, which combine measurements or apply them together with the individual's age, should be used.[45] The most common indices used in children are weight-for-age, height-for-age, and weight-for-height[45] and all reflect a different combination of biological processes.[47] These indices are expressed as standard deviation (SD) scores and indicate the number of standard deviations away from the mean of the growth population.[45] The reference standards used at present, in accordance with the recommendation from the WHO, are based on the WHO Multicentre Growth Reference Study.[48] An abnormal index is more than two SDs above or below the mean.[47]

### 1.4.1 Weight-for-age

Weight-for-age reflects an individual's body mass in relation to their chronological age.[47] Low weight-for-age (underweight) indicates insufficient weight gain (or excess weight loss) relative to age.[45] Underweight is a complex indicator that has features of undernutrition and stunting.[27]

### 1.4.2 Height/length-for-age

Height-for-age reflects a child's linear growth.[45] Low height-for-age indicates stunting and insufficient linear growth relative to age.[45] Early chronic exposure to under-nutrition and its effects often last a lifetime.[47] Stunting has also been linked to low micronutrient intake from poor quality foods and low dietary diversity.[49]

### 1.4.3 Weight-for-height/length

Weight-for-height/length assesses a child's weight relative to height/length.[45] Low weight-for-height is an indication of wasting and insufficient weight gain (or excess weight loss) relative to height.[45] It often implies sudden or acute malnutrition.[47]

### 1.4.4 Mid-upper arm circumference

MUAC is another measurement that is favoured for its simplicity.[47] It can be used instead of weight and height as a screening tool for malnutrition when it is difficult to obtain the other measurements, such as in emergency situations.[45] MUAC remains constant from six months to five years and avoids the need to calculate age.[19] A fixed cut-off is used to diagnose malnutrition, where a figure of less than 12.5 cm is classified as moderate acute malnutrition (MAM), and a figure of less than 11.5 cm is classified as SAM.[19]

### 1.4.5 Severe acute malnutrition

SAM is defined as having one or more of the following parameters: $<-3\,SD$ weight for length/height, MUAC <11.5 cm, and pitting bilateral oedema.[3,4,5]

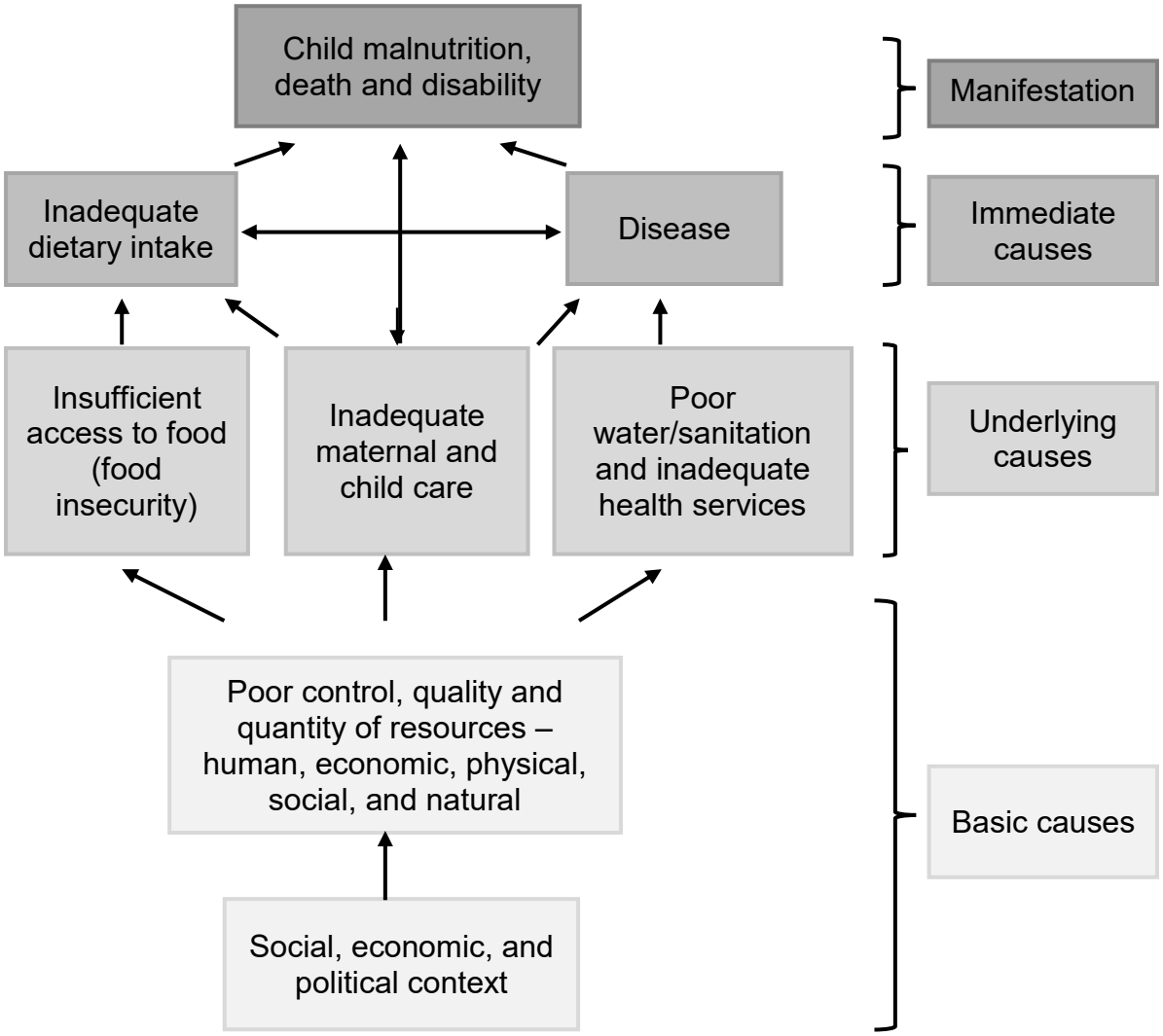
### 1.4.6 Moderate acute malnutrition

MAM is defined as having one or more of the following parameters: <–2 but >–3 SD weight for length/height, and MUAC <12.5 cm but >11.5 cm.[50] However, many studies define moderate forms of malnutrition as one of the following: <–2 SD but >–3 SD of either weight-for-age (underweight), height/length-for-age (stunting), or weight-for-height/length (wasting). For the purpose of this study and review, the terminology 'moderate malnutrition' will be used and will include MAM, as well as moderate stunting and underweight, and growth failure.

## 1.5 The conceptual framework of malnutrition

In 1990, UNICEF released a policy strategy for improving the nutritional status of mothers and children in the developing world.[51] As part of this policy, it developed a

conceptual framework of malnutrition outlining the various causes of malnutrition (Figure 1).[51] Although malnutrition is seen and diagnosed at an individual level, it is actually the result of a complex sequence of interlinked events.[51] The conceptual framework of malnutrition illustrates the complex nature of malnutrition by identifying basic, underlying and immediate causes.[51] These causes involve factors from a household to a national level.[51]



The immediate causes of malnutrition are inadequate dietary intake and disease.[51] An inadequate dietary intake may be a result of inappropriate infant feeding or complementary feeding practices,[52] and disease-related malnutrition may result from a nutrient imbalance from decreased nutrient intake, increased nutrient loss, altered use of nutrients or increased requirements.[35] These diet and disease-related causes often occur in combination.[51]

An important variable involved in dictating nutrient needs is the disease type and severity.[35] These immediate factors would lead to a deficiency of energy, protein and micronutrients, which negatively affect growth, development and other outcomes.[35] It is usually possible to identify the immediate cause/s of malnutrition in an individual and thereby treat the individual appropriately.[51] For example, the promotion of oral rehydration therapy and food supplementation can be used in a malnourished individual presenting with diarrhoeal disease and a poor nutritional intake.[51] However, simply treating the immediate causes is not a long-term solution and would likely need to be repeated in the future.[51] If long-term effects are to be established, the underlying and basic causes of malnutrition need to be analysed (i.e. the causes of disease and inadequate nutritional intake).[51]

Figure 1**: Conceptual framework analysing the causes of malnutrition (Adapted from UNICEF[51])**

The many different underlying causes are often interrelated.[51] For example, disease may occur as a result of poor sanitation and water supply, inadequate use of healthcare facilities e.g. not bringing the child for scheduled vaccinations, and poor child care. Poor nutritional intake may be a result of inadequate food security, or a mother having insufficient time to properly care for her child.[51] These underlying causes can be classified as: insufficient household food security, inadequate maternal and child care, poor basic health services and an unhealthy environment.[51]

All these underlying factors originate from a lack of resources (financial, human, physical, social, and natural), which ultimately stem from social, economic and political issues (basic causes).[53]

The conceptual framework looks at causes of malnutrition in general, but SAM has different causes and indicators than growth failure alone.[23] Looking at the pathophysiology, children presenting with SAM have unstable normal physiological processes as a result of reductive adaption. This occurs when the body adapts to try to survive on minimal energy. Reserves of carbohydrates, fat and protein are broken down, and certain physiological and metabolic processes are down-regulated. Growth is minimal, physical activity reduces and basal metabolic rate decreases.[19]

For proper screening, prevention and treatment of malnutrition to occur, it is necessary to distinguish between the different types of malnutrition, as this influences the strategies used in the management of malnutrition.[35] Once the various forms of malnutrition have been defined, the risk factors for the different types of malnutrition should be assessed to screen for all forms of malnutrition, giving priority to the more severe forms.

## 1.6 Factors associated with malnutrition

This section focuses on the causes of malnutrition and provides a summary of relevant studies that have identified risk factors associated with the different forms of malnutrition. The results of these studies have been divided into those associated with moderate malnutrition, and those associated with SAM. Most of these studies took place in developing countries in Africa or Asia.

### 1.6.1 Immediate causes

#### 1.6.1.1 Inadequate dietary intake

An inadequate diet is one of the immediate causes of malnutrition. When considering nutrition during infancy, it is evident that practices relating to breastfeeding, formula feeding and complementary feeding may affect the risk of developing SAM.

Delaying the initiation of breastfeeding to more than six hours after birth has been found to be a risk factor for moderate malnutrition, according to a study conducted in urban areas of India.[54] This same study found that not giving the infant colostrum after birth was identified as a risk factor for moderate malnutrition,[54] while another study conducted in North India identified this as a risk factor for SAM.[4] Colostrum is often replaced with prelacteals, which affects nutritional status. This was evident in the results of studies conducted in North India and Eastern Uganda, where it was reported that the use of prelacteals increased the risk of SAM[4] and moderate

malnutrition[55]. It would not only decrease the likelihood of the infant receiving colostrum, but would also mean that the infant is not receiving an adequate duration of exclusive breastfeeding, which plays a role in malnutrition risk.

Studies in Africa (Ethiopia,[3] Uganda[55] and Nigeria[56]) and Asia (India[4] and Vietnam[37]) found a link between nutritional status and infant feeding. A lack of exclusive breastfeeding (i.e. mixed feeding) for six months was shown to increase the risk of developing both SAM[3] and moderate malnutrition.[37] The risk of SAM was increased if a child was formula-fed (as opposed to breastfed) as an infant.[4,55] Similarly, the risk of moderate malnutrition was higher if formula was started before six months of age compared with after six months.[56]

The length of exclusive breastfeeding is an important factor, but duration of breastfeeding (not necessarily only exclusive breastfeeding) also affects the risk of malnutrition. A study conducted in Nigeria indicated that the risk of moderate malnutrition increased in children who were breastfed for less than six months.[40]By the same token, this risk would decrease with a longer duration of breastfeeding[57,58] (some studies specified 12–24 months[41,59,56]), as reported by a host of other African studies[40,41,56,57] (including a South African study)[58] and one study in Central America.[56] Results from a study performed in Limpopo, South Africa indicate that the duration of breastfeeding had an effect on the risk of developing SAM.[5] It was found that the risk of SAM was increased if breastfeeding was stopped before 12 months of age or abruptly for exceptional reasons,[5] such as the child's illness, the mother becoming pregnant, the mother becoming ill or dying or leaving, or the fear of human immunodeficiency virus (HIV) transmission.[5] Although it did not relate specifically to duration of breastfeeding, a study conducted in the Eastern Cape, South Africa, reported that if a child was not breastfed at the time of the interview, there was an increased risk of moderate malnutrition.[60]

Poor complementary feeding practices are associated with SAM in two studies conducted in Ethiopia[3] and North India.[4] Two other studies, also performed in Ethiopia[41] and India,[54] found that that poor complementary feeding practices are associated with moderate malnutrition.[54,41] There is an increased risk of SAM if complementary foods are started after 12 months of age[3] and if the incorrect consistency of foods is given.[4]

Poor quality and inadequate variety of diet are seen as risk factors for different forms of malnutrition. Giving the child diluted milk[13] (India) and a restricted intake of vegetables and meat (Ethiopia) are associated with moderate malnutrition.[14] A South African study conducted in Limpopo found that having to decrease the size of the child's meal or skipping a meal completely due to insufficient money is a risk factor for SAM.[5] It showed that consuming a balanced diet (containing vegetables, green leaves and fruit) decreases the risk of SAM.[5]

#### 1.6.1.2 Disease

The medical history and current disease status of children affect their risk of malnutrition. Factors relating to diarrhoea affect the risk of developing various forms of malnutrition. Studies conducted in India,[13] Vietnam,[61,37] Nigeria[57] and South Africa[60] found that a history of diarrhoea (in the past two weeks to a month) is associated with moderate malnutrition. A South African study of SAM risk factors found that a history of diarrhoea is associated with SAM, although this study looked at a longer history (the past 12 months).[5] It also identified a longer duration of diarrhoea as a risk factor for SAM.[5]

With regard to other illnesses, various studies in Africa (Uganda[34] and Nigeria[57]) and Asia (Indonesia[61]) established that a recent fever is a risk factor for moderate malnutrition, and a study in India found that acute respiratory infection in the past month[13] is also a risk factor for moderate malnutrition. In a South African study, exposure to Tuberculosis (TB) and previous hospitalization (unspecified), were found to be independent risk factors for SAM.[5]

### 1.6.2 Underlying causes of malnutrition

#### 1.6.2.1 Inadequate health services

Studies conducted in Uganda,[34] Nigeria[57] and North India[4] found that there is an association between the provision of various elements of basic healthcare and nutritional status. Incomplete immunisation is a risk factor for both moderate malnutrition and SAM,[4,57] while failing to deworm children 12 months and older increases the risk of moderate malnutrition.[34] Since immunisations and deworming schedules are often administered at clinics or healthcare facilities, it can be deduced that if these are incomplete, there was an element of poor healthcare, whether from

missing the required visits, or the inability of healthcare facilities to help or administer these items due to depleted supplies.

Poor healthcare services were evident in the results of a study of the knowledge and perceptions of nursing staff on the Road to Health Booklet (RTHB), conducted in the Tygerberg District, Western Cape.[62] Twelve knowledge-based questions were administered to the nursing staff, and a score of 75% was deemed sufficient knowledge.[62] However, the study showed that, with an average score of only 55%, most nursing staff did not have enough knowledge to use the booklet successfully.[62] Since the correct use of the booklet has the potential to decrease malnutrition in children, and is essential in growth monitoring and health promotion, these results are of great concern.[62]

#### 1.6.2.2 Poor living environment

Children residing in rural (compared to urban) communities have a higher risk of moderate malnutrition, according to studies in Ethiopia,[14] Vietnam,[37] India,[38] Yemen[63] and Central America.[59] The risk of moderate malnutrition was increased in those who lived in poor sanitary conditions, which included using unsanitary toilets.[14,8,34,41,58] As with rural living, this association occurred in studies across many countries in Africa[14,34,41] (including South Africa)[58] and Asia.[8] Studies conducted in Ethiopia and Tanzania found that an increased distance to a water source or unprotected water sources were risk factors for moderate malnutrition.[11,41]

#### 1.6.2.3 Inadequate maternal and child care

The health and dynamics of the family of the child affect the risk of malnutrition. Many studies found that in general, an undernourished mother is a risk factor for the development of moderate malnutrition in children.[14,12,6,38] These studies were conducted in countries in Africa (Nigeria[12] and Ethiopia[14]) and Asia (Bangladesh[6] and India[38]). Three African studies that looked specifically at height found that the risk of moderate malnutrition increases in shorter or stunted mothers.[12,64,65]

The health and disease status of the mother affects the child's risk of malnutrition. According to studies conducted in SSA[9] and South Africa,[5] a confirmed HIV-positive mother increases the risk of her child being moderately malnourished,[9] and if either parent is suspected of having HIV, the risk of SAM in the child increases.[5] The South African study reported that if the mother had an illness that forced her to stop

breastfeeding her child, the risk of SAM also increased.[5] The risk of SAM increased if the mother had lost another child,[5] and the risk of SAM[5] and moderate malnutrition[66] decreased if the mother was married. Both sides of the age spectrum of the mother or parents seem to affect the risk of developing moderate malnutrition, where a study in Bangladesh found that having a teenage mother[6] was a risk factor, and a study in Ethiopia found that increased parental age[14] was a risk factor.

#### 1.6.2.4 Inadequate household food security

Wealth and income are associated with various types of malnutrition. A low income was found to be a risk factor for SAM in a low-income country (Ethiopia)[3] and was also a risk factor for moderate malnutrition in low- and middle-income countries (Roma settlements in Serbia and Congo).[10,64] Conversely, an increased wealth index was shown to decrease the risk of SAM in a rural South African setting,[5] and decrease the risk of moderate malnutrition in rural South Africa, Nigeria and India.[38,57,60] It was found that receiving a child support grant decreased the risk of SAM.[5] However, a local study done in the Western Cape showed that recipients of child support grants were more likely to be stunted (moderate malnutrition) than those who were not receiving child support grants. In general, a lower socio-economic status was a risk factor for moderate malnutrition, according to a study conducted in Yemen.[63]

A Nigerian study found that when looking at the effect of income on food intake, the risk of moderate malnutrition increased if the mother or child ate less than desired due to limited finances,[40] and in households that were food insecure.[40]

#### 1.6.2.5 Other causes

There are other identified risk factors that are not strictly immediate or underlying causes of malnutrition, as defined by UNICEF. These factors may indirectly affect nutritional status by having an effect on an underlying cause.

Many studies throughout Africa[3,57,60,64,66] and Asia[4,38,63] have identified mothers with a lower literacy or education level as a risk factor for SAM[3,4] and moderate malnutrition.[38,66,64,63,57,60] The same applies to a father's literacy level, where poor paternal literacy was found to be a risk factor for both SAM[3] and moderate malnutrition.[12,6,61] In South Africa, having a father with at least 10 years of education was found to decrease the risk of SAM,[5] while in India, a father who is either

unemployed or who has a lower job category, such as a day-labourer, is a risk factor for moderate malnutrition.[13] Various African studies reported that having a mother who earns a salary protects against moderate malnutrition.[57,64,56] Factors relating to literacy and employment affect the underlying causes of malnutrition. For example, unemployment or a lower job category results in less income, giving rise to decreased food security (an underlying cause).

Asian studies found an association between a father who smokes and moderate malnutrition,[67,61] while a South African study found an association between a father who smokes marijuana and SAM.[5] These factors would likely decrease income available to purchase food, thus affecting food security. A deceased father or a father who has been in hospital in the past 12 months are also risk factors for SAM.[5]

Demographic factors have been shown to have an association with malnutrition. Gender and age both have conflicting results. Some studies (across Africa[14,41,44,60,66] and Asia[37,37]) found that boys were more likely to be moderately malnourished. Other studies (from Africa,[41] Central America[59] and Asia[38]) found that girls were more at risk of moderate malnutrition[38,59,41] Various studies from Asia and Africa found that a higher age may be a risk factor for becoming moderately malnourished.[61,41,63] An age of more than 11 months was associated with both moderate malnutrition[37,56] and SAM.[8] As a child gets older, there is an increased risk of infection, decreased breastfeeding and inadequate complementary foods, thereby affecting immediate causes of malnutrition.[68]

Looking at family structure, children with siblings are at a higher risk of becoming moderately malnourished (India),[13] and a higher birth order is a risk factor for both moderate malnutrition (India,[38] Nairobi[66] and Nigeria[57,12]) and SAM (South Africa).[5] Child spacing has a great effect on malnutrition risk, according to studies conducted in Ethiopia[14] and India[13], where it was found that having more than two children under the age of five years[14] and a birth interval of less than two years[13] are both risk factors for moderate malnutrition. Similarly, more than three children overall increase the risk of SAM (Ethiopian study)[3] and moderate malnutrition (Vietnamese study).[37] Multiple births are associated with SAM,[5] and a low birth weight (<2.5 kg) was found to be associated with SAM[5] and moderate malnutrition.[13,14,59,37]

### 1.6.3 Discrepancies in the evidence

Most studies only looked at factors associated with one index of malnutrition, such as weight-for-age. Others grouped all indices together, and just looked at malnutrition in general (e.g. <–2 SD of any indices). Some of the risk factors were found to be associated with more than one form of malnutrition, while other factors were only evident in certain forms of malnutrition.

A cross-sectional study using data collected from the International Demographic and Health Surveys programme from different countries in SSA assessed risk factors (specifically linked to maternal or household characteristics) associated with underweight, stunting and wasting.[9] They found that while the mother's age and single parenthood was associated with underweight and stunting ($p < 0.05$), it was not associated with wasting ($p > 0.05$).[9] Another difference identified was that although living in a rural area was associated with underweight and stunting ($p < 0.05$), it was not associated with wasting ($p > 0.05$).[9]

A case control study done in Dhaka (Bangladesh) involving 6 881 children aged 0–59 months found that when looking at risk factors for the three indices of severe malnutrition separately, similar results were found, except that a history of measles in the past six months was a risk factor only for severe underweight ($p<0.05$).[8] In a cross-sectional study in Bangladesh, paternal smoking was associated with moderate and severe underweight and stunting. However, there was no association with wasting ($p > 0.05$).[67]

Analysis of data from Madhya Pradesh, India, from the National Family Health Survey (NFHS) III, conducted during 2005–2006, found that the risk of both underweight ($p < 0.01$) and stunting ($p < 0.01$) increase in children of a higher birth order and in children whose mothers have a lower level of education; these were not found to be risk factors for wasting.[38] A study observing the results of the Living Standards and Development Survey performed in South Africa found that socioeconomic factors affected stunting and underweight but not wasting.[44] Factors related to income affect stunting the most,[44] because income often does not have a significant effect on environmental factors or diseases that often precede wasting.[44]

Another study performed in South Africa found that while male gender, child's age, low maternal education and the mother's perception that the child was not growing well were risk factors for both underweight and stunting, other factors were associated with only one of the indices.[60] Currently not breastfeeding and the occurrence of gastrointestinal symptoms are risk factors for underweight ($p = 0.014$ and $p = 0.013$), but not stunting.[60] On the other hand, not receiving a food handout the month before, not increasing fluids during diarrhoea, and a mother not having to make important household decisions were risk factors for stunting only ($p = 0.005$, $p = 0.049$, $p = 0.009$) and not underweight.[60]

Some studies found that some of the common risk factors for malnutrition were not apparent. A case-control study performed in Udupi taluk (Karnataka, India) found that exclusive breastfeeding, the caregiver's education level and environmental factors did not have any association with malnutrition, unlike many other studies done in developing countries.[13] Another study, performed on 1 192 children under the age of five years in a Roma settlement in Serbia, found no correlation with the following well-known risk factors and malnutrition: history of diarrhoea, an immunisation status and breastfeeding history.[10]

The review of these studies demonstrate that, despite the well-described causes and risk factors in the UNICEF conceptual framework, some results between the studies are inconsistent and some factors are associated more with certain types of malnutrition than others.

### 1.7 Current SA interventions

The most critical time for intervention is in a child's first 1 000 days, which includes the period during pregnancy, up to a child's second birthday.[27] This is a vulnerable period of increased nutritional needs and increased risk of infection.[27]

Various initiatives have been launched in South Africa over the past few decades aimed at improving the nutritional status of children.[69] The Integrated Nutrition Programme (INP) was launched in the mid-1990's to replace previous fragmented programmes in South Africa for a more integrated approach.[69] It targets nutritionally vulnerable groups, namely children under 60 months old, pregnant and lactating women and people with chronic lifestyle diseases.[70] It has seven main focus areas comprising various policies and programmes.[71] These seven focus areas include:

disease-specific nutrition support, treatment and counselling; growth monitoring and promotion (GMP); nutrition promotion, education and advocacy; micronutrient malnutrition control; food service management; the promotion, protection and support of breastfeeding; and contribution to household food security.

One of the aims of the INP was to reduce malnutrition in children under five years old, using the SAVACG status as a baseline.[69] The prevalence of underweight, stunting and wasting in 1994, according to the SAVACG study, was 9.3%, 23% and 2.6% respectively.[28] The goal was to reduce these figures, by 2007, to 8%, 18%, and 2% respectively.[69] As shown in **Error! Reference source not found.**, the goal for revalence of underweight was not reached by 2005, but had been reached by 2012. The goals relating to stunting and wasting had not been met by 2005 or by 2012.

While the INP is reasonably comprehensive in addressing the causes of malnutrition, it has had limited success.[70] In 2009, South Africa undertook the Landscape Analysis, which looks at the country readiness for putting nutrition strategies into action.[72] Although nutrition strategies exist, the analysis identified reasons why the implementation of these strategies was sub-optimal.[72] Some challenges that hinder the success of the INP are a lack of training, support and leadership, and a poor allocation of resources.[70,72] The Landscape Analysis also found that major stakeholders had different views on the main causes and priority areas related to nutritional status.[72] Nutrition-related programmes were mostly regarded by stakeholders as the provision of food.[72] This inconsistency among stakeholders' knowledge means that policies are not streamlined to focus on the biggest problem areas.[72] With the limited resources available, the focus on these key problem areas is essential in improving the nutritional status of South Africa.[72]

There needs to be a focus on priority target groups and on interventions that are known to result in the biggest impact, which involve the first 1 000 days of life (before and during pregnancy, and in the first two years after birth).[73] Therefore, the Nutrition Roadmap was developed to aid in redirecting resources to priority interventions.[73] The Nutrition Roadmap includes nutrition interventions that fall under three categories: behaviour change interventions; micronutrient and deworming programmes; and therapeutic feeding.[73]

The behaviour change interventions include those relating to infant feeding, maternal nutrition, and general health.[73] Exclusive breastfeeding promotion is the first intervention, and it targets pregnant women, as well as family members of children under six months.[73] Improved complementary feeding together with continued breastfeeding (and targeted supplementary feeds where needed) is the second intervention under the behaviour change interventions.[73] This should be targetted to pregnant women, families of children under 24 months, and populations with a high percentage of underweight children 6-23 months old. Some of the existing policies that would direct the interventions relating to infant feeding include the Prevention of Mother to Child Transmission (PMTCT) guidelines,[74] basic Antenatal Care (ANC), Mother-Baby-Friendly Initiative (MBFI), Infant and Young Child Feeding (IYCF) policy,[75] Integrated Management of Childhood Illness (IMCI),[76] the regulations on marketing of infant foods, School Health Services policy,[77] Health Promoting School's initiative,[78] and GMP.[73]

Healthy eating for optimal weight gain during pregnancy and lactation and implementation of evidence based interventions for the detection of malnutrition during pregnancy are the two interventions relating to maternal health and nutrition.[73] These interventions should be targeted at pregnant women (and breastfeeding women, if applicable).[73] The ANC, Food Based Dietary Guidelines (FBDG),[79] School Health Services policy,[77] Health Promoting School's initiative,[78] and 2007 Guidelines for Maternity Care in SA[80] are all current policies and programmes that are in place that will help achieve these initiatives.[73]

The final two behavioural interventions relate to general health and nutrition.[73] The first one is improved hygiene practices, including hand washing. This should be targeted to all caregiver and families, and to school going children, and forms part of the IMCI, IYCF guidelines, and the Health Promoting School's initiative.[78] The second initiative is nutrition education and information in healthy eating and health risks associated with poor diets.[73] The entire population should be targeted for this intervention, and special attention should be given to people with chronic conditions.[73] The guidelines on chronic diseases, the FBDG,[79] and the food guide are all current policies in place that should be used to achieve this intervention.[73]

The micronutrient and deworming programmes include the following interventions: Vitamin A supplementation (twice a year for children 6-59 months); therapeutic zinc supplementation (in children 6-59 months with diarrhoea); iron folate and calcium supplementation (for pregnant women); fortification of staples and salt iodization (for the entire population); deworming of children 6-59 months; and multiple micronutrient supplements and supplementary feeding to undernourished individuals.[73]

The interventions relating to therapeutic feeding include the treatment of SAM and the prevention or treatment of moderate undernutrition.[73] These interventions are targeted at children 6-59 months old who are diagnosed with SAM or moderate undernutrition. The WHO ten steps to management of SAM is an important guideline to govern these intervention. [73,81,82]

## 1.8 Conclusion

Malnutrition is a serious problem, both globally and in South Africa and, although there has been an overall decrease in prevalence, this has not happened at a satisfactory rate and there is certainly no room for complacency. Malnutrition, especially SAM, has significant consequences for survival, disease prevalence, healthy development and economic productivity.[1] Addressing malnutrition will save lives now, maximise economic opportunities, and help to decrease the risk of chronic disease in the future.[83] It is necessary to have an understanding of the risks, causes, extent and distribution of diseases in order to work on strategies for improving a population's health.[2]

Many studies have revealed the numerous risk factors associated with various forms of malnutrition. While many of these factors are associated with multiple forms of malnutrition, there are differences. SAM has a higher mortality rate than other types of malnutrition;[1,21] therefore it is vital that the specific risk factors for SAM are assessed. These risk factors should also be compared with those of other forms of malnutrition so that the aetiology can be further understood and prevention strategies developed and implemented.

Most of the studies assessed were performed in different locations. Established risk factors for malnutrition vary in different settings and few epidemiological patterns are consistent globally.[6] Therefore, specific populations need to be identified that require context-specific approaches.[7] In order to do this, a better understanding of a

population's child health epidemiology is needed.[7] This involves learning about the risk factors for malnutrition in specific populations so that health systems and stakeholders can plan appropriate and effective interventions.[84]

### 1.9 Motivation for the study

Although several studies have investigated the risk factors (specifically socioeconomic, demographic and health) for malnutrition in young children, most assessed risk factors for various forms of moderate malnutrition,[8,85,10,11,12,13] and few studies looked specifically at risk factors associated with SAM.[3,4,5] Furthermore, the data cannot necessarily be extrapolated, and limited data is available regarding risk factors associated with SAM in the South African context.

South Africa is diverse, with many different levels of socioeconomic status.[60] The City of Johannesburg is a growing cosmopolitan centre, diverse in its ethnicity and culture.[86]The city faces many struggles including poverty, inequality, unemployment and underdevelopment.[86] With as many as 42% of households food insecure,[86] malnutrition should be considered a major health threat.[53]

To the researcher's knowledge, no other studies have been performed in Region B or the surrounding referral areas of Johannesburg. Taking this and the review into consideration, it is clear that the risk factors associated with SAM need to be determined in the population residing in Johannesburg, South Africa.

This study provides information regarding the risk factors associated with SAM in vulnerable children under five years old who reside in Region B and surrounding referral areas of the City of Johannesburg. This study gives insight into the demographic and socioeconomic factors of the population, and the results can be used to determine which areas need to be prioritised so that intervention strategies for SAM can be developed. The information can also be used to timeously identify vulnerable children in order to prevent the development of SAM.

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# CHAPTER 2

# METHODOLOGY

# 2. CHAPTER 2: METHODOLOGY

This chapter unveils the aim of the study and the objectives it strives to achieve. It provides insight to the study methodology and plan, the methods of data collection and finally data analysis.

## 2.1 Research question, study aim and objectives

### 2.1.1 Research question

Which risk factors are associated with the prevalence of severe acute malnutrition in vulnerable children under five years of age who live in Region B and surrounding referral areas of the City of Johannesburg, South Africa?

### 2.1.2 Aim

The aim of this study was to determine which risk factors are associated with the development of severe acute malnutrition in vulnerable children under five years old who reside in Region B and surrounding referral areas of the City of Johannesburg.

### 2.1.3 Objectives

a) To determine the risk factors and the degree to which they are associated with severe acute malnutrition in children under five years old who reside in Region B and surrounding referral areas of the City of Johannesburg.
b) To determine the risk factors and the degree to which they are associated with moderate malnutrition and/or growth failure in children under five years old who reside in Region B and surrounding referral areas of the City of Johannesburg.
c) To compare the risk factors associated with the following groups: (i) severe acute malnutrition, (ii) moderate malnutrition and growth failure and (iii) well-nourished, in children under five years old who reside in Region B and surrounding referral areas of the City of Johannesburg.

## 2.2 Study plan

### 2.2.1 Study type

A descriptive, cross-sectional study with an analytical component was performed. This study design was used to describe a population and the relationship between exposures (risk factors) and patient outcome (malnutrition).

### 2.2.2 Study population

The study population was children under the age of five years who reside in Region B and surrounding referral areas of the City of Johannesburg. According to the 2011 National Census , there are 22 703 children under the age of five years in Region B, which consists of wards 68, 69, 82, 86, 87, 88, 90, 98, 99, 102, and 104 in the City of Johannesburg.[1] The clinics in this region are Berario Clinic, Bosmont Clinic, Claremont Clinic, Crosby Clinic, Parkhurst Clinic, Randburg Clinic, Riverlea Major Clinic, Rosebank Clinic, Sophiatown Clinic, Westbury Clinic, and Windsor Clinic. The paediatric hospital in this region is Rahima Moosa Mother and Child Hospital (See APPENDIX A – MAP OF REGION B, JOHANNESBURG for map).[2]

Rahima Moosa Mother and Child Hospital is the paediatric hospital for Region B of Johannesburg. However, it is also a referral hospital for surrounding areas such as Weldevreden Park, Zandspruit, Florida, Discovery, Mayfair, Honeydew and Diepsloot. Most of the hospital's Severe Acute Malnutrition (SAM) patients come from these surrounding areas. Therefore, to get a true reflection of the risk factors of SAM in Johannesburg, children from the surrounding referral areas of Region B were included in the study population.

In 2012, there were 2 485 admissions of children under five years of age in the paediatric wards of Rahima Moosa Mother and Child Hospital, 130 of whom were diagnosed with SAM (5.3%).[3] Within the SAM admissions, there was a mortality rate of 4.6 deaths per 100 admissions. This is below the international standard of 5%,[4] which indicates good management of SAM at a hospital level. Although this is good, the primary or secondary prevention of SAM is still the ideal, and therefore, malnutrition can be considered a public health concern in this region.[3]

### 2.2.3 Sample size

A power analysis for one-way Analysis of Variance (ANOVA) was done to compare three groups (SAM, moderate malnutrition/growth failure and well nourished) with 90% power to determine an effect size of 0.35 with a significance level of $\alpha = 5\%$. This showed that a sample size of $n = 53$ per group was required. Therefore, there was a total sample size of $n = 159$ (SAM $n = 53$, moderate malnutrition/growth failure $n = 53$, and well-nourished $n = 53$). No adjustments were made for attrition or a poor response rate since the study did not require follow-up and the investigator

went through the questionnaires with each participant, thereby eliminating the chance of no response.

### 2.2.4 Sample selection

Convenience sampling was used to include participants. Selection occurred from 26 August 2014 to 27 March 2015, on weekdays between 07:00 and 17:00. The participants were chosen from patients admitted to Rahima Moosa Mother and Child Hospital's paediatric wards – wards one, two, three and four. Three groups of children are represented in the study: SAM, moderate malnutrition/growth failure and well-nourished. Sample selection continued until there were enough patients representing each group.

#### 2.2.4.1 Inclusion criteria for study group

- Diagnosed as one of the following:
    i. SAM
    ii. moderately malnourished, including Moderate Acute Malnutrition (MAM), moderate stunting, moderate underweight, and growth failure (as discussed under section 1.4.6)
    iii. well nourished
- Under the age of five years (0–60 months) at the time of the interview
- Reside in region B or surrounding referral areas of Johannesburg
- Human immunodeficiency virus (HIV) infected or HIV uninfected
- Patients with a Road to Health Booklet (RTHB) present
- Admitted to Wards 1–4 of Rahima Moosa Mother and Child Hospital

MAM is defined as having one or more of the following parameters: <–2 but >–3 standard deviations (SD) weight for length/height, and mid-upper arm circumference (MUAC) <12.5cm but >11.5cm.[5] However, many studies define moderate forms of malnutrition as one of the following: <–2 SD but >–3 SD of either weight-for-age (underweight), height/length-for-age (stunting), or weight-for-height/length (wasting). Therefore, this review and study will use the term moderate malnutrition to include MAM, as well as moderate stunting and underweight, and growth failure.

#### 2.2.4.2 Exclusion criteria for study group

- Premature birth (<37 weeks gestation)
- Low Birth Weight

- Congenital diseases/disorders (such as heart defects, genetic disorders, foetal alcohol syndrome, chromosomal abnormalities)
- Diabetes mellitus
- Overweight
- Surgical patients (except for orthopaedic surgeries)
- Patients diagnosed with cancer
- Chronic diseases, such as chronic lung disease and chronic cardiac failure

The exclusion criteria relating to premature birth, low birth weight and chronic or congenital diseases/disorders were set because it is known and expected that these factors affect the weight or growth of a child.

### 2.3 Methods of data collection

Data was collected by performing anthropometrical measurements and through a series of questionnaires that each participant's mother/caregiver answered (refer to APPENDIX B – QUESTIONNAIRE 1, APPENDIX C – QUESTIONNAIRE 2; APPENDIX D – QUESTIONNAIRE 3; APPENDIX E – QUESTIONNAIRE 4; APPENDIX F – QUESTIONNAIRE 5).

If the mother/caregiver did not speak English, a translator was used. The process for using a translator was as follows: once it was identified that a mother/caregiver did not understand English, a nurse in the ward (who spoke the same language as the parent/guardian) was asked to help with translating. If she was willing, the study and questionnaire was described and explained to her. The informed consent form and questionnaire was completed with the parent/guardian through the translator. The informed consent form was translated from English into Afrikaans, isiZulu, and Sesotho. The mother or caregiver received a copy of the consent form in the language of her preference.

The measurements and questionnaires did not take more than one hour to complete per participant. The participant had to be present for the measurements, and the mother/caregiver had to be present for all the measurements and questionnaires. The questions asked were grouped according to two categories: underlying causes of malnutrition and information regarding immediate causes of malnutrition. Underlying causes of malnutrition were assessed from the information gathered from the questions in sections: 2.1) Socioeconomic and demographic factors; 2.2) Family

health and dynamics; 3.4) Food security; 3.5) Feeding habits; 4.1) Medical history (4.1.1–4.1.11); 4.2) Birth history; and 5) Mother's anthropometry. Immediate causes of malnutrition were assessed from the information gathered in sections: 3.1) Nutritional history (infant feeding and complementary feeding); 3.2) Nutritional history (food frequency); 3.3) Food frequency; and 4.1) Medical history (4.1.12 – 4.1.14).

After each of the methods and measurements is described, the analysis and interpretation of data will be explained in this section.

### 2.3.1 Anthropometrical measurements

All respondents had their weight, height/length, head circumference and MUAC measured by a trained and standardised dietitian. The measurements were recorded on a standard form (APPENDIX B – QUESTIONNAIRE 1). The measurements were performed in the treatment room in the child's ward. However, this was not always possible because the room was often occupied and the participants were often on nasal prong oxygen or IV fluids, which made it difficult to move them around. Therefore, the measurements were generally performed at the patient's bedside. Patient privacy was respected and curtains were closed around the bedside.

All the measurements were non-invasive and each was taken according to World Health Organization (WHO) child growth standards.[6] All measurements were taken twice. If the two measurements differed less than the maximum allowable difference used in the WHO Multicentre Growth Reference Study Group,[7] the mean of the two measurements was used. If the two measurements differed more than the maximum allowable difference, a third measurement was taken and the median of the three was used. The maximum allowable differences are 7 mm for length/height, 5 mm for head circumference, 5 mm for MUAC, and 100 g for weight.[7]

The scale was calibrated before use. A range of weights of known mass (1 kg, 500 g, 200 g, 50 g) were placed on the scale weekly to ensure that the scale was correct. The scale was correct for all of the weekly checks. Had the scale been incorrect on any of the checks, Seca would have been contacted to re-calibrate the scale. The WHO charts, developed in 2006, were used to plot the growth of the participants.[6] The $Z$-scores of the growth parameters were calculated, and classified according to Table 2.1.

Table 2.1 **: Assessment of growth indicators** [6,8]

| $Z$ – score | Growth indicators | | | |
|---|---|---|---|---|
| | **Height/length for age** | **Weight for age** | **Weight for height/length** | **HC for age** |
| **Above 3** | Normal | May be overweight – confirm with weight for height/length | Obese | Macrocephaly |
| **Above 2** | Normal | | Overweight | Macrocephaly |
| **Above 1** | Normal | | Normal | Normal |
| **0 (Median)** | Normal | Normal | Normal | Normal |
| **Below – 1** | Normal | Normal | Normal | Normal |
| **Below – 2** | Stunted | Underweight | Wasted | Microcephaly |
| **Below – 3** | Severely stunted | Severely underweight | Severely wasted | Microcephaly |

#### 2.3.1.1 Weight

A portable, battery-operated, flat Seca scale (model 874) was used to measure weight, in kilograms, to the nearest 50 g. Two measurements were taken. If they differed by less than 100 g, the mean of the two measurements was used. If they differed by more than 100 g, a third measurement was taken and the median of the three was used. The following guidelines were used for children who were less than two years old or unable to stand:[6]

- The child got undressed into only underwear
- Infants were weighed in a nappy (dry only)
- The mother/guardian removed her shoes and stood on the scale
- The mother's clothes did not cover the display on the scale
- Once her weight showed on the display, she remained on the scale and the tare button was pressed
- Once the scale showed a zero, the child was handed to her

- The child's weight appeared on the scale and was recorded to the nearest 50g

The following guidelines were used for children two years and older and who could stand on the scale alone:

- The child was undressed into underwear
- The child stood in the middle of the scale, with feet slightly apart
- The child's weight was recorded to the nearest 50g

If a child was dehydrated on admission, weighing was only done after the child was rehydrated.

#### 2.3.1.2 Length/height

Recumbent length was measured with a Seca mobile measuring mat (model 210) for children under two years and for children who could not stand. Two measurements were taken. If they differed by less than 7 mm, the mean of the two measurements was used. If they differed by more than 7 mm, a third measurement was taken and the median of the three was used. Length was measured in the following way:[6]

- All hair ornaments, shoes and socks were removed
- The mat was covered with soft paper
- The mother was asked to place the child on the mat and hold the child's head in place, against the headboard
- The head was positioned so that the imaginary vertical line from the ear canal to the lower border of the eye socket was perpendicular to the board.
- The examiner ensured that the child was placed straight along the board, with shoulders touching the board and the back not arched
- The legs were held down with one hand and the foot board was moved with the other hand.
- Gentle pressure was applied to the knees so that the legs were straightened as much as possible
- The measurement was taken to the nearest completed 0.1 cm
- If the child was more than two years old, 0.7 cm was subtracted from the measurement

The height of children, who were older than two years and could stand unassisted, was measured using a Seca portable stadiometer (model 213). Two measurements were taken. If they differed by less than 7 mm, the mean of the two measurements was used. If they differed by more than 7 mm, a third measurement was taken and the median of the three was used. Height was measured in the following manner:[6]

- All hair ornaments, shoes and socks were removed
- The child stood straight up against the backboard
- The child's heels were together and toes were slightly apart.
- Their head, shoulder blades, buttocks, calves and heels all touched the backboard.
- If it was necessary, the child's tummy was pushed gently
- The examiner aligned the head in the Frankfort horizontal plane, and then lowered the headpiece so that it rested firmly on the child's head.
- The measurement was taken to the nearest completed 0.1 cm

#### 2.3.1.3 Head circumference

The head circumference of the participant was measured using a Seca measuring tape made of non-stretch Teflon synthetic material (model 212). Two measurements were taken. If they differed by less than 5 mm, the mean of the two measurements was used. If they differed by more than 5 mm, a third measurement was taken and the median of the three was used. Head circumference was measured in the following manner:[7]

- All hair ornaments or braids were removed
- The guardian of the child placed the child on their lap and held the child still.
- The examiner then placed a tape measure around the child's head.
- The examiner ensured that the tape lay across the frontal bones of the skull and that it was just above the eyebrows, perpendicular to the long axis of the face, and over the occipital prominence at the back of the head.
- Once the tape was placed, it was moved up and down so that the maximal circumference of the head was found.
- Once the tape was in place, it was pulled tight to fit securely around the head
- The measurement was taken to the nearest completed 0.1 cm

#### 2.3.1.4 Mid-upper arm circumference

To measure MUAC, the mid-upper arm point was first calculated in the following manner:[7]

- The mother/caregiver held the child in her lap and ensured that the child's arm was held at a 90° angle at the elbow, with their palm facing upwards
- The acromion process and the olecranon process were located and marked with a marker
- The zero point of the tape was placed at the mark at the acromion process and the tape was run down the arm to the tip of the elbow
- A mark was made at the mid-point

MUAC was measured using a Seca measuring tape made of non-stretch Teflon synthetic material (model 212). Two measurements were taken. If they differed by less than 5 mm, the mean of the two measurements was used. If they differed by more than 5 mm, a third measurement was taken and the median of the three was used. The measurement took place in the following manner:[7]

- The child's arm hung in a relaxed position, or the mother/caregiver was asked to hold the child's arm in an extended position
- The child's arm muscles were not flexed
- The tape was wrapped around the arm at the mid-point
- The tape lay flat on the child's arm, without compressing the skin or leaving a gap
- The measurement was recorded to the nearest 0.1 cm

The following anthropometric classifications were used for this study, which are based on WHO growth parameters:[6]

- Moderate acute malnutrition is defined as any of the following parameters <–2 SD of the WHO standard: weight for age, length/height for age and weight for length/height.
- Growth failure refers to a failure to gain weight, or weight loss.[9]
- SAM is defined as any of the following parameters: <–3 SD weight for length/height, MUAC < 11.5 cm, and pitting bilateral oedema.[6,10]

- A well-nourished child refers to a child who is between all the following growth parameters: –2 to +3 SD length/height for age, −2 to +2 SD weight for age, and –2 to +2 SD weight for height/length. Also, the child should not be in growth failure.[6]

### 2.3.2 Demographic and socioeconomic information

To obtain the demographic and socioeconomic information, a trained dietitian (the researcher) went through a set questionnaire (APPENDIX C – QUESTIONNAIRE 2) with the caregiver. The intention was for the interview to be conducted in a private, closed office. However, it was established that the caregivers did not want to leave their children to come to a separate office. Therefore the option was given to the caregivers to either answer the questions at the bedside of the child or to go into a private office. All the caregivers preferred to stay at the child's bedside. Privacy was maintained by drawing the bedside curtain. The hospital files and RTHB of the subjects were also reviewed to obtain some of this data.

### 2.3.3 Nutritional history

The questionnaire included questions on their nutritional history, which consisted of infant feeding history, food frequency (which was used to calculate dietary diversity), and questions used to calculate household hunger score (APPENDIX D – QUESTIONNAIRE 3). The first section of this questionnaire gathered information on infant feeding (current or historical), breastfeeding history, and complementary feeding history. The questions were piloted and validated in the pilot study (refer to section 2.6). The second section of the nutritional history was a food frequency questionnaire, which gathered information on the variety of foods, frequency of meals, and frequency of consumption of certain foods. The information gathered from the food frequency questionnaire was then used to calculate a dietary diversity score.[11] Each food group (cereals, white tubers and roots, vegetables, fruit, meat, eggs, fish and other seafood, legumes and nuts and seeds, milk and milk products, oils and fats, sweets, spices and condiments, and beverages) that was consumed on a daily basis was given a score of one.[11] The scores were added up to make a final dietary diversity score. The dietary diversity score was classified as low, moderate or high. The classification of dietary diversity was made using the indicator guide of the Household Dietary Diversity Score (HDDS) for Measurement of Household Food Access. The guide states that if there is no data relating to income or economics

from a baseline survey, the HDDS target should be determined by taking the average diversity of the upper tercile or the average of the third of the households with the greatest diversity. This was calculated once the data had been collected, and the upper tercile average was 6.7. The lower and middle tercile averages were 1.4 and 3.7 respectively. Therefore, the classification of low, moderate, and high dietary diversity was 0–3, 4–5, and 6–12, respectively.

The final part of the nutritional history questionnaire involved three questions that were used to determine the household hunger score[12] (Table 2.2). These questions are used for establishing the measure of household food deprivation, and provides information on nutrition and food security.[12] A score was given for each of the respondent's answers, which was added up and classified according to the following table:

Table 2.2 **: Classification of score of household hunger scale** [12]

| **Score** | **Household hunger category** |
|---|---|
| 0–1 | Little to no hunger in the household |
| 2–3 | Moderate hunger in the household |
| 4–6 | Severe hunger in the household |

### 2.3.4 Medical history

The questionnaire (APPENDIX E – QUESTIONNAIRE 4) included questions on previous hospital admissions, previous illness, immunisation history, malnutrition history and current diagnoses. Some of this data was obtained from the patient's hospital file (current and previous admissions), as well as their RTHB.

### 2.3.5 Family history and dynamics

Questions were asked in the questionnaire that covered the child's family history and the dynamics in the family. This included questions pertaining to the parent's health, diagnoses, education, smoking status, and alcohol use (APPENDIX C – QUESTIONNAIRE 2).

### 2.3.6 Mother's nutritional status

The mother's weight, height and BMI were used to determine her nutritional status. This was recorded on a standard form (APPENDIX F – QUESTIONNAIRE 5).

#### 2.3.6.1 Weight

The mother's weight was measured using a portable, battery-operated, flat Seca scale (model 874), in kilograms to the nearest 50 g. Two measurements were taken. If they differed by less than 100 g, the mean of the two measurements were used. If they differed by more than 100 g, a third measurement was taken and the median of the three was used. The measurements were taken in the following manner:[13]

- The mother was asked to undress to minimal clothing and remove shoes and socks
- The mother stood on the centre of the scale, with her hands at her sides, and looking straight ahead
- The result was recorded to the nearest 50 g

#### 2.3.6.2 Height

A Seca portable stadiometer (model 213) was used to measure the height of the mother. If they differed by less than 7 mm, the mean of the two measurements were used. If they differed by more than 7 mm, a third measurement was taken and the median of the three was used. The mother's height was measured in the following manner:[13]

- Hair ornaments, shoes and socks were removed
- The mother stood straight up against the backboard
- Her heels were together and toes slightly apart.
- Her head, shoulder blades, buttocks, calves and heels touched the backboard.
- The mother was told to stand as tall as possible and take a deep breath

- The examiner aligned the head in the Frankfort horizontal plane, and then lowered the headpiece so that it rested firmly on the mother's head.
- The measurement was recorded to the nearest completed 0.1 cm

#### 2.3.6.3 BMI of the mother

BMI was calculated as the mother's weight in kilograms, divided by her height in metres squared ($kg/m^2$). Her BMI was interpreted according to the following table:[14]

Table 2.3 **: Classification of BMI (adapted from WHO)** [15]

| **BMI (kg/m$^2$)** | **Classification** |
|---|---|
| <18.5 | Underweight |
| 18.5–24.99 | Normal range |
| 25–29.99 | Overweight |
| 30–34.99 | Obese class 1 |
| 35–39.99 | Obese class 2 |
| >40 | Obese class 3 |

BMI: Body Mass Index; WHO: World Health Organization

### 2.3.7 Birth history

The questionnaire included questions on the birth history of the child, such as birth order, birth weight and number of siblings (APPENDIX E – QUESTIONNAIRE 4). This data was also verified from the hospital file and RTHB of the patient.

## 2.4 Validity and reliability

The validity of the study and the questionnaires was established by performing a pilot study. The household hunger scale was tested between 2006 and 2007 in South Africa, Mozambique, Zimbabwe, Kenya, Malawi and West Bank/Gaza Strip, and was found to be valid in developing countries and across cultures.[12,16] Therefore, the household hunger scale is a valid measure of household food deprivation. The information from the food frequency questionnaire was used to determine a dietary diversity score. Two dietitians separately placed each food from the food frequency questionnaire into a food group according to the HDDS.[11] Any differences were discussed and consensus was reached. All information from the questionnaires was inserted into a data collection form in Excel. This was validated by a second person who checked that each entry was correct.

The following types of validity were checked:

- Face validity: This was ensured by the researcher asking the parent or caregiver of the subject in the pilot study if they thought that the questionnaire was appropriate in determining the purpose of the study. They

were asked to rank how appropriate the questionnaire was from one to four, where one was very inappropriate and four was very appropriate.

- Content validity: This was ensured by asking experts in the field if they thought that the questionnaire was appropriate in determining the purpose of the study. They were asked to rank how appropriate the questionnaire was from one to four, where one was very inappropriate and four was very appropriate.

The following forms of reliability were checked:

- Test-retest reliability: This was achieved by the same researcher going through the same questionnaire twice (the first time in the morning and the second time in the afternoon) with certain participants. Participants were chosen for this in increments of 20.
- Inter-observer reliability: This was achieved by a different researcher going through the questionnaire a second time with certain participants. Participants were chosen for this in increments of 20.

### 2.5 Pilot study

The pilot study was performed after ethics approval was obtained. It was done on patients diagnosed with SAM, moderate malnutrition/growth failure and well-nourished children. Measurements and interviews were performed on these subjects and any difficulties recorded. Content and face validity was determined in the pilot study. Finally, it was determined in the pilot study if having a RTHB present was an appropriate inclusion criteria for participants.

Based on the pilot study, the following changes were made:

- Minor amendments were made to the questionnaire.
- Some errors (e.g. numbering) or omissions were corrected.
- Practical aspects relating to the most convenient time of day to perform the questionnaire were established.
- Most of the screened patients did have their RTHB present, but many of them did not have a completed RTHB. Therefore, the current inclusion criteria of “RTHB present” is acceptable for the study.

- It was determined that most of the SAM patients seen at Rahima Moosa Hospital came from surrounding referral areas of Region B. Therefore, the inclusion criteria were changed to include surrounding areas of Region B.

## 2.6 Analysis of data

### 2.6.1 Anthropometrical data

Anthropometrical measurements were taken by a trained and standardised dietitian. $Z$-scores for each anthropometric value were calculated using WHO Anthro Version 3.2.2. These values were analysed according to the WHO growth parameters.[6] This information was used to classify participants into the three groups, based on nutritional status.

### 2.6.2 Questionnaires

Data was collected using a set of questionnaires pertaining to socioeconomic and demographic factors; family health and dynamics; food security; feeding habits; medical history; and birth history. An HDDS and household hunger scale[12] were used as part of the data analysis (refer to section 2.3.3). The data was statistically analysed to determine if the various factors were associated with nutritional status.

## 2.7 Statistical analysis

MS Excel was used to capture the data and SPSS version 22 was used to analyse the data. Summary statistics were used to describe the variables. Data were described using means, standard deviations and percentages. The relationship between nominal variables was investigated with contingency tables and appropriate Chi-squared or Fisher's exact tests. A $p$-value of $p < 0.05$ represented statistical significance in hypothesis testing and 95% confidence intervals were used to describe the estimation of unknown parameters.

## 2.8 Budget

Table 2.4 illustrates the costs incurred for this study.

Table 2.4 **: Budget for study**

| **Item** | **Cost** |
|---|---|
| Printing of questionnaires | R3 000 |
| Other stationary | R50 |
| Translating of informed consent | R300 |
| Equipment | R7 189.58 |
| Personnel | Nil |
| Travelling | Nil |
| Language editing | R3 500 |
| **Total** | **R14 039.58** |

## 2.9 Ethical and legal aspects

Ethics approval was obtained from the Health Research Ethics Committee of Stellenbosch University before any data collection took place (S13/10/198). Institutional approval was obtained from the Department of Health to conduct the research in Rahima Moosa Mother and Child Hospital. Informed consent was obtained from the participants' mothers (APPENDIX G – INFORMED CONSENT FOR MOTHERS OF PARTICIPANTS - ENGLISH) or the participants' caregivers (APPENDIX H – INFORMED CONSENT FOR CAREGIVER OF PARTICIPANT - ENGLISH). These forms were translated from English into three other South African languages (Afrikaans, isiZulu and Sesotho).

The parents/guardians were assured that there would be no repercussions should they refuse to participate in the study, and no incentives were offered to the participants.

Data was handled confidentially and anonymously. This was achieved by assigning a case number to each participant, which was written on each questionnaire. The participant's name did not appear on the questionnaires. The only document where the participant's name appeared was the informed consent forms. The researcher compiled a list of participant names and corresponding case numbers which were kept in a locked office and were not published.

The study was low risk as there were no interventions or invasive procedures, such as blood samples. After the measurements and questionnaires had been completed, all malnourished patients were referred to the dietitian responsible for the unit the patient was in. The dietitian then prescribed appropriate feeds for the patient in hospital and educated the caregiver on feeding guidelines for the child/infant.

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# CHAPTER 3

# RESULTS

# 3. CHAPTER 3 - RESULTS

The results chapter is divided into two sections. Firstly to provide some background, the study population is described, looking specifically at the anthropometrical and the socio-demographic characteristics. The second part of this chapter is in the format of an article that addresses the study objectives and other significant results. The article will be submitted for publication to a peer-reviewed journal.

## 3.1 Description of the study population

The study population consisted of 159 children under the age of five years, comprising 53 participants in each of three groups: well-nourished, moderately malnourished, and those with severe acute malnutrition (SAM) (refer to section 2.2.3). In most cases the interviews were conducted with the mother of the child ($n = 151$; 95%).

Data collection took place from 26 August 2014 to 27 March 2015. Initial screening included 520 individuals, 209 of whom did not conform to the inclusion criteria, and 152 who were discharged from hospital after screening but before data collection could take place.

The majority of the children were males ($n = 85$; 53.5%) and the mean age of the total study population was 11.64 months. The average age for SAM, moderately malnourished, and well-nourished participants was 13.9 months, 11.4 months and 9.9 months respectively.

### 3.1.1 Anthropometrical characteristics

Table 3.1 describes the average anthropometrical indices for the participants.

Table 3.1 **: Anthropometrical averages of participants**

| **Indices** | **SAM** $(n = 53)$ | **Moderately malnourished** $(n = 53)$ | **Well-nourished** $(n = 53)$ | **Total study population** $(n = 159)$ |
|---|---|---|---|---|
| **Weight for age $z$-score (mean; SD)** | –3.06; ±1.18 | –1.83; ±0.91 | 0.26; ±0.75 | –1.71; ±1.50 |
| **Height/length for age $z$-score (mean; SD)** | –2.21; ±1.19 | –1.66; ±1.27 | –0.31;±0.92 | –1.43; ±1.41 |
| **Weight for height/length $z$-score (mean; SD)** | –2.50; ±1.41 | –1.12; ±1.12 | 0.01; ±0.85 | –1.21; ±1.54 |
| **HC for age $z$-score (mean; SD)** | –1.3; ±1.02 | –0.22; ±1.13 | 0.59; ±0.94 | –0.31; ±1.29 |
| **MUAC (cm) (mean; SD)** | 12.74; ±1.49 | 14.27; ±1.01 | 15.2; ±1.01 | 13.97; ±1.59 |

SAM: severe acute malnutrition; SD: standard deviation

Of the 53 SAM participants, 27 (50.9%) had a weight for length/height of $< -3$ standard deviations (SD), 10 (18.9%) had a MUAC of <11.5 cm, and 30 (56.6%) had bipedal oedema. Bipedal oedema was identified as nutritionally-related if the participant's doctor identified no other cause for the oedema (e.g. nephrotic syndrome). Table 3.2 shows how many SAM participants had the different diagnostic criteria. It is interesting to note that only two (3.8%) had all three of these diagnostic criteria.

Table 3.2 **: Diagnostic criteria for SAM participants** $(n = 53)$

| Number of SAM participants | Weight-for-length $< -3\ SD$ | MUAC $< 11.5$cm | Bipedal oedema |
|---|---|---|---|
| **17 (18.9%)** | ✓ | × | × |
| **2 (3.8%)** | × | ✓ | × |
| **22 (41.5%)** | × | × | ✓ |
| **4 (7.6%)** | ✓ | ✓ | × |
| **4 (7.6%)** | ✓ | × | ✓ |
| **2 (3.8%)** | × | ✓ | ✓ |
| **2 (3.8%)** | ✓ | ✓ | ✓ |

MUAC: mid-upper arm circumference; SD: standard deviation; SAM: severe acute malnutrition

### 3.1.2 Socio-demographic characteristics of study sample

The following table displays the demographic characteristics of the total study population. .

Table 3.3 **: Demographic characteristics of study sample** $(n = 159)$

| Variables | | Sample $(n)$ | Percentage (%) |
|---|---|---|---|
| **Age** | <12 months | 96 | 60.38 |
| | 12–24 months | 51 | 32.08 |
| | > 24 months | 12 | 7.55 |
| **Gender** | Male | 85 | 53.46 |
| | Female | 74 | 46.54 |
| **Race** | Black | 152 | 95.60 |
| | Mixed race | 7 | 4.40 |
| **SA citizen** | Yes | 105 | 66.04 |
| | No | 54 | 33.96 |
| **Maternal education** | Completed primary school | 16 | 10.06 |
| | Completed high school | 130 | 81.76 |
| | Tertiary qualification | 13 | 8.18 |
| **Paternal education** | Completed primary school | 12 | 8.05 |
| | Completed high school | 124 | 83.22 |
| | Tertiary education | 13 | 8.72 |
| **Maternal** | Yes | 71 | 44.65 |

| | | | |
|---|---|---|---|
| **employment** | No | 88 | 55.35 |
| **Paternal employment** | Yes | 128 | 83.66 |
| | No | 25 | 16.34 |
| **Household grants received** | Yes | 87 | 54.72 |
| | No | 72 | 45.28 |
| **Amount of child grants** | 0 | 114 | 71.70 |
| | 1 | 20 | 12.58 |
| | >1 | 25 | 15.72 |
| **Household income** | < R4500 | 111 | 70.25 |
| | ≥ R4500 | 47 | 29.75 |
| **Type of toilet** | Flushing | 131 | 82.39 |
| | Not flushing | 28 | 17.61 |
| **Water source** | Inside | 67 | 42.14 |
| | Outside | 92 | 57.86 |
| **Electricity** | Yes | 120 | 75.47 |
| | No | 39 | 24.53 |
| **Dwelling type** | Permanent structure (house, flat, room, RDP) | 107 | 67.30 |
| | Informal housing (shack, wooden hut) | 52 | 32.70 |
| **Region** | A | 49 | 30.82 |
| | B | 33 | 20.75 |
| | C | 59 | 37.11 |
| | D | 5 | 3.14 |
| | E | 2 | 1.26 |
| | F | 11 | 6.92 |
| **Age of Mother** | <19 years | 5 | 3.16 |
| | 19 - 35 years | 132 | 83.54 |
| | >35 years | 21 | 13.29 |
| **Age of Father** | 19 - 35 years | 18 | 11.54 |
| | >35 years | 138 | 88.46 |
| **Mother's HIV status** | HIV+ mother | 58 | 36.48 |
| | HIV− mother | 101 | 63.52 |
| **Mom married** | Yes | 43 | 27.22 |
| | No | 115 | 72.78 |

SA: South Africa; RDP: Reconstruction and Development Programme; HIV: Human Immunodeficiency Virus

# Risk factors associated with severe acute malnutrition in children under five years old residing in City of Johannesburg

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**Abstract**

**Objective:** To determine which risk factors are associated with the development of severe acute malnutrition (SAM) in vulnerable children under five years old that reside in City of Johannesburg.

**Methods:** A descriptive, cross-sectional study with quantitative approach was undertaken. Children under the age of five years who were admitted to Rahima Moosa Mother and Child Hospital were eligible for inclusion.

Data was collected by performing anthropometrical measurements and collating data from a series of questionnaires that the participant's mother/caregiver answered. These questionnaires had sections pertaining to socioeconomic and demographic factors, family health and dynamics, nutritional history, food security, feeding habits, medical history, and birth history.

**Results:** The study population consisted of 159 participants and consisted of 53 children in each of the following groups: diagnosis of SAM, moderate malnutrition or a well-nourished control group. Human Immunodeficiency Virus (HIV) infection ($n = 14$, 13.2%, $p < 0.01$); acute gastroenteritis ($n = 32$, 60.38%, $p < 0.05$); diarrhoea in the past year (77.36%; $n = 41$, $p < 0.05$); dehydration on admission ($n = 31$, 58.49%, $p < 0.01$); and previous malnutrition diagnosis ($n = 7$, 13.21%, $p < 0.05$) were the disease-related factors associated with SAM. Dietary-related risk factors associated with SAM included the inappropriate choice of replacement feeds after early cessation of breastfeeding ($n = 6$, 20%, $p < 0.05$); and early and late introduction of complementary foods ($n = 15$, 31.25%, $p < 0.01$; and $n = 8$, 16.67%, $p < 0.0$). Exclusive breastfeeding between 4–6 months was protective against SAM ($n = 14$, 30.43%, $p < 0.05$). Underlying causes of malnutrition that were associated with SAM were immunisations that were not up-to-date ($n = 14$, 26.42%, $p < 0.05$); Vitamin A doses missed ($n = 26$, 49.06%, $p < 0.01$); no deworming in the last year ($n = 28$, 93.33%, $p < 0.05$); having more than 3 children in the house ($n = 10$; 18.87%, $p < 0.05$); and children between the ages of 12 – 24 months ($n = 26$, 49.06%, $p < 0.01$). All these factors were also associated with moderate malnutrition (but had a lower prevalence compared to the SAM group), except for: exclusive breastfeeding for less than four months or more than six months;

inappropriate replacement feeds after early breastfeeding cessation; and immunisations, Vitamin A, and deworming schedules that were not up-to-date.

**Recommendations:** In order to be most effective, interventions need to occur in the first 1 000 days of life. These interventions include aspects relating to: 1) maternal nutrition; 2) infant and young child feeding (including breastfeeding and complementary feeding guidelines); 3) prevention and treatment of micronutrient deficiencies; 4) prevention and treatment of SAM; 5) promotion of good sanitation; and 6) promotion of healthy practices and the use of health services.

## Introduction

The fourth Millennium Development Goal (MDG) is to reduce the global under-five mortality rate by two thirds between 1990 and 2015.[1] However, the under-five mortality rate in South Africa in 1990 and 2010 was 60 and 57 deaths per 1 000 live births respectively,[2] indicating that despite efforts, current strategies seem to be ineffective in significantly reducing the under-five mortality rate in South Africa.[3]

Not including the neonatal period, more than one third of all deaths under-five years of age, can be attributed to underlying undernutrition.[3] Children with severe acute malnutrition (SAM) have a mortality rate that is 9.4 times higher than children who are not wasted.[3,4] SAM is still a problem in South Africa.

In 1990, The United Nations Children's Fund (UNICEF) released a policy strategy for improving the nutritional status of mothers and children in the developing world.[5] As part of this policy, they developed a conceptual framework of malnutrition outlaying the various causes of malnutrition.[5] This stemmed from the fact that although malnutrition is seen and diagnosed at an individual level, it is in fact a result of a multifaceted sequence of interlinked events.[5] The conceptual framework of malnutrition illustrate the complex nature of malnutrition by identifying basic, underlying, and immediate causes.[5] These causes involve factors from a household to a national level.[5]

The immediate causes of malnutrition are inadequate dietary intake and disease, often occurring in combination. Immediate causes stem from underlying causes.[5] There are many different underlying causes and they are often interrelated.[5] These underlying causes can be grouped into household food security, maternal and child

care, and basic health services and a healthy environment.[5] All of these underlying factors originate from a lack of resources (financial, human, physical, social, and natural), which ultimately stem from social, economic, and political issues (basic causes).[6]

Although there have been several studies investigating the risk factors (specifically socioeconomic, demographic, and health) for malnutrition in young children, most of the studies assessed risk factors for various forms of moderate malnutrition,[7,8,9,10,11,12] and few studies looked specifically at risk factors associated with SAM.[13,14,15] While there were different countries represented in these studies, mostly across Africa and Asia, few were conducted within South Africa. Established risk factors for malnutrition differ from one settings to another, and few epidemiological patterns are consistent globally.[16] The identification of important risk factors in a particular setting is a fundamental step to developing intervention programs to reduce childhood severe malnutrition.

**Methodology**

A descriptive, cross-sectional study was conducted to determine the risk factors associated with SAM. Data collection took place from August 2014 to March 2015. Convenience sampling was used to include participants. Children admitted to Rahima Moosa Mother and Child Hospital formed part of the study population and were included if they: 1) were under the age of five years; 2) resided in City of Johannesburg; 3) had a Road to Health Booklet (RTHB) present.

Data was collected by performing anthropometrical measurements and through a series of questionnaires that the participant's mother/caregiver answered. Measurements included weight, height/length, head circumference and Mid-Upper Arm Circumference (MUAC). Measurements were done by a trained dietitian. Anthropometric measurements were classified according to the World Health Organization (WHO) standards. Participants were classified as SAM if they had one or more of the following parameters: < –3 standard deviations (SD) weight for length/height, MUAC of <11.5cm, or pitting bilateral oedema.[13,14,15] Participants were classified as moderately malnourished if they had one or more of the following parameters: < –2 SD weight for age, < –2SD length/height for age, < –2SD weight for length/height,[7,17,9,10,11,12,18] or growth failure.

The questionnaire was divided into different sections pertaining to socioeconomic and demographic factors, family health and dynamics, nutritional history, food security, feeding habits, medical history, and birth history. A previously validated household hunger scale[19] was used to measure food security. Scores of 0–1, 2–3, and 4–6 were classified as having little/no hunger, moderate hunger and severe hunger in the households respectively. A dietary diversity score was classified using information gathered from a food frequency questionnaire.[20] Each food group that was consumed on a daily basis was given a score of 1.[20] The scores were added and gave the dietary diversity score. The lower, middle, and upper tercile averages of the dietary diversity scores of the study group were used to classify as low, moderate or high based on of the study group. Therefore, the classification of low, moderate, and high dietary diversity was 0 – 3, 4 – 5, and 6 – 12, respectively.

Z-scores for each anthropometric values were calculated using WHO Anthro Version 3.2.2. These values were analysed according to the WHO growth parameters.[21] MS Excel was used to capture the data and SPSS version 22 was used to analyse the data. Summary statistics were used to describe the variables. Data were described using means, standard deviations, and percentages. The relationship between the three groups (SAM, moderate malnutrition, and well nourished) and other nominal variables was investigated with contingency tables and appropriate Chi-squared or Fisher's exact tests. A $p$-value of $p < 0.05$ represented statistical significance in hypothesis testing and 95% confidence intervals was used to describe the estimation of unknown parameters.

Ethics approval was obtained from the Health Research Ethics Committee of Stellenbosch University (S13/10/198) and institutional approval was obtained from the Department of Health. Informed consent was obtained from all participants.

## Results

Initial screening included 520 individuals, whereof 209 did not conform to the inclusion criteria, and 152 were discharged from the hospital after screening but before data collection could take place. In most cases the interviews were conducted with the mother of the child ($n = 151$; 95%).

The final study population consisted of 159 participants, of which there were 85 (53.46%) males and 74 (46.54%) females. The majority ($n = 96$; 60.38%) of

participants were under the age of 12 months. The average age of SAM, moderately malnourished, and well-nourished participants were 13.9 months, 11.4 months, and 9.9 months respectively. Refer to Table 1 for the demographic information.

Table 1 : **Demographic characteristics of study sample** ($\boldsymbol{n = 159}$)

| **Variables** | | **Sample ($n$)** | **Percentage (%)** |
|---|---|---|---|
| **Age** | <12 months | 96 | 60.38 |
| | 12–24 months | 51 | 32.08 |
| | > 24 months | 12 | 7.55 |
| **Gender** | Male | 85 | 53.46 |
| | Female | 74 | 46.54 |
| **Race** | Black | 152 | 95.60 |
| | Mixed race | 7 | 4.40 |
| **Maternal education** | Completed primary school | 16 | 10.06 |
| | Completed high school | 130 | 81.76 |
| | Tertiary qualification | 13 | 8.18 |
| **Paternal education** | Completed primary school | 12 | 8.05 |
| | Completed high school | 124 | 83.22 |
| | Tertiary education | 13 | 8.72 |
| **Maternal employment** | Yes | 71 | 44.65 |
| | No | 88 | 55.35 |
| **Paternal employment** | Yes | 128 | 83.66 |
| | No | 25 | 16.34 |
| **Household grants received** | Yes | 87 | 54.72 |
| | No | 72 | 45.28 |
| **Maternal age** | <19 years | 5 | 3.16 |
| | 19 - 35 years | 132 | 83.54 |
| | >35 years | 21 | 13.29 |
| **Paternal age** | 19 - 35 years | 18 | 11.54 |
| | >35 years | 138 | 88.46 |

Participants were classified as being SAM, moderately malnourished or well-nourished. There were 53 participants in each of the respective groups. Anthropometrical data is shown in Table 2.

Table 2 : **Anthropometrical averages of participants ($n = 159$)**

| Indices | SAM | Moderately malnourished | Well-nourished | Total study population |
|---|---|---|---|---|
| **Weight for age $z$-score (mean; SD)** | –3.06; ±1.18 | 1.83; ±0.91 | 0.26; ±0.75 | –1.71; ±1.50 |
| **Height/length for age $z$-score (mean; SD)** | –2.21; ±1.19 | –1.66; ±1.27 | –0.31; ±0.92 | –1.43; ±1.41 |
| **Weight for height/length $z$-score (mean; SD)** | –2.50; ±1.41 | –1.12; ±1.12 | 0.01; ±0.85 | –1.21; ±1.54 |
| **HC for age $z$-score (mean; SD)** | –1.3; ±1.02 | –0.22; ±1.13 | 0.59; ±0.94 | –0.31; ±1.29 |
| **MUAC (cm) (mean; SD)** | 12.74; ±1.49 | 14.27; ±1.01 | 15.2; ±1.01 | 13.97; ±1.59 |

SD: standard deviation; HC: head circumference; MUAC: mid-upper arm circumference

The results will be described according to immediate, underlying, and other causes of malnutrition, as per the UNICEF conceptual framework. The framework will be used as the basis to describe the results of this study (Figure 1).

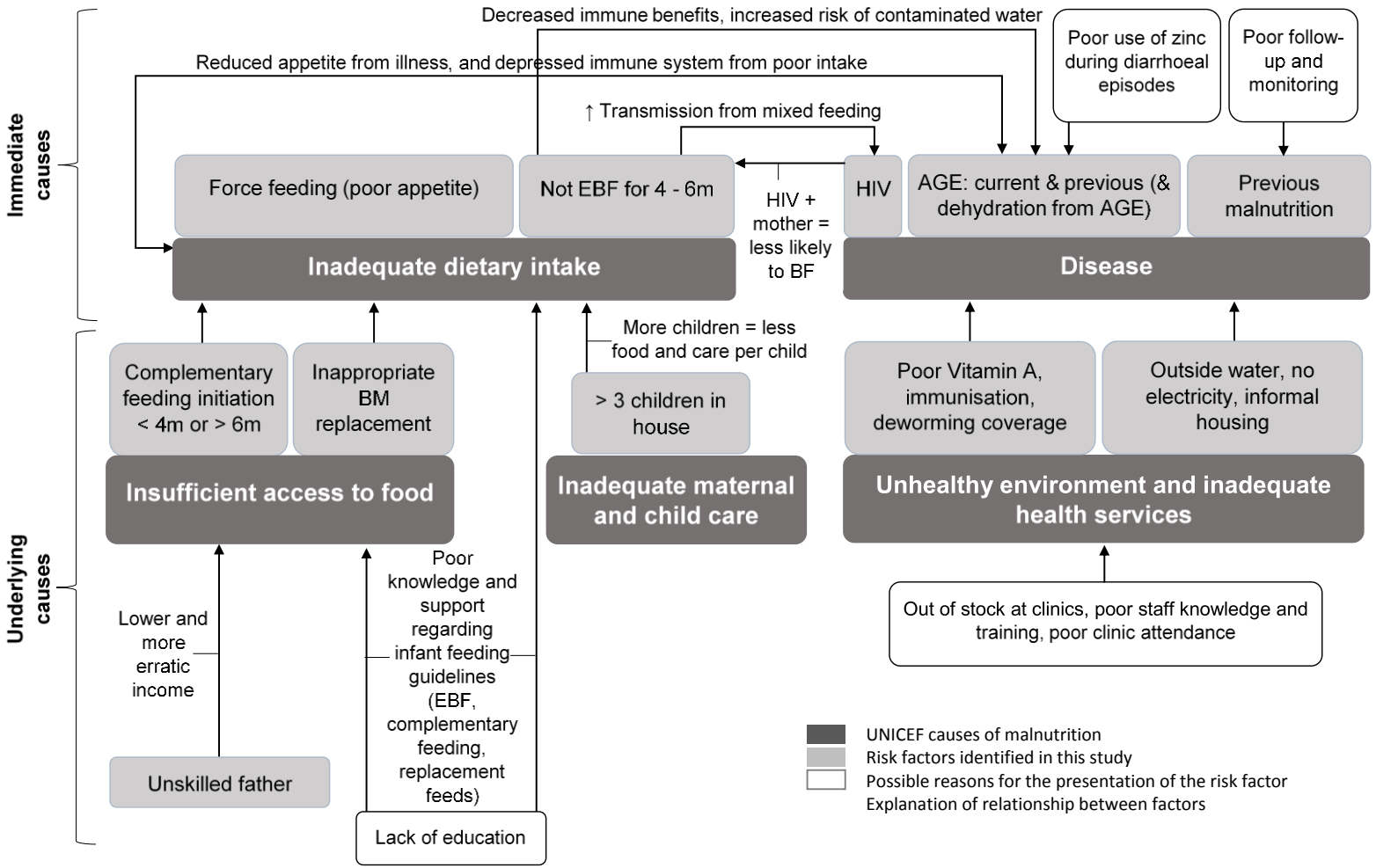


Figure 1 : **Adapted framework of malnutrition**

EBF: Exclusive Breastfeeding; HIV: Human Immunodeficiency Virus; AGE: Acute Gastroenteritis; BM: Breast Milk; UNICEF: United Nations International Children's Fund

**Disease - Immediate cause**

Three major risk factors were identified as disease bearing causes of malnutrition. These were Acute Gastroenteritis (AGE), Human Immunodeficiency Virus (HIV) and a previous diagnosis of malnutrition. AGE was associated with a poor nutritional status ($p < 0.05$). More participants in the SAM group ($n = 32$; 60.38%) and the moderately malnourished group ($n = 24$; 45.28%) were affected by AGE when compared to the well-nourished group ($n = 18$; 33.96%). One factor that affected AGE diagnosis was the current breastfeeding status ($p < 0.05$), with a lower incidence of AGE in those who were currently breastfeeding ($n = 18$; 26.47%) versus those who were not currently breastfeeding ($n = 32$; 43.84%) (Figure 2).

Similarly, a history of diarrhoea was associated with a poor nutritional status ($p < 0.05$). Within the SAM group, 77.36% ($n = 41$) had had diarrhoea in the past year, followed by 66.04% ($n = 35$) in the moderately malnourished group and 54.72% ($n = 29$) in the well-nourished group. Also relating to AGE diagnosis, dehydration on admission was associated with a poor nutritional status ($p < 0.01$). As expected the severity of AGE was more pronounced in the SAM group who were more regularly dehydrated on admission ($n = 31$; 58.49%) than the moderately malnourished group ($n = 22$; 41.51%) and the well-nourished group ($n = 12$; 22.64%).

Twenty-one participants were known to be HIV (13.2%) infected. No well-nourished participants were HIV positive, but as the severity of malnutrition increased, so did the prevalence of HIV ($p < 0.01$). Seven (13.21%) of the moderately malnourished group were HIV positive, and 14 (26.42%) of the SAM group were HIV positive. A previous diagnosis of malnutrition was also associated with a poor nutritional status ($p < 0.05$). The SAM group had the highest percentage of participants who had been previously diagnosed with malnutrition ($n = 7$, 13.21%). This was followed by the moderately malnourished group ($n = 3$, 5.66%). No participants in the well-nourished group had been previously diagnosed with malnutrition. See Table 3 for the results relating to disease.

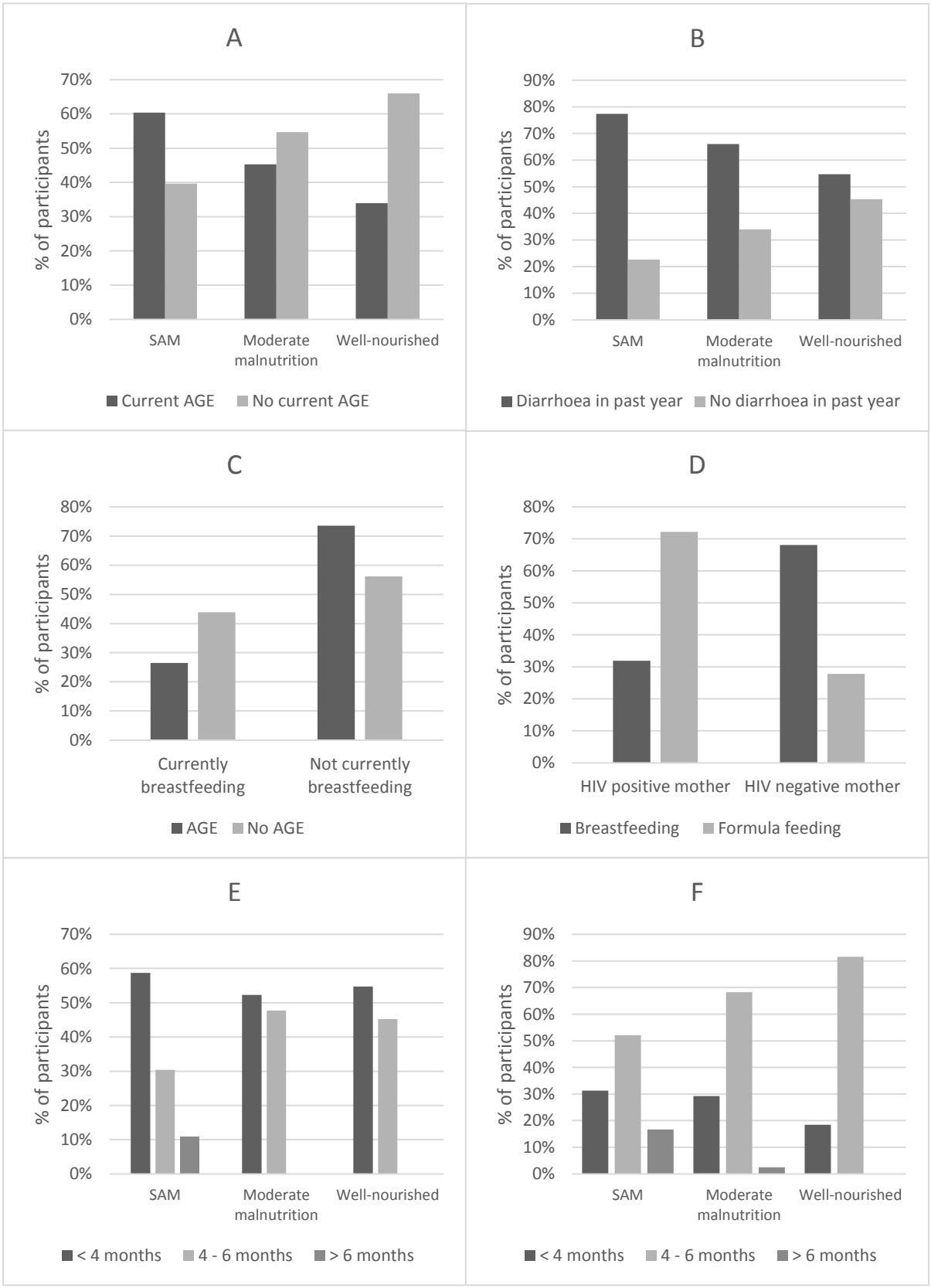


Figure 2 : **Disease and dietary related factors**

A: Prevalence of current acute gastroenteritis diagnosis according to nutritional status*
B: Prevalence of diarrhoea in the past year according to nutritional status*
C: Prevalence of AGE diagnosis according to current breastfeeding status*
D: Prevalence of the infant feeding choice at birth according to HIV status of mother**
E: Prevalence of different durations of exclusive breastfeeding according to nutritional status*
F: Prevalence of different ages of initiation of complementary foods according to nutritional status**
HIV: Human Immunodeficiency Virus; AGE: Acute Gastroenteritis; SAM: Severe Acute Malnutrition; *$p < 0.05$; **$p < 0.01$

Table 3 : **Medical history and healthcare factors**

| Variables | SAM ($n = 53$) | | Moderate malnutrition ($n = 53$) | | Well-nourished ($n = 53$) | | $p$-value |
|---|---|---|---|---|---|---|---|
| | $n$ | % | $n$ | % | $n$ | % | |
| **Has the child had diarrhoea in past year? ($n = 159$)** | | | | | | | |
| Yes | 41 | 77.36 | 35 | 66.04 | 29 | 54.72 | $p < 0.05$[a*] |
| No | 12 | 22.64 | 18 | 33.96 | 24 | 45.28 | |
| **Has the child been previously diagnosed with malnutrition? ($n = 159$)** | | | | | | | |
| Yes | 7 | 13.21 | 3 | 5.66 | 0 | 0.00 | $p < 0.05$[b*] |
| No | 46 | 86.79 | 50 | 94.34 | 53 | 100.00 | |
| **Has the child been diagnosed with an acute respiratory infection? ($n = 159$)** | | | | | | | |
| Yes | 14 | 26.42 | 21 | 39.62 | 25 | 47.17 | $p = 0.083$[a] |
| No | 39 | 73.58 | 32 | 60.38 | 28 | 52.83 | |
| **Is the child HIV positive? (n=159)** | | | | | | | |
| Yes | 14 | 26.42 | 7 | 13.21 | 0 | 0.00 | $p < 0.01$[a*] |
| No | 39 | 73.58 | 46 | 86.79 | 53 | 100.00 | |
| **Has the child been diagnosed with tuberculosis? ($n = 159$)** | | | | | | | |
| Yes | 3 | 5.66 | 2 | 3.77 | 0 | 0.00 | $p = 0.372$[b] |
| No | 50 | 94.34 | 51 | 96.23 | 53 | 100.00 | |
| **Has the child been diagnosed with acute gastroenteritis? ($n = 159$)** | | | | | | | |
| Yes | 32 | 60.38 | 24 | 45.28 | 18 | 33.96 | $p < 0.05$[a*] |
| No | 21 | 39.62 | 29 | 54.72 | 35 | 66.04 | |
| **Was the participant dehydrated on admission? ($n = 159$)** | | | | | | | |
| Yes | 31 | 58.49 | 22 | 41.51 | 12 | 22.64 | $p < 0.01$[a**] |
| No | 22 | 41.51 | 31 | 58.49 | 41 | 77.36 | |
| **Are immunisations up-to-date? ($n = 159$)** | | | | | | | |
| Yes | 39 | 73.58 | 49 | 92.45 | 48 | 90.57 | $p < 0.05$[a*] |
| No | 14 | 26.42 | 4 | 7.55 | 5 | 9.43 | |
| **Is the Vitamin A schedule up-to-date? ($n = 159$)** | | | | | | | |
| Yes | 27 | 50.94 | 41 | 77.36 | 42 | 79.25 | $p < 0.01$[a**] |
| No | 26 | 49.06 | 12 | 22.64 | 11 | 20.75 | |
| **Has the participant been dewormed in the last year (if applicable)? ($n = 62$)** | | | | | | | |
| Yes | 2 | 6.67 | 7 | 36.84 | 5 | 38.46 | $p < 0.05$[a*] |
| No | 28 | 93.33 | 12 | 63.16 | 8 | 61.54 | |

*Statistical significance $p < 0.05$; ** Statistical significance $p < 0.01$; [a]Chi$^2$ test, [b]Fisher's exact test

**Inadequate dietary intake and inadequate access to food - Immediate and underlying cause**

Inadequate dietary intake is an immediate cause of malnutrition however it is affected by insufficient access to food. There were a number of dietary related factors that were associated with nutritional status, as illustrated in Table 6 (Supplementary Material). Figure 2 shows the prevalence of some of these factors in relation to nutritional status. The number of participants that started off with breastfeeding from birth was identical in each group ($n = 47$; 88.68%), meaning that infant feeding choice from birth did not affect nutritional status. However, maternal HIV status was associated with infant feeding choice ($p < 0.01$). More of the HIV positive mothers chose to formula feed ($n = 13$; 72.22%) when compared to the HIV negative mothers ($n = 5$, 27.78%).

Although the decision to breastfeed at birth did not affect nutritional status, a shorter exclusive breastfeeding duration was associated with a poor nutritional status ($p < 0.05$). Data indicates that participants diagnosed with SAM had the lowest rates of exclusive breastfeeding between 4 – 6 months ($n = 14$, 30.43%) compared to the moderately malnourished ($n = 21$, 47.73%) and well-nourished ($n = 19$, 45.24%) groups. Similarly, the results regarding initiation of complementary foods found that introduction of solids before four months of age was associated with the incidence of SAM ($n = 15$; 31.25%) and moderate malnutrition ($n = 12$, 29.27%), compared to 18.42% ($n = 7$) in the well-nourished group ($p < 0.01$). The late introduction of solids (more than six months) was mostly present in the SAM group ($n = 8$, 16.67%), compared to 2.44% ($n = 1$) in the moderately malnourished group and none in the well-nourished group. This same pattern is reflected in the timing of initiation of starch as a complementary food and its significant association with a poor nutritional status ($p < 0.01$). The early introduction of starchy foods was similarly high in both the SAM ($n = 13$, 27.08%) and moderately malnourished ($n = 11$, 26.83%) groups, compared to 13.51% ($n = 5$) in the well-nourished group. As with the late introduction of solids in general, the introduction of starchy foods after six months of age was highest in the SAM group ($n = 12$, 25%), with only 2.44% ($n = 1$) in the moderately malnourished group and 2.7% ($n = 1$) in the well-nourished group.

There were 67 (73.6%) participants that stopped breastfeeding before the age of one year. The most common reasons given for this were medical-related conditions (such as the mother becoming ill, the child becoming ill, fear of HIV transmission, and the mother being on medication that she thought would afftect her breastmilk), difficulty breastfeeding, and the mother returning to work ($p < 0.05$). Of the participants that stopped breastfeeding before one year old, the inappropriate choice of replacement feeds was significantly associated with the incidence of SAM ($p < 0.05$). The SAM group was the only group that contained participants ($n = 6$; 20%) who gave inappropriate replacement feeds, such as tea or water (as opposed to formula feeds).

With regard to diet history, the data shows that the daily consumption of meat was associated with a poor nutritional status ($p < 0.01$). The group that had the highest percentage of participants who consumed meat daily was the SAM group ($n = 9$, 18.75%), who also had the highest average age, indicating the age appropriateness to consume meat. The group with the lowest percentage of participants who consumed meat daily was the well-nourished group ($n = 0$), while the moderately malnourished group had 7.32% ($n = 3$). This was also evident in the daily consumption of sweets and spices ($p < 0.05$ and $p < 0.01$ respectively). The group with greatest percentage of participants who consumed sweets daily was the SAM group ($n = 38$, 79.17%). The moderately malnourished group had the second highest percentage ($n = 26$, 63.41%), followed by the well-nourished group with the lowest percentage of 52.63% ($n = 20$). The SAM group also contained the greatest percentage of participants who consumed daily spices ($n = 30$, 62.5%), compared to 34.15% ($n = 14$) in the moderately malnourished group and 38.95% ($n = 11$) in the well-nourished group.

Force feeding a child, when the child was refusing food, was found to affect the nutritional status ($p < 0.05$). The group with the highest percentage of participants that were force fed was the SAM group ($n = 28$, 52.83%). This was followed by the moderately malnourished group ($n = 17$, 32.08%) and the group with the lowest percentage was the well-nourished group ($n = 11$, 20.75%).

The receipt of social grants ($p = 0.927$), the number of child grants received in the house ($p = 0.113$), and the household food security ($p = 0.281$), were not associated

with nutritional status. However, interestingly, maternal HIV status was associated with a better food security ($p < 0.01$). Fewer of the HIV positive mothers experienced little/no hunger in the household ($n = 44$; 75.86%) compared to HIV negative mothers ($n = 92$; 91.09%). The participants with SAM were found to be more likely to have a HIV positive mother with a poorer food security (moderate vs little/no hunger) ($p < 0.01$).

**Inadequate health services - Underlying cause**

The status of the participants' immunisation ($p < 0.05$), Vitamin A ($p < 0.01$), and deworming ($p < 0.05$) schedule were all associated with a poor nutritional status (Table 4). The SAM group had the highest percentage of participants that did not have their immunisations ($n = 14$, 26.42%), Vitamin A ($n = 26$, 49.06%) or deworming ($n = 28$, 93.33%) schedules up-to-date. The moderately malnourished and well-nourished groups had similar percentages of participants with incomplete immunisation ($n = 4$, 7.55% and $n = 5$, 9.43% respectively), Vitamin A ($n = 12$, 22.64% and $n = 11$, 20.75% respectively), and deworming schedules ($n = 12$, 63.16% and $n = 8$, 61.54% respectively). This is illustrated in Figure 3.

Table 4 : **Health services factors**

| **Variables** | **SAM ($n = 53$)** | | **Moderate malnutrition ($n = 53$)** | | **Well-nourished ($n = 53$)** | | ***p*-value[a]** |
|---|---|---|---|---|---|---|---|
| | ***n*** | **%** | ***n*** | **%** | ***n*** | **%** | |
| **Are immunisations up-to-date? ($n = 159$)** | | | | | | | |
| Yes | 39 | 73.58 | 49 | 92.45 | 48 | 90.57 | $p < 0.05$* |
| No | 14 | 26.42 | 4 | 7.55 | 5 | 9.43 | |
| **Is the Vitamin A schedule up-to-date? ($n = 159$)** | | | | | | | |
| Yes | 27 | 50.94 | 41 | 77.36 | 42 | 79.25 | $p < 0.01$** |
| No | 26 | 49.06 | 12 | 22.64 | 11 | 20.75 | |
| **Has the participant been dewormed in the last year (if applicable)? ($n = 62$)** | | | | | | | |
| Yes | 2 | 6.67 | 7 | 36.84 | 5 | 38.46 | $p < 0.05$* |
| No | 28 | 93.33 | 12 | 63.16 | 8 | 61.54 | |

*Statistical significance $p < 0.05$; ** Statistical significance $p < 0.01$; [a]Chi$^2$ test

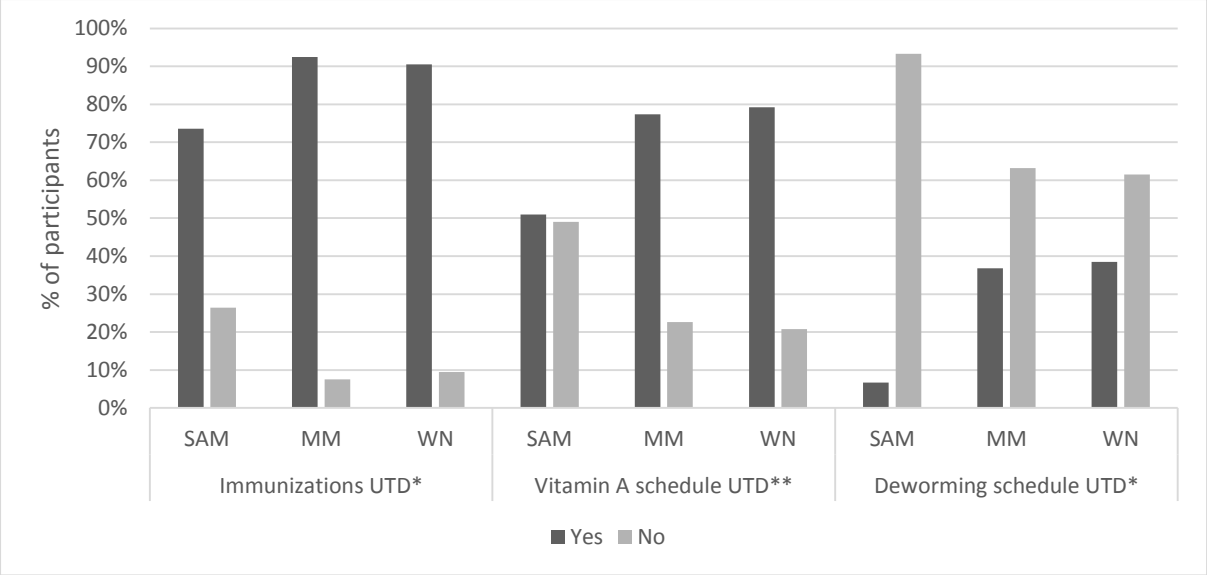


Figure 3 : **Prevalence of completed immunisation, Vitamin A, and deworming schedules, according to nutritional status**

SAM: Severe acute malnutrition; MM: Moderate malnutrition; WN: Well-nourished; UTD: Up-to-date; *$p < 0.05$; **$p < 0.01$

**Poor living environment - Underlying cause**

Participants with SAM were more likely to have an outside water source ($n = 37$; 69.81%), no electricity ($n = 19$; 35.85%), and informal housing ($n = 25$; 47.17%) when compared to the moderately malnourished ($n = 31$, 58.49%; $n = 12$, 22.64%; and $n = 17$, 32.08%) and well-nourished participants ($n = 24$, 45.28%; $n = 8$, 15.09%; and $n = 10$, 18.87%). Refer to Table 6.

**Inadequate maternal and child care - Underlying cause**

An increased number of children under 18 years living in the house was associated with a poor nutritional status ($p < 0.05$), which relates to care of children. The biggest difference between the groups was in the percentage of participants with more than three children under 18 years in the house. This again affected the participants with SAM more severely ($n = 10$; 18.87%) compared to the moderately malnourished ($n = 7$; 13.21%) and the well-nourished participants ($n = 1$; 1.89%), as seen in Table 5.

### Other causes

Participants between the ages of 12 – 24 months had a significantly higher incidence of SAM ($n = 26$; 49.06%), compared to 26.42% ($n = 14$) and 20.75% ($n = 11$) in the moderately malnourished and well-nourished groups respectively ($p < 0.01$).

Although parental education had no effect on nutritional status, the father's work category was associated with a poor nutritional status ($p < 0.05$). The SAM and moderately malnourished groups had similarly higher proportions of unskilled working fathers ($n = 40$; 97.56% and $n = 39$; 95.12% respectively) compared to the well-nourished group ($n = 38$; 82.61%).

Table 5 : **Other underlying factors**

| **Variables** | **SAM ($n = 53$)** | | **Moderate malnutrition ($n = 53$)** | | **Well-nourished ($n = 53$)** | | **$p$-value [a]** |
|---|---|---|---|---|---|---|---|
| | **$n$** | **%** | **$n$** | **%** | **$n$** | **%** | |
| **Children < 18 years in house** | | | | | | | |
| 1 | 16 | 30.19 | 25 | 47.17 | 21 | 39.62 | $p < 0.05$* |
| 2-3 | 27 | 50.94 | 21 | 39.62 | 31 | 58.49 | |
| >3 | 10 | 18.87 | 7 | 13.21 | 1 | 1.89 | |
| **Water source** | | | | | | | |
| Inside | 16 | 30.19 | 22 | 41.51 | 29 | 54.72 | $p < 0.05$* |
| Outside | 37 | 69.81 | 31 | 58.49 | 24 | 45.28 | |
| **Electricity** | | | | | | | |
| Yes | 34 | 64.15 | 41 | 77.36 | 45 | 84.91 | $p < 0.05$* |
| No | 19 | 35.85 | 12 | 22.64 | 8 | 15.09 | |
| **Dwelling type** | | | | | | | |
| Permanent structure † | 28 | 52.83 | 36 | 67.92 | 43 | 81.13 | $p < 0.01$** |
| Informal housing ‡ | 25 | 47.17 | 17 | 32.08 | 10 | 18.87 | |

*Statistical significance $p < 0.05$; ** Statistical significance $p < 0.01$; [a]$Chi^2$ test; † Permanent structure: House, flat, room, RDP; ‡ Informal housing: Shack, wooden hut

### Discussion

This study aimed to identify the risk factors for SAM and moderate malnutrition. Many of the significant factors were associated with both SAM and moderate malnutrition. However, there were some differences, and many of the factors

occurred more frequently in the participants with SAM compared to the participants with moderate malnutrition. A participant with SAM had, on average, more of the factors present that were significantly associated with nutritional status when compared to the participants with moderate malnutrition. This indicates that more factors occur, in combination, in participants with SAM versus participants with moderate malnutrition, highlighting the fact that multiple factors need to be addressed to minimise the occurrence of SAM.

The factors are categorised based on whether they are immediate or underlying causes of malnutrition, as defined by UNICEF. The relationship between the factors will be discussed in the context of this framework (Figure 1). The UNICEF framework illustrates that the underlying (and basic) causes affect the immediate causes of malnutrition. However, the different factors often have an effect on other factors within the same level. In order to help identify suitable interventions, strategies and practices that have shown to be effective in addressing the risk factors will be discussed.

## SAM risk factors

### Disease - Immediate cause

One of the immediate causes of malnutrition is disease. This study found that a current diagnosis of AGE, dehydration on current hospital admission, and diarrhoea in the last year were all associated with SAM. Diarrhoea in the last year has been associated with SAM in other studies.[15] A higher frequency of diarrhoea in SAM participants would naturally mean that there would be a higher frequency of dehydration on admission. Diarrhoea has an direct effect on malnutrition, in that it results in a decrease in nutrient absorption.[22] However, there is also a relationship between diarrhoea and dietary intake (the other immediate cause of malnutrition). Diarrhoea causes a decrease in nutrient intake due to loss of appetite and poor feeding practices during diarrhoeal episodes, while an inadequate dietary intake can affect diarrhoea by resulting in a supressed immune system, which would increase the risk of infection.[22]

A child or infant that was currently breastfeeding had a lower incidence of AGE, thus highlighting the importance of the promotion of breastfeeding as a strategy to reduce AGE. The beneficial effects of breastmilk are well-known, improving immunity and

decreasing the exposure to enteric pathogens.[7] Exclusive breastfeeding also reduces the risk of ingestion of contaminated water.[23]

A diagnosis of HIV was a risk factor for SAM. HIV has previously been shown to be associated with SAM in South Africa.[15] A meta-analysis conducted using studies in Sub-Saharan Africa found that there was an HIV prevalence of 29.2% amongst children with SAM.[24] This is comparable with the prevalence of 26.42% ($n = 14$) in the SAM group in this study. It is well documented that HIV positive children have a 10% increase in energy requirements if they are asymptomatic and a 50 – 100% increase in requirements if they are losing weight.[8] If these requirements are not met, it would result in poor growth. Since this effect is present from early in life, growth faltering can occur even before any symptoms are present.[8] This highlights the importance of following the Prevention of Mother-to-Child Transmission (PMTCT) principles. These principles start with regular HIV Counselling and Testing (HCT) for HIV negative women during antenatal visits and while breastfeeding.[25] If a pregnant woman is diagnosed as HIV positive, or known to be HIV positive, ARVs should be initiated.[25] With regards to infant feeding, HIV exposed infants should exclusively breastfed for six months (with six or 12 weeks of NVP, depending on viral load suppression of the mother), complementary feeding should start at six months, and breastfeeding should continue until 12 months (and stopped over one month). HIV testing for the infant should occur according to the PMTCT schedule.[25] It also highlights the importance of close monitoring and early treatment of HIV positive infants and children.

A somewhat obvious, but nonetheless disturbing, finding was that a previous diagnosis of malnutrition was associated with an increased prevalence in SAM. This reflects the lack in proper prevention strategies to reduce the recurrence of malnutrition. Children previously diagnosed with malnutrition therefore need frequent follow-ups and close monitoring. This may indicate that although the immediate causes of malnutrition are dealt with in hospital (meeting nutritional needs and treating disease), once a child is discharged the underlying and basic causes are still present and results in the return of malnutrition, thus highlighting the need to address these underlying causes.

**Inadequate dietary intake and inadequate access to food - Immediate and underlying cause**

Dietary related risk factors sometimes overlap as an immediate and underlying cause of malnutrition. However, since dietary related factors are often related, they will all be discussed together.

Infant feeding choice from birth did not affect nutritional status, but exclusive breastfeeding duration did. The South African Demographic and Health Survey (SADHS) from 2003 show that even though breastfeeding initiation is common in South Africa, exclusive breastfeeding is not the norm.[26] Infant feeding choice from birth was, however, affected by the HIV status of the mother. A mother who was HIV positive was more likely to formula feed compared to HIV negative mothers. This indicates the importance of education to mothers regarding the PMTCT principles and infant feeding guidelines in the context of HIV.

This study found that continued exclusive breastfeeding from birth up to six months (this includes continued exclusive breastfeeding between four to six months) was protective against SAM. Exclusive breastfeeding beyond six months was not protective against SAM. This result was expected since poor breastfeeding practices, and specifically a lack of exclusive breastfeeding for six months, have been identified as risk factors for SAM in various other studies.[13,15,14] Exclusive breastfeeding provides vital nutrition for a child's growth and development, and increasing the rates of exclusive breastfeeding can help in the progress towards global nutrition targets.[27] The duration of exclusive breastfeeding and the initiation of complementary foods are interrelated. The WHO recommends that food should be introduced to a child at the age of 6 months.[28] This study found that early or delayed introduction of complementary foods (before four months or after six months) were also associated with SAM, which is similar to findings in other studies.[13,7]

If a mother stops breastfeeding while the child is less than one year old, an appropriate replacement feed should be given in order to meet nutritional needs.[29] Inappropriate replacement feeds after early breastfeeding cessation was identified as a risk factor for SAM. The inappropriate feeds were water, tea, or only food. This could be as a result of lack of resources to purchase appropriate replacement feeds or as a result of lack of knowledge regarding appropriate replacement feeds. This

emphasises the need of continued support of mothers to continue to breastfeed to two years and beyond so that replacement feeds are not needed. Or, if breastfeeding does stop before one year, mothers need to be educated regarding appropriate replacement feeds.

Force feeding the child upon refusal of food was identified as a risk factor for SAM. A child with an infection or malnutrition is more likely to have a poor appetite, which could lead to parental anxiety resulting in the mother force feeding her child. However, the UNICEF conceptual framework of malnutrition highlights the importance of child caring practices, of which responsive feeding is a part. Responsive feeding involves the caregiver responding to the child's feeding cues in an appropriate manner.[30] Poor feeding behaviours, including force-feeding, have been associated with a lower intake of food.[30] This highlights the fact that education surrounding infant and young child feeding should not only include types of foods, but also feeding practices. The daily consumption of meat, sweets and spices were associated with SAM. The association with SAM and the daily consumption of sweets could be explained since the sweets may displace more nutritional foods. However, this is likely an incidental finding, and should be interpreted with caution since it relied on a food frequency questionnaire which is affected by recall bias.

Although an HIV positive mother and a poorer food security were not significantly associated with SAM on their own, the prevalence of SAM was increased when there was both an HIV positive mother and poorer food security (moderate vs little/no hunger). This knowledge could help in the screening of children to find those at risk of SAM.

**Inadequate health services - Underlying cause**

Incomplete immunisation, Vitamin A, and deworming schedules were all risk factors for SAM. Results from this study indicates that 23 (14.47%) participants had missed at least one immunisation, 49 participants (32.89%) had missed at least one dose of Vitamin A, and 48 (77.42%) participants had not been dewormed in the last year (of those $>$ 1 year old). These factors were all seen more frequently in the participants with SAM, and thus identified as major risk factors for SAM. Incomplete immunisations have previously been associated with SAM.[14] Immunisations affect nutritional status because they help to prevent the diseases that can often result in

the worsening of nutritional status.[3] Having an incomplete Vitamin A schedule would increase the risk of a Vitamin A deficiency, which increases the risk of infections, xeropthalmia, and mortality.[31] The prevalence of Vitamin A deficiency in children under five years old in South Africa in 2012 was 43.6%, making it a severe public health problem.[31] Deworming prevents the loss of nutrients (through the treatment of worm infections) and therefore improves micronutrient status and can marginally increase weight.[32,33]

All of these factors imply either a poor clinic attendance, stock issues at clinics, or poorly trained staff. Staff would need to be trained on the correct use of the RTHB, which indicates the schedules of immunisations, vitamin A, and deworming. The issue of poorly trained staff on the RTHB has been identified in a study performed in Cape Town.[34] A study conducted in 2005, looking at the quality of care offered to children at primary healthcare clinics in Johannesburg, found that (in well children) while immunisations were given to all eligible children, 36% of eligible children did not receive a Vitamin A dose, and 96% of eligible children were not dewormed.[35] The problem that needs addressing is therefore both poor clinic attendance by caregivers and poor delivery of basic healthcare services by the clinics.

**Poor living environment – Underlying cause**

An outside water source, no electricity, and informal housing were all associated with SAM. These are all indicators of poverty, which has previously been associated with SAM.[15] An unsanitary environment can increase the prevalence of infectious diseases, and improving water access, sanitation, and housing can promote a healthy envirmonment.[36] Improved access to water, electricity, and formal housing is important, and should form part of a long-term strategy. However, education regarding sanitation and hand washing will also have a positive effect on disease, and has been shown to reduce the risk of diarrhoea.[32] This should therefore form a part of education given at healthcare facilities. It should also form part of the curriculum at schools, as it is an ideal forum to instil the importance of sanitation and hand washing at a young age.

**Inadequate maternal and child care – Underlying cause**

Having more than three children in the house was associated with SAM, and these results are supported by other studies.[13] More children in the house mean that there

is less childcare and resources (e.g. food) available per child, which would affect growth rate.[37] This can be used as a factor in screening to identify children at risk of malnutrition.

**Other causes**

The results of this study indicate that the prevalence of SAM is increased in children 12 – 24 months old. Many of the studies looking at risk factors for SAM were case-control studies that matched for age, so age would naturally not have been identified as a risk factor.[13,14,15] However, one study found that an age of more than 11 months was a risk factor for SAM.[7] The age when children enter the weaning period (6 – 18 months) often results in a trend of decreased growth that is thought to be due to poor quality of complementary foods, a decrease in breastfeeding, and an increased number of infections.[38,39] This highlights the importance of addressing factors that affect nutritional status at an early age.

Having an unskilled working father was associated with SAM. A father with unskilled work would mean that the income would be lower and more erratic than income received from skilled work. This would naturally affect money available for food and other basic requirements. As was the case with more children in the house, this would mean less resources available per child.

**Moderate malnutrition risk factors**

Many of the risk factors for SAM were also present for moderate malnutrition. However, unless specified, the prevalence of these factors in participants with moderate malnutrition was lower than it was for the participants with SAM. As with SAM, a diagnosis of AGE, diarrhoea in the last year, dehydration on admission, a positive HIV diagnosis, and previous malnutrition diagnosis were all associated with moderate malnutrition. Although other studies found an association between a history of diarrhoea and moderate malnutrition,[12,40,41,42,43] they all specified the diarrhoea in the last two to four weeks. This study did not look at the exact time frame of the history of diarrhoea, only that it was in the past year. The fact that the prevalence of a history of diarrhoea was lower in the MAM group than the SAM group could be due to the fact that the mean age of the SAM group was older, thus having more time to contract diarrhoea.

Introducing complementary foods (and specifically starchy foods) before four months was associated with moderate malnutrition. Other studies found that poor complementary feeding practices in general were associated with moderate malnutrition.[44,45] Daily consumption of 6, sweets and spices were associated with moderate malnutrition, but, as with SAM, should be interpreted with caution. Force feeding a child on refusal of foods, which is likely as a response to a poor appetite, goes against the practices of responsive feeding, and was also associated with moderate malnutrition. Poor responsive feeding techniques have previously been associated with malnutrition.[46]

Outside water, no electricity, informal housing were all associated with moderate malnutrition, and similar results were seen in other studies (specifically related to unsanitary toilets,[18,7,47,45,38] an increased distance to a water source, and an unprotected water source[10,45]). Having more than 3 children in the house, also identified in another study, was associated with moderate malnutrition.[41]

An age of 1 – 2 years was associated with moderate malnutrition, which has been identified before.[41,48] Having an unskilled working father was also a risk factor for moderate malnutrition but to a similar degree as SAM. This was also seen in other studies.[12]

As previously discussed, many of the factors that were associated with nutritional status were most prevalent in the SAM group and least prevalent in the well-nourished group, and the prevalence for the moderately malnourished group was somewhere in between the other two groups. However, there were some factors that were associated with SAM, but not with moderate malnutrition, evident from the fact that the prevalence was higher in the SAM group but similar in both the moderately malnourished group and the well-nourished group. These factors were: exclusive breastfeeding less than four months or more than six months; inappropriate replacement feeds after early breastfeeding cessation; the late introduction of solids; and immunisations, Vitamin A, deworming schedules that were not up-to-date. It is unclear why the factors relating to breastfeeding would have been associated with SAM and not with moderate malnutrition. However, the factors relating to basic healthcare could be due to the fact that the average age of the participants increased as the severity of their malnutrition increased. Children's attendance to clinics tend to

decrease as the child gets older. Therefore, since the average age of the SAM participant was more than the moderately malnourished participant, they would have more of a chance of missing their clinic visits, giving it more time to have an effect on nutritional status. Regardless of the reasons, special attention needs to be placed on addressing these factors. Emphasis should be placed on clinic attendance according to the required schedule, and staff should be correctly trained to administer the required schedules of immunisations, Vitamin A, and deworming. The support, promotion, and protection of correct breastfeeding practices (and other infant and young child feeding practices) is vital.

**Conclusion and recommendations**

The factors associated with SAM are diverse (relating to socio-demographics and socioeconomics; infant and young child feeding; and medical history and healthcare services), which emphasises the fact that there needs to be a focus on multiple interventions in order to reduce the prevalence of SAM. The results of this study can be used to determine which specific areas need to be prioritised so that preventative intervention strategies for SAM can be developed, or given priority to, in this community. The information can also be used to timeously identify vulnerable children in order to prevent development of SAM.

The first 1 000 days of life (from conception to 2 years old) has been identified as the most important time to meet nutritional requirements because there are increased nutritional needs due to rapid growth and development, an increased susceptibility to infections, and a total dependence on others.[36,23] Many of the risk factors that were identified in this study pertain to the first 1 000 days of life. This illustrates that interventions with the greatest impact on nutritional status, need to happen in the 1 000 day window.[49]

Based on the findings of this study, interventions during this time period should relate to: 1) infant and young child feeding (including breastfeeding and complementary feeding guidelines); 2) promotion of healthy practices and the use of health services 3) prevention and treatment of micronutrient deficiencies; 4) prevention and treatment of SAM; 5) promotion of good sanitation; and 6) maternal nutrition.

Optimising infant and young child feeding is a critical aspect of the interventions in the first 1 000 days, especially the guidelines relating to exclusive breastfeeding

duration. Not only would exclusively breastfeeding for six months directly improve nutritional status, but it would also have a beneficial effect on disease related factors. A review from 42 countries showed that death from diarrhoea, pneumonia, and neonatal sepsis was successfully reduced through the promotion, support, and protection of breastfeeding.[26] Therefore, addressing the barriers to breastfeeding through continued counselling and support of mothers (from healthcare professionals and community counsellors) and education of mothers and the general public regarding key principles of breastfeeding is important. HIV and infant feeding have an effect on each other because an HIV positive mother was less likely to breastfeed, and incorrect infant feeding principles can increase the transmission of HIV to the infant. Therefore, improved education regarding the PMTCT principles is required (e.g. HCT during pregnancy and breastfeeding, exclusive breastfeeding for six months, complementary food initiation at six months, continued breastfeeding until one year, and breastfeeding cessation over one month). As discussed, exclusive breastfeeding for six months is important, however, this goes hand-in-hand with initiating complementary foods at six months of age. Therefore, education regarding complementary feeding principles should be relayed to caregivers.

This study identified an incomplete Vitamin A, deworming, and immunisation schedule as risk factors for SAM. This poor coverage could be due to either poor attendance or poor services (either stock issues or poor training of staff) at the clinics. Awareness needs to be spread regarding the importance of clinic attendance, and this should start being communicated at antenatal clinics. A strategy that has worked in other countries is using clinic attendance as a requirement for receiving grants. Holding child healthcare days is an intervention that has helped many developing countries with administering missed doses of Vitamin A, deworming, and immunisations.[36] Stock levels need to be monitored and if this is a reason for poor coverage, it needs to be addressed urgently. To deal with the possibility that poor coverage could be due to poorly trained staff, enough emphasis needs to be placed on the recruiting, training, supporting and deploying of healthcare workers in order to strengthen services at basic healthcare facilities.[23] This would have an effect on other risk factors, since healthcare facilities is where mothers should receive education and support in various areas (e.g. breastfeeding support), and is therefore critical.

Other important aspects or interventions that would have a positive effect on malnutrition prevalence are: the routine administration of zinc as part of the management of diarrhoea;[50] iron supplementation to children with iron deficiency; optimising a mother's nutritional status; the monitoring and continued support of previously malnourished children; and encouraging good hygiene and sanitation.

In order to properly monitor and evaluate the success of an implemented programme or policy, it is important to have a system in place that collects data regarding the delivery and effects of a program.[49] If an intervention or policy is in place but is poorly implemented, the issues around implementation need to be addressed.[49]

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## SUPPLEMENTARY MATERIAL

Table 6 : **Dietary related factors**

| Variables | SAM ($n = 53$) | | Moderate malnutrition ($n = 53$) | | Well-nourished ($n = 53$) | | $p$-value |
|---|---|---|---|---|---|---|---|
| | $n$ | % | $n$ | % | $n$ | % | |
| **Infant feeding choice at birth ($n = 159$)** | | | | | | | |
| Breastfeeding | 47 | 88.68 | 47 | 88.68 | 47 | 88.68 | $p = 1^{a}$ |
| Formula feeding | 6 | 11.32 | 6 | 11.32 | 6 | 11.32 | |
| **Exclusive breastfeeding duration ($n = 133$)** | | | | | | | |
| < 4 months | 27 | 58.70 | 23 | 52.27 | 23 | 54.76 | $p < 0.05^{b*}$ |
| 4 - 6 months | 14 | 30.43 | 21 | 47.73 | 19 | 45.24 | |
| > 6 months | 5 | 10.87 | 0 | 0.00 | 0 | 0.00 | |
| **Are you still breastfeeding (if applicable)? ($n = 141$)** | | | | | | | |
| Yes | 8 | 17.02 | 23 | 48.94 | 19 | 40.43 | $p < 0.01^{a**}$ |
| No | 39 | 82.98 | 24 | 51.06 | 28 | 59.57 | |
| **What did you replace the breast milk with? ($n = 67$)** | | | | | | | |
| Formula | 24 | 80.00 | 15 | 100.00 | 22 | 100.00 | $p < 0.05^{b*}$ |
| Other (tea, water, only food) | 6 | 20.00 | 0 | 0.00 | 0 | 0.00 | |
| **When did you start to give your child solids? ($n = 127$)** | | | | | | | |
| < 4 months | 15 | 31.25 | 12 | 29.27 | 7 | 18.42 | $p < 0.01^{b**}$ |
| 4 - 6 months | 25 | 52.08 | 28 | 68.29 | 31 | 81.58 | |
| > 6 months | 8 | 16.67 | 1 | 2.44 | 0 | 0.00 | |
| **If your child refuses food, what do you normally do? ($n = 159$)** | | | | | | | |
| Stop trying to feed him/her and put the food away | 11 | 20.75 | 17 | 32.08 | 18 | 33.96 | $p < 0.05^{a*}$ |
| Pause for a while, and try again in a few minutes | 14 | 26.42 | 19 | 35.85 | 24 | 45.28 | |
| Make your child eat the food, even though he/she doesn't want it | 28 | 52.83 | 17 | 32.08 | 11 | 20.75 | |

*Statistical significance $p < 0.05$; ** Statistical significance $p < 0.01$; [a]Chi$^2$ test, [b]Fisher's exact test

† Breastfeeding issues: Perceived not enough milk, breast problems, baby refused breast

‡ Medical related issues: Mom became ill, child became ill, fear of HIV transmission, on medication

# CHAPTER 4

# CONCLUSIONS AND RECOMMENDATIONS

# 4. CHAPTER 4 – CONCLUSIONS AND RECOMMENDATIONS

This chapter provides a brief description of the study objectives and study design, and addresses the study objectives. General conclusions and recommendations are given, based on the results. Finally, any further research recommendations and limitations of the study are discussed.

## 4.1 A brief description of the study objectives and design

More than one-third of all deaths under five years of age (not including the neonatal period) can be attributed to underlying undernutrition.[1] Children with severe acute malnutrition (SAM) have a mortality rate 9.4 times higher than children who are not wasted.[1,2] Malnutrition, especially SAM, has significant consequences for survival, disease prevalence, healthy development and economic productivity.[3] Therefore, addressing malnutrition will save lives now, maximise economic opportunities and help to decrease the risk of chronic disease in the future.[4]

In 1994, the South African Vitamin A Consultative Group (SAVACG) determined that the prevalence of severe wasting (one of the criteria for SAM) was 0.4% (for 6–71 months), and in 2012 the South African National Health and Examination Survey (SANHANES) estimated it at 0.8% (for 0–14 years).[5,6] These numbers show an increase in SAM, and probably underestimate prevalence since they only used weight-for-length/height as a diagnostic criteria, and not a mid-upper arm circumference (MUAC) of <11.5cm or bilateral oedema. Therefore, malnutrition is an important public health issue and primary and secondary prevention of childhood malnutrition is vital.[7] It is important to have an understanding of the risks, causes, extent and distribution of diseases in order to work on strategies for improving a population's health.[8]

There have been several studies investigating the risk factors (specifically socioeconomic, demographic and health) for malnutrition in young children. However, most of the studies assessed risk factors for various forms of moderate malnutrition,[9,10,11,12,13,14] and few looked specifically at risk factors associated with SAM.[15,16,17] Few of these studies were conducted in South Africa, with most occurring in countries across Africa and Asia. Risk factors for malnutrition vary in different settings, and few epidemiological patterns are consistent globally.[18]

Therefore, specific populations need to be identified that call for context-specific approaches.[2]

The aim of this study was to determine which risk factors are associated with the development of SAM in vulnerable children under five years old who reside in the City of Johannesburg. A descriptive, cross-sectional study was conducted to determine the risk factors associated with SAM. Convenience sampling was used to include participants and children admitted to Rahima Moosa Mother and Child Hospital formed part of the study population. Data was collected by performing anthropometrical measurements and through a series of questionnaires that the participant's mother/caregiver answered. Measurements included weight, height/length, head circumference and MUAC. Anthropometric data were classified according to the World Health Organization (WHO) standards.

Data were described using means, standard deviations and percentages. The relationship between the three groups (SAM, moderate malnutrition and well-nourished) and other nominal variables was investigated with contingency tables and appropriate Chi-squared or Fisher's exact tests.

## 4.2 Addressing the study objectives

### 4.2.1 Risk factors associated with SAM

The first objective of this study was: *to determine the risk factors and the degree to which they are associated with severe acute malnutrition in children under five years old who reside in Region B and surrounding referral areas of the City of Johannesburg.*

A chi$^2$ test (or Fisher's exact, where relevant) was used to determine if there was an association between nutritional status and the different variables. The variables that had an association with nutritional status were said to be a risk factor for SAM if their prevalence was significantly higher in the SAM group compared with the well-nourished group.

Based on this, the following were identified as risk factors for SAM: An age of 12–24 months; an HIV-positive diagnosis; previous malnutrition diagnosis; inappropriate choice of replacement feeds after early cessation of breastfeeding; acute gastroenteritis (AGE) diagnosis; diarrhoea in the past year; dehydration on

admission; immunisations not up-to-date; Vitamin A doses missed; no deworming in the past year; early or late introduction of solids; early introduction of starchy foods; the daily consumption of meat, spices and sweets; force-feeding when food was refused; having more than three children in the house; an unskilled working father; an outside water source; no electricity; and informal housing. The SAM participants also had the lowest rates of exclusive breastfeeding (4–6 months).

### 4.2.2 Risk factors associated with moderate malnutrition

The second objective was: *to determine the risk factors and the degree to which they are associated with moderate malnutrition and/or growth failure in children under five years old who reside in Region B and surrounding referral areas of the City of Johannesburg.*

With respect to SAM, the variables that had an association with nutritional status were said to be a risk factor for moderate malnutrition if their prevalence was significantly higher in the moderately malnourished group compared with the well-nourished group.

Based on this, the following were identified as risk factors for moderate malnutrition: An age of 12–24 months; having more than three children in the house; an unskilled working father; an outside water source; no electricity; informal housing; early introduction to solids; daily consumption of meat, sweets and spices; force-feeding a child on refusal of food; a diagnosis of AGE; diarrhoea in the past year; dehydration on admission; a positive HIV diagnosis; and previous malnutrition diagnosis.

### 4.2.3 Comparison of risk factors associated with SAM and moderate malnutrition

The final objective was: *to compare the risk factors associated with the following groups: (i) severe acute malnutrition, (ii) moderate malnutrition and growth failure and (iii) well-nourished, in children under five years old who reside in Region B and surrounding referral areas of the City of Johannesburg.*

As evident above, some risk factors were associated with both SAM and moderate malnutrition. These included: An age of 12–24 months; more than three children in the house; an unskilled working father; an outside water source; no electricity; informal housing; early introduction to solids; daily consumption of meat, sweets and

spices; force-feeding a child on refusal of food; a diagnosis of AGE; diarrhoea in the last year; dehydration on admission; a positive HIV diagnosis; and previous malnutrition diagnosis. All these factors (except for unskilled working father) had a higher prevalence in the SAM group than the moderately malnourished group.

When comparing the participants with SAM and the participants with moderate malnutrition, the SAM participants had more of the factors present that were significantly associated with nutritional status. This indicates that more factors occur in combination in participants with SAM than in participants with moderate malnutrition. This means that malnutrition was more likely to be more severe if an individual had more risk factors present, which highlights the fact that multiple factors need to be addressed to minimise the occurrence of SAM.

Some factors were associated with SAM but not with moderate malnutrition. These factors had a higher prevalence in the SAM group but similar prevalence in both the moderately malnourished group and the well-nourished group. These factors were: exclusive breastfeeding less than four months or more than six months; inappropriate replacement feeds after early breastfeeding cessation; the late introduction of solids; and immunisations, Vitamin A and deworming schedules that were not up-to-date.

## 4.3 Conclusion

The findings of this study provide insight into the risk factors associated with SAM. According to the UNICEF framework, many of the factors that are specific to children diagnosed with SAM are immediate causes of malnutrition. This emphasises the fact that an accumulation of underlying debilitating causes affect the wellbeing of a child over time. Since factors associated with SAM are diverse, there needs to be a focus on multiple interventions in order to reduce its prevalence.

This research showcases the importance of aiming these interventions at the first 1 000 days of a child's life. Children's health deteriorates with poor breastfeeding practices, insufficient dietary intake and suboptimal primary health care, which emphasises the importance of focusing on interventions relating to these areas. The information from this study can also be used to timeously identify vulnerable children in order to prevent development of SAM.

## 4.4 Recommendations

UNICEF developed the conceptual framework of malnutrition, indicating determinants of child malnutrition, more than 20 years ago, and it is still relevant today. It indicates how malnutrition is not simply a result of a lack of adequate food, but also a result of illness, poor care practices and lack of health services.[19] This implies that there is no single recommendation for the prevention of malnutrition, but rather that it needs to be addressed from multiple avenues.

If one looks at the entire lifecycle, the first 1 000 days of life (from conception to two years old), is the most important time to meet nutritional requirements.[19] During the first 1 000 days a child has increased nutritional needs due to rapid growth and development, is more susceptible to infections and is totally dependent on others.[19,20] Therefore, the quality of nutrition in the first 1 000 days of life is a determining factor for a child's future, and if nutrient requirements are not met in this period, irreversible damage often results.[19,20] Many of the risk factors that were identified in this study can be addressed in the first 1 000 days of life, emphasising the fact that interventions that will have the greatest impact on nutritional status need to happen in the 1 000 day window.[21]

Many organisations, including UNICEF,[20,19] WHO,[22] The United States Agency for International Development (USAID),[23] and 1,000 Days,[21] have developed core interventions to address the requirements in this critical stage in the life cycle. These interventions include aspects relating to: 1) maternal nutrition; 2) infant and young child feeding (including breastfeeding and complementary feeding guidelines); 3) prevention and treatment of micronutrient deficiencies; 4) prevention and treatment of SAM; 5) promotion of good sanitation; and 6) promotion of healthy practices and the use of health services.[19]

### 4.4.1 Optimising maternal nutrition

This study looked at risk factors for the development of malnutrition that were present and affected an infant after birth (as opposed to in utero). However, it is understood that undernourished mothers often give birth to undernourished infants.[20] Therefore, although not linked to risk factors established in this study, optimising maternal nutrition is also important in addressing child malnutrition.

One of the biggest nutritional problems affecting pregnant women is anaemia, which increases the risk of maternal mortality, premature birth and low birth weight.[20] Supplementation with iron, folic acid or multiple micronutrients can help improve maternal nutritional status.[19]

Education should be given to a mother regarding a healthy, balanced diet (also managing symptoms that may affect nutritional status), and if a mother is undernourished, a protein-energy supplement should be used, as it has been shown to reduce the prevalence of low birth-weight.[19] Antenatal visits should be used as an opportunity to educate mothers on nutrition and to deliver these interventions.[19]

### 4.4.2 Optimising infant and young child feeding

Information on interventions for the first 1 000 days of life places heavy emphasis on optimising infant and young child feeding, with breastfeeding and complementary feeding practices taking centre stage. Optimal infant and young child feeding practices include initiating breastfeeding within one hour of birth, exclusive breastfeeding for six months, initiation of appropriate complementary foods at six months and continued breastfeeding up to two years and beyond (for HIV-unexposed infants).[19]

Looking specifically at this study, breastfeeding practices had a direct association with nutritional status. Exclusive breastfeeding for less than four months or more than six months, and giving inappropriate replacement feeds (when breastfeeding was stopped before one year of age) were identified as risk factors for SAM. Breastfeeding would also have an indirect effect on nutritional status through its relationship with other risk factors. For example, participants who were breastfeeding at the time of the interview had a lower prevalence of AGE, and AGE was a risk factor for SAM.

A review from 42 countries showed that death from diarrhoea, pneumonia, and neonatal sepsis was successfully reduced through the promotion, support and protection of breastfeeding,[24] thus making breastfeeding an important aspect of disease prevention. Considering the aforementioned relationships (direct or indirect) between breastfeeding and nutritional status, it is important to implement interventions relating to breastfeeding to decrease the prevalence of malnutrition.

These interventions need to address duration of exclusive breastfeeding, overall duration of breastfeeding and appropriate replacement feeds.

There are currently policies and programmes in place that promote, protect and support the various principles of breastfeeding, including the Integrated Management of Childhood Illness (IMCI) and the Mother-Baby-Friendly Initiative (MBFI). However, the South African Demographic and Health Survey (SADHS) from 2003 shows that even though breastfeeding initiation is common in South Africa, exclusive breastfeeding is not the norm.[24] In 2008, the Baby-Friendly Hospital Initiative (BFHI) conducted a review in eight provinces. It determined that although 73% of mothers were initiating breastfeeding, almost half had given formula by 10 weeks.[24] This highlights the need for strategies to increase exclusive breastfeeding rates in South Africa.

Some barriers to breastfeeding optimally include cultural beliefs, poor knowledge and incorrect information.[20] Mothers and family members often do not know of the advantages of exclusive breastfeeding.[20] The main reasons given in this study for early (<1 year) cessation of breastfeeding were: breastfeeding issues (perceptions of insufficient milk, breast problems, baby refusing the breast), medical related issues (mom became ill, child became ill, fear of HIV transmission, on medication) or the mother returning to work or school.

Many of these barriers can be addressed with support (from family, peers, and healthcare workers) and education or counselling.[20] Counselling should occur during pregnancy, immediately after birth and at specific times after birth.[22] Support for breastfeeding is most critical in the first few weeks of life and should include consistent messages from a variety of avenues, including community workers, family, and healthcare workers.[22]

Support for exclusive breastfeeding needs to continue at regular intervals until six months of age. Although professional counsellors have been shown to be most effective in extending the duration of breastfeeding, some studies have identified lay counsellors as being the most effective in lengthening the duration of exclusive breastfeeding.[24,25,26] The greatest effect is often seen when healthcare workers work together with community workers to offer consistent information, practical support and a screening system to refer mothers who have breastfeeding problems.[27,22]

Therefore, support at healthcare institutes and within communities, using professionals and lay counsellors, is important. Another avenue to promote is the use of social media and marketing, which has been shown to be an effective tool in improving attitudes and behaviours towards breastfeeding.[27,24,28]

A study conducted in 2004 among rural healthcare workers in KwaZulu-Natal concluded that breastfeeding knowledge was outdated and not in line with the latest recommendations.[29] It highlights the significance of developing, training and retaining motivated staff.[30]

Another identified risk factor that has a relationship with breastfeeding was HIV diagnosis, where participants who were diagnosed as HIV-positive had a higher prevalence of SAM. Correct infant feeding practices are crucial in the prevention of mother-to-child transmission in HIV-exposed infants. The monitoring and evaluation of the Prevention of Mother-to-Child Transmission (PMTCT) programme is an important first step in determining why HIV is transmitted to some infants and children. For example, if it was determined that poor infant feeding practices (e.g. mixed feeding) was prevalent in most cases of HIV transmission, more focus should be placed on that aspect of PMTCT. This study indicated that mothers who were HIV-positive were less likely to breastfeed their infants than mothers who were HIV-negative, illustrating that fear of HIV transmission is a barrier to breastfeeding. According to the Infant and Young Child Feeding Policy of South Africa, HIV-exposed infants should exclusively breastfeed for six months, be introduced to appropriate complementary foods at six months, and continue breastfeeding until one year old.[24] Breastfeeding is only contraindicated if the mother has been on second- or third-line treatment for more than three months *and* has a viral load of more than 1 000 copies/ml.[31]

The use of antiretroviral therapy in HIV-positive mothers has a great impact on transmission rates of HIV, reducing the risk of HIV transmission drastically.[22] A lower rate of HIV transmission is observed through exclusive breastfeeding for six months compared with mixed feeding.[22] The risk of transmission exists as long as there is any breastfeeding; however, HIV-free survival was better in HIV-exposed infants who breastfed beyond six months when compared with those who were started on replacement feeds.[22] The cessation of breastfeeding in HIV-exposed infants is an

important aspect of PMTCT. HIV-positive mothers should stop breastfeeding slowly over one month.[22] Rapid cessation is linked to poor consequences in the infant, and increases the viral load in the breastmilk.[22]

The counselling and support of HIV positive mothers is important to reduce the transmission of HIV from mother to child, and to optimise infant feeding practices in the context of HIV. Healthcare workers working with HIV positive mothers need to know the guidelines relating to infant feeding in the context of HIV in order to better educate mothers. The public also needs to be better educated regarding the guidelines of infant feeding for HIV-exposed infants, so that greater support can be given to mothers.

Exclusive breastfeeding for six months is important, but it goes hand-in-hand with initiating complementary foods at six months of age. Various studies in South Africa have indicated that complementary feeding is typically started too early, at two to three months of age.[24] Since the timing of initiation of complementary feeding is important in reducing the prevalence of SAM, education regarding complementary feeding principles should be relayed to caregivers.

Nutrition education is a common, important method of intervention to improve nutritional status.[32] It generally involves information on types of foods, quantities of food and frequency of meals.[32] One aspect of nutrition education that often is not included is highlighting the importance of responsive feeding.[32] Another option for improving infant feeding practices is a health-facility based nutrition education programme, which has been suggested as a strategy to combat child malnutrition, and includes complementary feeding demonstrations, growth-monitoring and nutrition education sessions.[33]

Policies and legislation regarding the support of optimal infant feeding practices are important. South Africa has legislated regulations relating to foodstuffs for infants and young children (R991), which will decrease the effect of media and marketing on infant formula use.[34] However, in order to fully reap the benefits of this legislation, the implementation of the regulations must be regularly monitored for adherence. Implementation of the MBFI is also an important step towards promoting, supporting and protecting optimal breastfeeding practices. South Africa aimed, through the Tshwane declaration, to have all healthcare facilities MBFI compliant by 2015, but

this has not yet been achieved.[35] Current South African legislation, according to the code of good practice on the protection of employees during pregnancy and after the birth of a child, allows breastfeeding mothers two 30 minute lactation breaks per day for the first six months of the infant's life, where they can breastfeed or express. Breastfeeding mothers, as well as employers, should be educated regarding their rights to these lactation breaks. Legislation can also be addressed and enforced regarding paid maternity leave.

Counselling and support of caregivers is critical for the improvement of all infant feeding practices. Consistent and reliable support needs to be given to mothers from healthcare professionals, community workers and family members. Policies and programmes that are to be effective in addressing malnutrition should include community empowerment along with health promotion and education.[30]

### 4.4.3 Prevention and treatment of micronutrient deficiencies

Ensuring an adequate micronutrient status in children improves their survival, and physical and mental growth and development.[19] Although this study did not assess whether or not participants were diagnosed with micronutrient deficiencies, certain micronutrients have been shown to have an effect on some of the identified risk factors. Therefore, the prevention and treatment of micronutrient deficiencies would play a role in reducing the risk of SAM.

In South Africa, a high dose Vitamin A capsule is given to children at clinics every six months from 6–59 months, to ensure that Vitamin A requirements are met in this age group. Vitamin A is absorbed, stored in the liver and used by the body.[22] Having a Vitamin A schedule that was not up-to-date was identified as a risk factor for SAM, indicating that although the policy is in place, there are still children who are not receiving this full schedule. An incomplete deworming schedule was also a risk factor for SAM, and would have an effect on micronutrient status because deworming prevents the loss of nutrients (through the treatment of worm infections).[36] Vitamin A and deworming, along with immunisations, are routinely administered during clinic visits, highlighting the importance of primary healthcare. This is discussed in more detail in section 4.4.6.

An intervention that has helped many developing countries with administering missed doses of Vitamin A, deworming, and immunisations, is holding child

healthcare days.[19] These could take place within the community, at places such as preschools, and the aim would be to identify and administer the doses to children who have missed them.

Other micronutrients that are related to risk factors of SAM are zinc and iron. Although this was not directly assessed in the study, zinc supplementation can reduce the duration of diarrhoea, which is a risk factor for SAM.[20] Therefore, zinc should be routinely administered as part of the management of diarrhoea.[22] Iron deficiency, which is the greatest contributor to anaemia, most commonly affects children, adolescents, menstruating women and pregnant women.[19] Anaemia in children reduces their resistance to infections.[20] Infants are normally born with sufficient iron store,[22] but the iron content of breastmilk is not sufficient to provide an infant with enough iron beyond six months.[22] Therefore, if the diet does not contain enough iron, or if there is iron deficiency, iron supplements should be given.[22]

### 4.4.4 Prevention and treatment of SAM

Prevention of SAM is obviously a vital step in reducing SAM prevalence. However, once SAM is present, urgent action is needed towards treating and preventing its recurrence .[19]

The fact that a previous diagnosis of malnutrition was a risk factor for SAM indicates that there needs to be improved monitoring of SAM patients once discharged from hospital. Children with SAM need to be followed up regularly to prevent relapse, support provided, and the appropriate continued development of the child ensured.[22] This includes ensuring the appropriate infant and young child feeding guidelines are followed, which increases the chance of a good recovery.[22]

The policy at the facility where this study took place was to follow up children with SAM at least once per month at the hospital. However, patients often skipped follow-ups. It would be beneficial to find out the exact reasons for this, but one of the most likely reasons is that caregivers do not have money to travel to the hospital. Therefore focus needs to be given to strategies that address monitoring of SAM patients at their local clinic, within their communities. Community-based management of SAM allows for early detection, treatment, referral of children to hospital if needed and follow-ups in the community.[19] More attention needs to be

given to equipping clinics and staff to better support the early diagnosis, treatment (where applicable) and follow-up of SAM.

Since HIV-positive children have an increased risk of SAM and an increased energy requirement, the prevention of SAM in HIV-positive children is an important area that needs addressing. Closer growth monitoring and nutrition education should be a priority for these children.

### 4.4.5 Promotion of good sanitation

Both a current AGE diagnosis and a history of diarrhoea were risk factors for SAM, highlighting the need to address the prevention and management of AGE. The risk of diarrhoea was found to be reduced after hygiene interventions, such as hand washing and sanitation.[27] This should therefore form a part of education given at healthcare facilities.

### 4.4.6 Promotion of healthy practices and the use of health services

The fact that poor coverage of immunisations, vitamin A and deworming needs to be addressed was covered in section 4.4.3. This poor coverage could be due to either poor attendance or poor services (either stock issues or poor training of staff) at the clinics. Priority needs to be given to addressing these possible causes.

Awareness needs to be spread regarding the importance of clinic attendance, and should start being communicated at antenatal clinics. A strategy that has worked in other countries is using clinic attendance as a requirement for receiving grants. South Africa was compared with four other countries that also give cash transfers (grants) to alleviate poverty. Two of these countries (Brazil and Colombia) continue with the cash transfers only if the recipient has attended basic health monitoring (e.g. immunisations and growth monitoring) and education.[37] This has drastically improved the nutritional status of the target population.[37] These countries also have monitoring and evaluation programmes in place to track the delivery and effect of nutrition strategies in place.[37] Another cost-effective strategy that has proven successful, is implementing child health days (where immunisations, vitamin A and deworming are administered) where child education topics are included.[33]

The Road to Health Booklet (RTHB) can be used as a guide by healthcare professionals for growth monitoring, immunisations, Vitamin A, deworming and

educational topics. However, a study conducted in the Tygerberg District in the Western Cape indicated that most of the nursing staff did not have sufficient knowledge of the RTHB.[38] Since the correct use of the booklet has the potential to decrease malnutrition in children, and is essential in growth monitoring and health promotion, these results are of great concern. More emphasis needs to be placed on the recruiting, training, supporting and deploying of healthcare workers.[20] It should also be noted that poor stock levels could cause poor coverage of immunisations and Vitamin A. Stock levels need to be monitored and if this is a reason for poor coverage, it needs to be addressed urgently.

This study found that an outside water source, a lack of electricity and informal housing were risk factors for SAM. Therefore, improving water access, sanitation, and housing can promote a healthy environment.[19] These would all have a beneficial effect on nutritional status.

### 4.4.7 Other recommendations

Once a programme or policy has been implemented, it is important to have evidence that these interventions are effective.[21] Therefore, there needs to be a monitoring and evaluation system in place where the delivery and the effects of any programme is assessed. If an intervention or policy is in place but is poorly implemented, the issues around implementation need to be addressed.[21]

Successful approaches for addressing malnutrition reach mothers and children early, and for long durations.[39] This highlights the need for screening of children to determine those at risk as early as possible. All the identified risk factors for SAM can be used to help identify those at risk of developing SAM. This forms part of primary disease prevention, and is essential in combatting the prevalence of malnutrition in South Africa. Once a child has been identified as at risk of malnutrition, appropriate interventions can optimise nutritional status.

## 4.5 Study limitations

The study has the following limitations:

i. Since the study was performed in a hospital, even the well-nourished participants had some form of illness which likely would have affected recent nutrient intake.

ii. Some of the caregivers did not speak English, or had limited knowledge of English. Therefore, other healthcare professionals (mostly nurses) were used as interpreters. This could have led to interpreter bias.

iii. The data was collected on one day, and so if a participant was diagnosed with something else later in their hospital stay, this would not have been recorded. Therefore, some diagnoses would likely have been missed.

iv. Some data was collected from the participant's RTHB and hospital file, and therefore relied on the accuracy of these documents.

v. Dehydration may have affected actual weight and MUAC, thereby over-diagnosing SAM or moderate malnutrition.

### 4.6 Future research

i. Although it was determined that a significant number of participants had missed some of their immunisations, vitamin A or deworming schedules, the reason why they missed them was not explored. Knowing the reason behind missed schedules is important in order to better address this issue.

ii. Since a diagnosis of HIV was identified as a risk factor for SAM, it would be beneficial to determine where the failure in PMTCT lay. This would help in prioritising further strategies to decrease transmission rates.

iii. It was determined that exclusive breastfeeding rates were low. However, the reason for starting other fluids or food early was not asked. Finding out these reasons could help in developing strategies for improving exclusive breastfeeding rates.

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## APPENDIX A – MAP OF REGION B, JOHANNESBURG

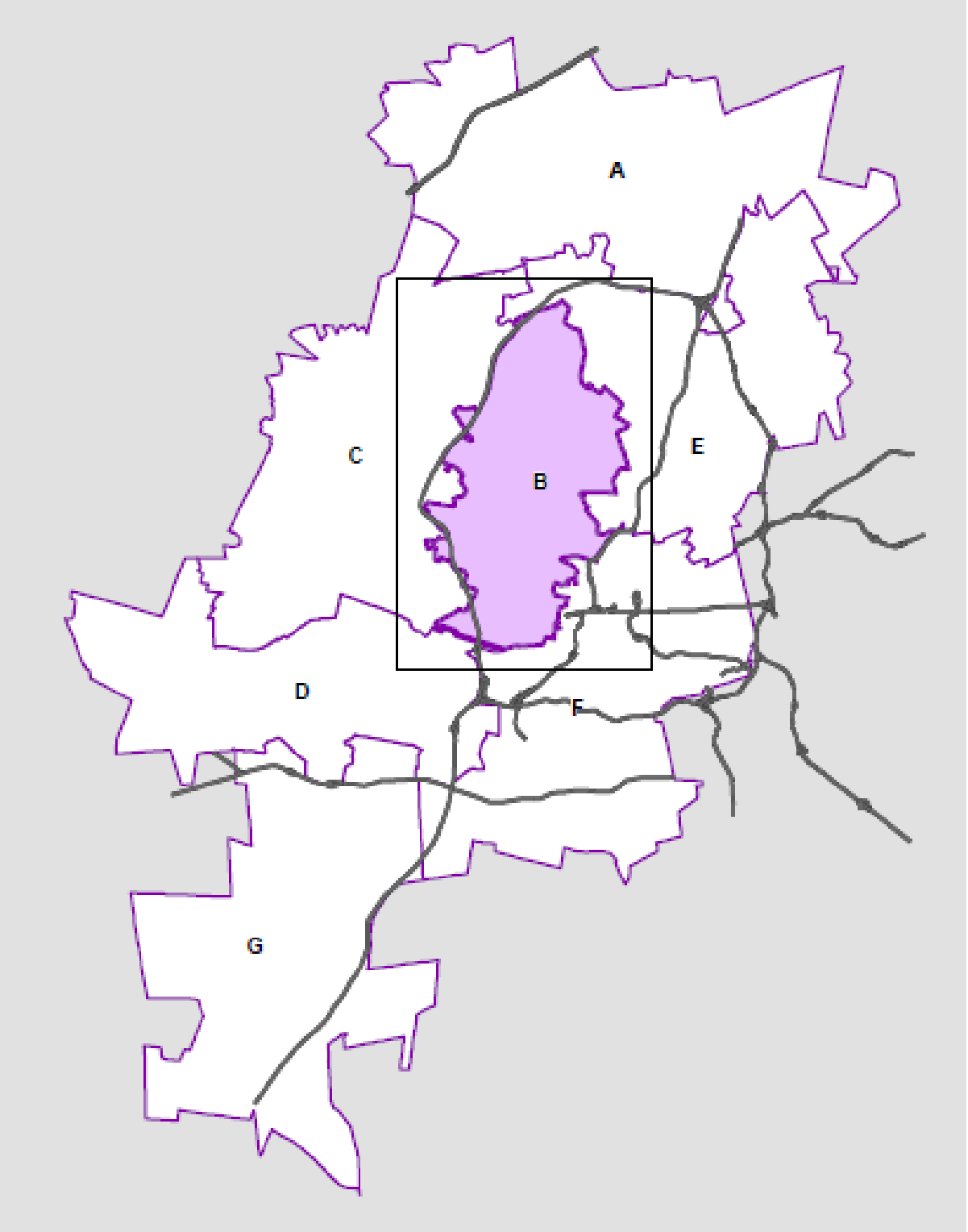


Figure taken form Joburg archive website[40]

**APPENDIX B – QUESTIONNAIRE 1**

**Section 1 – Anthropometry**

| **Code** | | | |
|---|---|---|---|

Weight will be measured to the nearest 50g and height, head circumference and mid-upper arm circumference will be measured to the nearest 0.1cm

| **Growth parameter** | **1st measurement** | **2nd measurement** | **Difference between measurements** | **3rd measurement (if needed)** |
|---|---|---|---|---|
| Weight | | | | |
| Height/length | | | | |
| MUAC | | | | |
| Head circumference | | | | |

Date of measurements: _____

| **No.** | **Growth parameter** | **Final figure** |
|---|---|---|
| **1.1** | Weight | |
| **1.2** | Height/length | |
| **1.3** | MUAC | |
| **1.4** | Head circumference | |
| **1.5** | Birth weight | |

| **Growth parameter** | | **SD** | **Code** |
|---|---|---|---|
| **1.6** | Weight for age | | |
| **1.7** | Height/length for age | | |
| **1.8** | Weight for height/length | | |
| **1.9** | MUAC for age | | |
| **1.10** | HC for age | | |

Note: If the difference between the first two measurements less than the maximum allowable difference, the mean of the two measurements will be used. If the two measurements differ more than the maximum allowable difference, a third measurement will be taken and the median of the three will be used. The maximum allowable difference used is 7mm for length/height, 5mm for head circumference, 5mm for MUAC, and 100g for weight.

| **Question** | | **Answer** | | **Code** |
|---|---|---|---|---|
| **1.11** | Bilateral pedal pitting oedema | a. Yes | | |
| | | b. No | | |
| **1.12** | Growth failure according to clinic weights on RTHB | a. Yes | | |
| | | b. No | | |
| **1.13** | Nutritional diagnosis | a. SAM | | |
| | | b. Moderate malnutrition/growth faltering | | |
| | | c. Well nourished | | |

## APPENDIX C – QUESTIONNAIRE 2

### Section 2.1 - Socioeconomic and demographic factors

| No. | Question | Answer | | Code |
|---|---|---|---|---|
| **2.1.1** | Date of birth | D D M M 2 0 Y Y | | |
| **2.1.2** | What age bracket does your child fit into? | a. 0 – 5 months | | |
| | | b. 6-11 months | | |
| | | c. 12 – 23 months | | |
| | | d. 24 – 35 months | | |
| | | e. 36 – 47 months | | |
| | | f. 48 – 60 months | | |
| **2.1.3** | Is your child a boy or a girl? | a. Boy | | |
| | | b. Girl | | |
| **2.1.4** | What race is your child? | a. Black | | |
| | | b. Indian | | |
| | | c. Mixed race | | |
| | | d. White | | |
| | | e. Other:_____ | | |
| **2.1.5** | Are you a permanent South Africa citizen? If no, specify what country you are from. | a. Yes | | |
| | | b. No _____ | | |
| **2.1.6** | Does this child live with the mother? If no, specify where (e.g. gran). | a. Yes | | |
| | | b. No _____ | | |
| **2.1.7** | How many adults (≥18 years) live in your house (including yourself)? | a. 1 | | |
| | | b. 2-3 | | |
| | | c. 4-5 | | |
| | | d. 6-7 | | |
| | | e. > 7 | | |
| **2.1.8** | How many children (<18 years) live in your house? | a. 1 | | |
| | | b. 2-3 | | |
| | | c. 4-5 | | |
| | | d. 6-7 | | |
| | | e. > 7 | | |
| **2.1.9** | What is your highest level of education (mother)? | a. Partial primary school | | |
| | | b. Completed primary school | | |
| | | c. Partial high school | | |
| | | d. Completed high school | | |
| | | e. Tertiary education | | |
| **2.1.10** | What is the highest level of | a. Partial primary school | | |

| | | | | |
|---|---|---|---|---|
| | education that the child's father has? | b. Completed primary school | | |
| | | c. Partial high school | | |
| | | d. Completed high school | | |
| | | e. Tertiary education | | |
| **2.1.11** | Are you (mother) employed? | a. Yes | | |
| | | b. No | | |
| **2.1.12** | If yes, what type of employment? Unskilled refers to jobs that do not require tertiary education or experience (e.g. labourers, grocery clerks, hotel maids, and general, janitorial work). Skilled refers to work that requires specialised training or a learned skill-set (e.g. electricians, law enforcement officers, computer operators, financial technicians, and administrative assistants) | a. Temporary unskilled | | |
| | | b. Permanent unskilled | | |
| | | c. Temporary skilled | | |
| | | d. Permanent skilled | | |
| **2.1.13** | Has anything in the past 3, 6 and 12 months changed in your employment (chose one option)? | a. No | | |
| | | b. Yes. In the last 3 months, was unemployed, now employed | | |
| | | c. Yes. I the last 3 months, was employed, now unemployed | | |
| | | d. Yes. 4 - 6 months ago, was unemployed, now employed | | |
| | | e. Yes. 4 - 6 months ago, was employed, now unemployed | | |
| | | f. Yes. 7 - 12 months ago, was unemployed, now employed | | |
| | | g. Yes. 7 - 12 months ago, was employed, now unemployed | | |
| **2.1.14** | Is the child's father employed? | a. Yes | | |
| | | b. No | | |
| **2.1.15** | If yes, what employment? | a. Temporary unskilled | | |
| | | b. Permanent unskilled | | |
| | | c. Temporary skilled | | |
| | | d. Permanent skilled | | |

| | | | | |
|---|---|---|---|---|
| **2.1.16** | Has anything in the past 3, 6 and 12 months changed in his employment (chose one option)? | a. No | | |
| | | b. Yes. In the last 3 months, was unemployed, now employed | | |
| | | c. Yes. I the last 3 months, was employed, now unemployed | | |
| | | d. Yes. 4 - 6 months ago, was unemployed, now employed | | |
| | | e. Yes. 4 - 6 months ago, was employed, now unemployed | | |
| | | f. Yes. 7 - 12 months ago, was unemployed, now employed | | |
| | | g. Yes. 7 - 12 months ago, was employed, now unemployed | | |
| **2.1.17** | How many adults receive income in your household? | a. 0 | | |
| | | b. 1-2 | | |
| | | c. 3-4 | | |
| | | d. 5-6 | | |
| | | e. > 6 | | |
| **2.1.18** | Does your household receive any social grants? If yes, indicate which ones and how many: | a. None | | |
| | | b. Child support | | |
| | | c. Care dependency | | |
| | | d. Older persons | | |
| | | e. Disability | | |
| | | f. Foster | | |
| **2.1.19** | What is the monthly household income? | a. <R1000 | | |
| | | b. R1000 – R4499 | | |
| | | c. R4500 – R7999 | | |
| | | d. > R8000 | | |
| **2.1.20** | Has your household income changed in the last 3, 6, or 12 months (choose 1 option)? | a. No | | |
| | | b. Yes, in the last 3 months, it was less | | |
| | | c. Yes, in the last 3 months, it was more | | |
| | | d. Yes, 4 – 6 months ago, it was less | | |
| | | e. Yes, 4 – 6 months ago, it | | |

| | | | | |
|---|---|---|---|---|
| | | was more | | |
| | | f. Yes, 7 - 12 months ago, it was less | | |
| | | g. Yes, 7 - 12 months ago, it was more | | |
| **2.1.21** | What toilet do you use? | a. Inside toilet | | |
| | | b. Outside toilet, with plumbing | | |
| | | c. Outside toilet without plumbing | | |
| **2.1.22** | Where do you get your water from? | a. Inside tap | | |
| | | b. Outside tap | | |
| | | c. Communal tap | | |
| | | d. Water tank | | |
| | | e. Other:_____ | | |
| **2.1.23** | Do you have electricity | a. Yes | | |
| | | b. No | | |
| **2.1.24** | What type of house do you live in? | a. Shack | | |
| | | b. RDP | | |
| | | c. Room | | |
| | | d. House | | |
| | | e. Flat | | |
| | | f. Other:_____ | | |
| **2.1.25** | Do you own or rent the place where you are living? | a. Own | | |
| | | b. Rent | | |
| **2.1.26** | What region do you live in? | a. A | | |
| | | b. B | | |
| | | c. C | | |
| | | d. D | | |
| | | e. E | | |
| | | f. F | | |
| | | g. G | | |
| **2.1.27** | What area do you live in? (write answer) | | | |
| **2.1.28** | What clinic do you attend? (write answer) | | | |

**Section 2.2 – Family health and dynamics**

| No. | Question | Answer | | Code |
|---|---|---|---|---|
| **2.2.1** | How old are you (mother)? | a. 14 – 18 years | | |
| | | b. 19 – 25 years | | |
| | | c. 26 – 35 years | | |
| | | d. 36 – 45 years | | |
| | | e. > 45 years | | |
| **2.2.2** | How old were you (mother) when the child was born? | a. 14 – 18 years | | |
| | | b. 19 – 25 years | | |
| | | c. 26 – 35 years | | |
| | | d. 36 – 45 years | | |
| | | e. > 45 years | | |
| **2.2.3** | How old is the father? | a. 14 – 18 years | | |
| | | b. 19 – 25 years | | |
| | | c. 26 – 35 years | | |
| | | d. 36 – 45 years | | |
| | | e. > 45 years | | |
| **2.2.4** | How old was the father when the child was born? | a. 14 – 18 years | | |
| | | b. 19 – 25 years | | |
| | | c. 26 – 35 years | | |
| | | d. 36 – 45 years | | |
| | | e. > 45 years | | |
| **2.2.5** | Is the mother HIV positive? | a. Yes | | |
| | | b. No | | |
| | | c. Unconfirmed | | |
| **2.2.6** | Is the child in contact with someone who has TB? | a. Yes | | |
| | | b. No | | |
| **2.2.7** | Are you (mother) married? | a. Yes | | |
| | | b. No | | |
| **2.2.8** | Does the father live with the child? | a. Yes | | |
| | | b. No | | |
| **2.2.9** | Do you (mother) smoke? | a. Yes | | |
| | | b. No | | |
| **2.2.10** | Does the father smoke? | a. Yes | | |
| | | b. No | | |
| **2.2.11** | Do you (mother) drink alcohol? | a. Yes | | |
| | | b. No | | |
| **2.2.12** | Does the father drink alcohol? | a. Yes | | |
| | | b. No | | |
| **2.2.13** | Have you (mother) been in hospital due to illness in the past year? | a. Yes | | |
| | | b. No | | |
| **2.2.14** | Has the father been in hospital due to | a. Yes | | |

| | | | | |
|---|---|---|---|---|
| | illness in the past year? | b. No | | |
| **2.2.15** | Has the child had any siblings who have passed away (before or after the study participant was born)? | a. Yes | | |
| | | b. No | | |
| **2.2.16** | How often do you talk to your child when you are together? | a. Rarely | | |
| | | b. Sometimes | | |
| | | c. Most of the time | | |
| **2.2.17** | How often do you play with your child? | a. Never | | |
| | | b. Some days | | |
| | | c. Most days | | |
| | | d. Every day | | |
| **2.2.18** | How much time does your child spend at home per day, without an adult (≥ 18 years) caregiver present? | a. No time | | |
| | | b. < 1 hour | | |
| | | c. 1 – 4 hours | | |
| | | d. > 4 hour | | |
| **2.2.19** | How often does your child play/interact with other children? | a. Never | | |
| | | b. Some days | | |
| | | c. Most days | | |
| | | d. Every day | | |

## APPENDIX D – QUESTIONNAIRE 3

### Section 3.1 – Nutritional history (infant feeding and complementary feeding)

| No. | Question | Answer | | Code |
|---|---|---|---|---|
| **3.1.1** | What infant feeding method did you use after birth? | a. Breastfeeding | | |
| | | b. Formula feeding | | |
| **If the answer is "Breastfeeding", skip questions 3.1.9 – 3.1.10**<br>**If the answer is "Formula feeding", skip questions 3.1.2 – 3.1.8** | | | | |
| **3.1.2** | When you child was born, did you give him/her anything else before giving breastmilk? | a. Yes | | |
| | | b. No | | |
| **3.1.3** | Was your baby put to the breast within one hour after birth? | a. Yes | | |
| | | b. No | | |
| **3.1.4** | How long did your baby receive only breastmilk for (exclusively)? | a. Mixed fed from the start | | |
| | | b. < 1 month | | |
| | | c. 1 – 3 months | | |
| | | d. 4 – 6 months | | |
| | | e. 7 – 8 months | | |
| | | f. > 8 months | | |
| | | g. Still exclusively BF | | |
| **3.1.5** | Are you still breastfeeding? | a. Yes | | |
| | | b. No | | |
| **3.1.6** | If no, when did you stop? | a. < 1 month | | |
| | | b. 1 – 3 months | | |
| | | c. 4 – 6 months | | |
| | | d. 7 – 8 months | | |
| | | e. 9 – 10 months | | |
| | | f. 11 – 12 months | | |
| | | g. 1 – 2 years | | |
| | | h. < 2 years | | |
| **3.1.7** | If you stopped when your child was < 1 year old, why did you stop? | a. Child became ill | | |
| | | b. Mom became pregnant | | |
| | | c. Mom became ill | | |
| | | d. Mom died or left | | |
| | | e. Fear of HIV transmission | | |
| | | f. Mom went to | | |

| | | | | |
|---|---|---|---|---|
| | | work/school | | |
| | | g. Started with solid food | | |
| | | h. Other: _____ | | |
| **3.1.8** | If you stopped when your child was < 1 year old, what did you replace the breastmilk with? **Go to Q 3.1.11** | a. Formula | | |
| | | b. Nothing, only food | | |
| | | c. Tea | | |
| | | d. Other:_____ | | |
| **3.1.9** | Are you still formula feeding? | a. Yes | | |
| | | b. No | | |
| **3.1.10** | If no, when did you stop? | a. < 1 month | | |
| | | b. 1 – 3 months | | |
| | | c. 4 – 6 months | | |
| | | d. 7 – 8 months | | |
| | | e. 9 – 10 months | | |
| | | f. 11 – 12 months | | |
| | | g. 1 – 2 years | | |
| | | h. > 2 years | | |
| **3.1.11** | When did you start to give your child solids? | a. Haven't started yet | | |
| | | b. < 4 months | | |
| | | c. 4 – 6 months | | |
| | | d. 7 – 8 months | | |
| | | e. 9 – 12 months | | |
| | | f. > 1 year | | |

**3.1.12** At what age did your child start the following foods:

| **No.** | **Type of food** | **Age** | | | | | |
|---|---|---|---|---|---|---|---|
| | | a. Not started yet | b. < 4m | c. 4-6m | d. 7-8 m | e. 9-12m | f. > 1 yr |
| **3.1.12.1** | Starchy foods/ grains | | | | | | |
| **3.1.12.2** | Vegetables | | | | | | |
| **3.1.12.3** | Fruit | | | | | | |
| **3.1.12.4** | Meat, fish, chicken, organs | | | | | | |
| **3.1.12.5** | Legumes, nuts | | | | | | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **3.1.12.6** | Dairy | | | | | | |
| **3.1.12.7** | Eggs | | | | | | |

**Section 3.2 – Nutritional history (Food frequency)**

| No. | Question | Answer | | Code |
|---|---|---|---|---|
| **3.2.1** | Does the child follow any special diet? | a. No | | |
| | | b. Yes, Slimming | | |
| | | c. Yes, allergies | | |
| | | d. Don't know | | |
| **3.2.2** | Has the child eaten away from home during the last week? Specify the place. | a. No | | |
| | | b. Yes, crèche | | |
| | | c. Yes, friends or family's house | | |
| | | d. Yes, other | | |
| **3.2.3** | Specify the number of times that the child eats away from home in a week | a. 1 - 2 | | |
| | | b. 3 – 4 | | |
| | | c. 5 - 7 | | |
| **3.2.4** | Which of the following best describes the eating patterns that your child usually follows: | a. More than three meals with eating between meals | | |
| | | b. Three meals with eating between meals | | |
| | | c. Three meals with no eating between meals | | |
| | | d. Two meals with eating between meals | | |
| | | e. Two meals with no eating between meals | | |
| | | f. One meal with eating between meals | | |
| | | g. One meal with no eating between meals | | |
| | | h. Nibble the whole day, no specific meals | | |
| | | i. Others (Please specify) | | |
| **3.2.5** | Do you use any dietary supplements? | a. Yes | | |
| | | b. No | | |

**Section 3.3 – Food frequency**

We would like to find out what your child ate and drank during the last

month.

I am going to go through a list of foods and for each one you must tell me:

- If your child eats this food
- How the food is prepared (by you or whoever prepares the food),
- How much of the food he / she eats at a time, and
- How many times a day he / she eats the food and if he / she does not eat it every day, how many times a week or a month it is eaten?

**ABBREVIATIONS**

| | | |
|---|---|---|
| Measures | Meat: | Comm = commercial |
| 1t = 1 rounded teaspoon | F = with fat | Home = homemade |
| 1T = 1 rounded tablespoon (15ml) | FT = fat trimmed | Pot = potato |
| 1SP = 1 rounded serving spoon (30ml) | Oil/Fat | Cab = cabbage |
| c = measuring cup (250ml) | B = butter | Carr = carrot |
| s/s = small size | | Fill = filling |
| m/s = medium size | HM = hard margarine | |
| L/s = large size | Med = medium fat/light | Usually = at least 4x/week |
| E = enriched | PM =polyunsaturated | HHM = Household Measure |
| P = plain | SO = sunflower oil | P/D = Per day |
| Milk: SM = skim milk | WF = white fat | D/W = Days Per Week |
| FC = full cream | PB = peanut butter | P/M = Per Month |
| BL = blend | | SEL/NEV = Seldom / Never |
| CON = condensed | BR = breakfast (Up to 09h00) | |
| Bread: | IS = in-between snack | |
| Wh = white | L = lunch (midday (12h00-14h00) | |
| Br = brown | D = dinner (evening) ( 17h00 - 19h00) | |
| Ww = wholewheat | AD = after dinner | |

**INSTRUCTIONS TO RESEARCHER: CIRCLE THE CHOSEN ANSWER AND FILL IN THE AMOUNT AND TIMES EATEN IN THE APPROPRIATE COLUMNS**

| Food | Description | Code | Quantity (g/ml) | Amount usually eaten (HHM / g) | P/D | D/W | P/M | Seldom |
|---|---|---|---|---|---|---|---|---|
| Maize-meal porridge | 3.3.1 Stiff *pap* | 4278 | 1 c stiff = 250g<br>1 SP = 120g<br>1 T = 75g | | | | | |
| | 3.3.2 Soft *(Slappap)* | 4277 | 1 c soft = 250g<br>1 SP = 120g<br>1 T = 75g | | | | | |
| | 3.3.3. Crumbly (Phutu) | 4279 | 1 c crumbly = 140g<br>1 SP = 75g | | | | | |

| Food | Description | Code | Quantity (g/ml) | Amount usually eaten (HHM / g) | P/D | D/W | P/M | Seldom |
|---|---|---|---|---|---|---|---|---|
| | | | 1 T = 30g | | | | | |
| Maltabella Porridge | 3.3.4. Stiff | 3241 | ½ c = 125g<br>1 c = 250g<br>1 SP = 120g | | | | | |
| 3.3.5. Oats Porridge | | 3239 | ½ c = 125g<br>1 c = 250g<br>1 SP = 120g | | | | | |
| Milk on Porridge<br>(circle the type usually used) | 3.3.6. None | | | | | | | |
| | 3.3.7. Full cream | 2718 | Little = 30g<br>Med = 60g<br>A lot = 125g | | | | | |
| | 3.3.8. Sour | 2787 | | | | | | |
| | 3.3.9. 2% | 2772 | | | | | | |
| | 3.3.10. Fat free / skim | 2775 | | | | | | |
| | 3.3.11. Milk Blend | 2771 | | | | | | |
| | 3.3.12. Soy milk | 2737 | | | | | | |
| Is sugar added to porridge?<br>(Circle the type usually used) | 3.3.13. None | | | | | | | |
| | 3.3.14. White | 3989 | 1 t = 6g | | | | | |
| | 3.3.15 Brown | 4005 | | | | | | |
| | 3.3.16. Syrup | 3988 | 1 t = 15g | | | | | |
| | 3.3.17. Honey | 3984 | | | | | | |
| | 3.3.18. Sweetener:<br>Type | P0016 | | | | | | |
| Is fat added to porridge?<br>(Circle the type usually used) | 3.3.19. None | | | | | | | |
| | 3.3.20. Animal fat (Butter) | 3479 | 1 t = 5g | | | | | |
| | 3.3.21. Hard margarine | 3484 | | | | | | |
| | 3.3.22. Soft margarine PM) | 3496 | | | | | | |
| | 3.3.23. Soft margarine (Med) | 3531 | | | | | | |
| 3.3.24. Breakfast cereals | Specify types usually eaten | | | | | | | |
| 3.3.25. Milk on cereals | Specify type | | Little = 80g<br>Med = 125g | | | | | |

| Food | Description | Code | Quantity (g/ml) | Amount usually eaten (HHM / g) | P/D | D/W | P/M | Seldom |
|---|---|---|---|---|---|---|---|---|
| | | | A lot = 180g | | | | | |
| 3.3.26. Is sugar added to the cereal? | Specify type: | | 1 t = 6g | | | | | |
| Samp / Maize rice | 3.3.27. Samp, White | 3250 | 1 T = 55g<br>1 SP = 125g<br>½ c = 125g | | | | | |
| | 3.3.28. Maize Rice | 3250 | | | | | | |
| 3.3.29. Samp and Beans | | 3402 | 1 T = 50g<br>1 SP = 125g<br>½ c = 125g | | | | | |
| Rice | 3.3.30. White | 3247 | 1 T = 25g<br>1 SP = 60g<br>½ c = 65g | | | | | |
| | 3.3.31. Brown | 3315 | | | | | | |
| Pastas | 3.3.32. Macaroni | 3262 | 1 T = 35g<br>1 SP = 70g<br>½ c = 90g | | | | | |
| | 3.3.33. Spaghetti Plain | 3262 | | | | | | |
| | 3.3.34. Spaghetti and tomato sauce | 3258 | 1 T = 45g<br>1 SP = 80g<br>½ c = 125g | | | | | |
| | 3.3.35. Macaroni and cheese | 3301 | 1 c = 230g<br>1 SP = 70g | | | | | |
| Bread / Bread rolls | 3.3.36. White | 3210 | Wh + Br 10 mm = 30g<br>Wh + Br 20 mm = 60g<br>Wh + Br 30 mm = 100g<br>½ loaf = 400g | | | | | |
| | 3.3.37. Brown | 3211 | | | | | | |
| | 3.3.38. Whole Wheat | 3212 | Ww 10 mm = 35g | | | | | |
| | Other: | | | | | | | |
| Roti | 3.3.39 With sunflower oil | 3358 | Small = 50g<br>Large = 150g | | | | | |
| | 3.3.40. With margarine | 3356 | | | | | | |
| 3.3.41. Vetkoek | | 3257 | 8 cm diam = 60g | | | | | |

| Food | Description | Code | Quantity (g/ml) | Amount usually eaten (HHM / g) | P/D | D/W | P/M | Seldom |
|---|---|---|---|---|---|---|---|---|
| 3.3.42. Provita | | 3235 | 6g | | | | | |
| 3.3.43. Crackers | 3.3.43. Cream Crackers | 3230 | 8g | | | | | |
| | 3.3.44. Refined (eg Tuc) | 3331 | 4g | | | | | |
| 3.3.45. Fastfood / Takeaways | Specify | | | | | | | |
| Are any of the following spreads on your bread?<br><br>Fat spreads:<br><br>(Tick a box) | 3.3.46. Butter | 3479 | 1 t = 5g | | | | | |
| | 3.3.47. Butro | 3523 | | | | | | |
| | 3.3.48. Animal fat | 3494 | | | | | | |
| | 3.3.49. Lard | 3495 | | | | | | |
| | 3.3.50. Hard margarine | 3484 | | | | | | |
| | 3.3.51. Soft margarine(PM) | 3496 | | | | | | |
| | 3.3.52. Soft margarine (Med) | 3531 | | | | | | |
| 3.3.53. Peanut butter | | 3485 | 1 t = 12g | | | | | |
| Sweet spreads | 3.3.54. Jam | 3985 | 1 t = 15g | | | | | |
| | 3.3.55. Syrup | 3988 | | | | | | |
| | 3.3.56. Honey | 3884 | | | | | | |
| Marmite / Oxo | 3.3.57. Marmite | 4030 | Thin = 2g | | | | | |
| | 3.3.58. Oxo | 4029 | Med = 4g<br><br>Thick = 7g | | | | | |
| Paste | 3.3.59. Fish Paste | 3109 | Thin = 5g | | | | | |
| | 3.3.60. Meat Paste | 2917 | Med = 7g<br><br>Thick = 10g | | | | | |
| Cheese | 3.3.61. Cheddar | 2722 | Grated Med = 10g<br><br>Thick = 15g | | | | | |
| | 3.3.62. Gouda | 2723 | Cubes = 30g<br><br>Slice = 8g<br><br>Cheezi = 20g | | | | | |
| | 3.3.63. Cottage Low-fat cheese | 2760 | Med = 20g<br><br>Thick = 30g | | | | | |
| | 3.3.64. Cream cheese | 2725 | Thin = 10g | | | | | |

| Food | Description | Code | Quantity (g/ml) | Amount usually eaten (HHM / g) | P/D | D/W | P/M | Seldom |
|---|---|---|---|---|---|---|---|---|
| | | | Med = 20g | | | | | |
| | | | | | | | | |
| Other spreads<br><br>(Specify types) | | | | | | | | |
| Chicken | 3.3.65. Boiled with skin | 2926 | Breast + skin = 125g<br><br>Thigh = 80g<br><br>Drumstick = 42g<br><br>Foot = 30g<br><br>Wing = 30g | | | | | |
| | 3.3.66. Boiled without skin | 2963 | | | | | | |
| | 3.3.67. Fried in batter / crumbs | 3018 | | | | | | |
| | 3.3.68. Fried – not coated | 2925 | | | | | | |
| | 3.3.69. Roasted / grilled with skin | 2925 | | | | | | |
| | 3.3.70. Roasted / grilled without skin | 2950 | | | | | | |
| 3.3.71. Chicken heads | | 2999 | | | | | | |
| Chicken stew | 3.3.71. With vegetables | 3005 | 1 SP = 90g<br><br>½c = 125g | | | | | |
| | 3.3.72. With tomato & onion | 2985 | | | | | | |
| 3.3.73. Chicken feet | | 2997 | Foot = 30g | | | | | |
| Chicken offal | 3.3.73. Giblets | 2998 | Stomach = 20g | | | | | |
| 3.3.74. Chicken liver | | 2970 | Liver = 30g | | | | | |
| 3.3.75. Chicken pie | | 2954 | Med = 150g | | | | | |
| Beef | 3.3.76. Stewed / boiled with fat (vegetables) | 3020 | 1 SP = 105g<br><br>½c = 125g | | | | | |
| | 3.3.77. Mince with tomato & onion | 2987 | 1T = 40g<br><br>1SP = 85g | | | | | |
| | 3.3.78. Mince, plain | 2921 | ½c = 100g | | | | | |
| | 3.3.79. Other preparation methods | | | | | | | |
| Mutton | 3.3.80. Fried / grilled with fat | 2927 | Lion chop = 60g<br><br>Rib chop = 40g | | | | | |
| | 3.3.81. Stew: plain | 2974 | 1 SP = 105g | | | | | |

| Food | Description | Code | Quantity (g/ml) | Amount usually eaten (HHM / g) | P/D | D/W | P/M | Seldom |
|---|---|---|---|---|---|---|---|---|
| | 3.3.82. Stew: Irish (vegetables) | 2916 | ½c = 125g | | | | | |
| | 3.3.83. Other preparation methods | | | | | | | |
| Pork | 3.3.84. Fried / grilled with fat | 2930 | Chop: 115x80x20 = 100g<br>Schnitzel: 115x80x20 = 110g<br>Roast: 110x65x5 = 30g<br>1 SP = 105g<br>½c = 125g | | | | | |
| | 3.3.85. Other preparation methods | | | | | | | |
| | | | | | | | | |
| Offal | 3.3.86. Veldderm fried | P0023 | 1 SP = 105g<br>½c = 125g | | | | | |
| | 3.3.87. Liver: beef (fried) | 2920 | 80g | | | | | |
| | 3.3.88. Liver: sheep (fried) | 2955 | 55g | | | | | |
| | 3.3.89. Kidney (Beef) | 2923 | 85g | | | | | |
| | 3.3.90. Kidney (sheep) | 2956 | 30g | | | | | |
| | 3.3.91. Tripe, beef, cooked in milk | 2951 | 1 SP = 105g<br>½c = 125g | | | | | |
| | 3.3.92. Heart (beef) | 2968 | 60g | | | | | |
| | 3.3.93. Heart (sheep) | 2969 | 60g | | | | | |
| | 3.3.94. Lung (beef) | 3019 | 60g | | | | | |
| Wors / sausage | 3.3.95. Fried | 2931 | Thin x 200mm = 45g<br>Thick x 165mm = 90g | | | | | |
| 3.3.96. Bacon | Fat | 2906 | 1 rasher = 10g | | | | | |
| Cold meats | 3.3.97. Polony | 2919 | Slice 5 mm thick = 8g<br>Comm slice = 16g | | | | | |
| | 3.3.98. Ham | 2967 | Med slice = 25g | | | | | |
| | 3.3.99. Viennas | 2936 | 100mm = 30g<br>150mm = 40g | | | | | |

| Food | Description | Code | Quantity (g/ml) | Amount usually eaten (HHM / g) | P/D | D/W | P/M | Seldom |
|---|---|---|---|---|---|---|---|---|
| | 3.3.100. Other | | | | | | | |
| Meat pie | 3.3.101. Bought (steak & kidney) | 2957 | 120g | | | | | |
| | 3.3.102. Other (specify) | | | | | | | |
| Legumes (specify dried bean / peas / legumes) | 3.3.103. Stew (bean, potato & onion) | 3178 | 1 T = 60g<br>1 SP = 120g<br>½c = 125g | | | | | |
| | 3.3.104. Soups: Commercial / powder | 3165 | ½c = 125g | | | | | |
| | 3.3.105. Split pea | 3157 | 1 T = 35g<br>1 SP = 80g<br>½c = 130g | | | | | |
| | 3.3.106. Beef & vegetables | 3159 | | | | | | |
| | 3.3.107. Bean | 3145 | | | | | | |
| | 3.3.108. Baked beans | 3176 | 1 T = 50g<br>1 SP = 105g<br>½c = 135g | | | | | |
| 3.3.109. Soy Products e.g. Toppers / Imana | Specify | 3196 | 1 SP = 85g<br>½c = 120g | | | | | |
| | | | | | | | | |
| Fried fish (fresh or frozen, fried in sun oil) | 3.3.110. With batter / crumbs | 3094 | Small 50x55x30 = 60g<br>Med 100x55x30 = 120g | | | | | |
| | 3.3.111. Without batter / crumbs | 3084 | | | | | | |
| Canned fish | 3.3.112. Pilchards in brine | 3055 | 1 pilchard = 75g | | | | | |
| | 3.3.113. Pilchards in tomato sauce | 3102 | | | | | | |
| | 3.3.114. Sardines in oil | 3104 | Ss = 7g<br>Ls = 25g | | | | | |
| | 3.3.115. Sardines in tomato sauce | 3087 | | | | | | |
| | 3.3.116. Tuna in oil | 3093 | ¼c = 50g | | | | | |
| | 3.3.117. Tuna in brine | 3054 | | | | | | |
| | 3.3.118. Other (Specify) | | | | | | | |

| Food | Description | Code | Quantity (g/ml) | Amount usually eaten (HHM / g) | P/D | D/W | P/M | Seldom |
|---|---|---|---|---|---|---|---|---|
| Do you remove fish bones before eating canned fish? Yes _____ No _____ | | | | | | | | |
| 3.3.119. Fish cakes | Fried: oil/butter/margarine | 3098 | 65x15mm = 50g | | | | | |
| 3.3.120. Fish fingers | Fried: oil/butter/margarine | 3081 | 85mm = 35g | | | | | |
| Eggs | 3.3.121. Boiled/poached | 2867 | 1 egg = 52g | | | | | |
| | Scrambled<br>3.3.122. In oil | 2889 | 1 T = 35g<br>1 SP = 80g<br>½c = 115g<br>(approx 2 eggs) | | | | | |
| | 3.3.123. In butter | 2886 | | | | | | |
| | 3.3.124. In margarine | 2887 | | | | | | |
| | Fried:<br>3.3.125. In oil | 2869 | 1 egg = 52g | | | | | |
| | 3.3.126. In butter | 2868 | | | | | | |
| | 3.3.127. In margarine | 2877 | | | | | | |
| Cabbage | 3.3.128. Boiled, nothing added | 3756 | 1 T = 30g<br>1 SP = 55g<br>½c = 80g | | | | | |
| | 3.3.129. Boiled with potatoes, onion and fat | 3813 | 1 T = 35g<br>1 SP = 75g<br>½c = 80g | | | | | |
| | 3.3.130. Fried, nothing added | 3812 | 1 T = 30g<br>1 SP = 55g<br>½c = 80g | | | | | |
| | 3.3.131. Boiled, then fried with potato, onion | 3815 | 1 T = 35g<br>1 SP = 75g<br>½c = 80g | | | | | |
| | 3.3.132. Other | | | | | | | |
| | | | | | | | | |
| Spinach | 3.3.133. Boiled, nothing added | 3980 | 1 T = 40g<br>1 SP = 105g<br>½c = 90g | | | | | |
| | 3.3.134. Boiled, fat added | 3898 | 1 T = 40g<br>1 SP = 105g | | | | | |

| Food | Description | Code | Quantity (g/ml) | Amount usually eaten (HHM / g) | P/D | D/W | P/M | Seldom |
|---|---|---|---|---|---|---|---|---|
| | | | ½c = 90g | | | | | |
| | 3.3.135. Boiled with onion, potato and fat | 3901 | 1 T = 50g<br>1 SP = 105g<br>½c = 110g | | | | | |
| Tomato and onion gravy / relish / chow / sheshebo | 3.3.136. Homemade, with sugar | 3910 | 1 T = 35g<br>1 SP = 75g<br>½c = 140g | | | | | |
| | 3.3.137. Homemade, no sugar | 3925 | | | | | | |
| | 3.3.138. Canned | 4192 | | | | | | |
| Pumpkin (specify type) | 3.3.139. Boiled, nothing added | 4164 | 1 T = 45g<br>1 SP = 85g<br>½c = 105g | | | | | |
| | 3.3.140. Cooked in fat and sugar | 3893 | | | | | | |
| | 3.3.141. Other | | | | | | | |
| Carrots | 3.3.142. Boiled, sugar and fat | 3818 | 1 T = 25g<br>1 SP = 50g<br>½c = 85g | | | | | |
| | 3.3.143. With potato & onion | 3822 | 1 T = 35g<br>1 SP = 70g<br>½c = 105g | | | | | |
| | 3.3.144. Raw, salad (sugar added) | 3721 | 1 T = 25g | | | | | |
| Mealies | 3.3.145. On Cob | 3725 | 1 T = 30g<br>1 SP = 60g<br>½ c = 95g | | | | | |
| | 3.3.146. Off Cob – Creamed, sweet corn | 3726 | 1 T = 55g<br>1 SP = 125g<br>½ c = 135g | | | | | |
| | 3.3.147. Off Cob – Whole Kernel Canned | 3942 | | | | | | |
| Beetroot | 3.3.148. Salad grated | 3699 | 1 T = 25g<br>1 SP = 65g | | | | | |
| Potatoes | 3.3.149. Boiled/baked with skin | 4155 | S/s = 60g<br>m/s = 90g | | | | | |
| | 3.3.150. Without skin | 3737 | | | | | | |

| Food | Description | Code | Quantity (g/ml) | Amount usually eaten (HHM / g) | P/D | D/W | P/M | Seldom |
|---|---|---|---|---|---|---|---|---|
| | 3.3.151. Mashed (WM) | 3876 | 1 T = 50g<br>1 SP = 115g<br>½ c = 125g | | | | | |
| | 3.3.152. Roasted | 3878 | 1 med = 70g | | | | | |
| | 3.3.153. French fries / potato chips | 3740 | ½ c = 50g<br>Med = 80g | | | | | |
| | 3.3.154. Salad | 3928 | 1 T = 45g<br>1 SP = 105g<br>½ c = 120g | | | | | |
| | 3.3.155. Other | | | | | | | |
| Sweet potato | 3.3.156. Boiled / baked with skin | 3748 | 1 T = 50g<br>1 SP = 110g<br>½ c = 145g | | | | | |
| | 3.3.157. Without skin | 3903 | | | | | | |
| | 3.3.158. Mashed (with sugar) | 3749 | | | | | | |
| | | | | | | | | |
| Green beans | 3.3.159. Green, Frozen | 4123 | 1 T = 25g<br>1 SP = 60g<br>½ c = 80Cg | | | | | |
| | 3.3.160. Cooked, potato & onion (HM) | 3792 | 1 T = 40g<br>1 SP = 75g<br>½ c = 120g | | | | | |
| | 3.3.161. Other | | | | | | | |
| Peas | 3.3.162. Green, frozen, Boiled | 4146 | 1 T = 30g<br>1 SP = 65g<br>½ c = 85g | | | | | |
| | 3.3.163. Green, frozen, with sugar, boiled | 3720 | | | | | | |
| | 3.3.164. With sugar & butter | 3859 | | | | | | |
| Onions | 3.3.165. Sauteed in sun oil | 3730 | 1 T = 50g<br>½ c chopped = 120g | | | | | |
| | 3.3.166. Raw | 3755 | | | | | | |
| Salad | 3.3.167. Raw tomato | 3750 | Med = 120g<br>Slice = 15g | | | | | |
| | 3.3.168. Lettuce | 3723 | 1 med leaf = 30g | | | | | |

| Food | Description | Code | Quantity (g/ml) | Amount usually eaten (HHM / g) | P/D | D/W | P/M | Seldom |
|---|---|---|---|---|---|---|---|---|
| | 3.3.169. Cucumber | 3718 | Med slice = 10g<br><br>Thick = 15g | | | | | |
| | 3.3.170. Avocado | 3656 | ¼ avo (80x50mm) = 40g | | | | | |
| Other vegetables:<br><br>Specify | | | | | | | | |
| Mayonnaise/salad dressing | 3.3.171. Mayonnaise – Bought | 3488 | 1t = 10g<br><br>1T = 40g | | | | | |
| | 3.3.172. Salad dressing – French | 3487 | | | | | | |
| Apples | 3.3.173. Fresh | 3532 | 1 T = 60g<br><br>½ c = 120g<br><br>1 med = 150g (52x66) | | | | | |
| | 3.3.174. Canned, pie, unsweetened | 4216 | | | | | | |
| 3.3.175. Bananas | | 3540 | 1 med = 75g | | | | | |
| 3.3.176. Oranges/Naartjies | | 3560 | Med = 180g | | | | | |
| 3.3.177. Grapes | | 3550 | Med bunch = 230g<br><br>½ c = 90g | | | | | |
| Peaches | 3.3.178. Fresh | 3565 | 1 med = 150g (60x65) | | | | | |
| | 3.3.179. Canned in syrup | 3567 | | | | | | |
| Mangoes | 3.3.180. Fresh | 3556 | 135mm = 350g | | | | | |
| | 3.3.181. Canned in syrup | 3633 | | | | | | |
| Pineapple | 3.3.182. Raw | 3581 | 1 slice (85x10mm) = 40g | | | | | |
| | 3.3.183. Canned in syrup | 3648 | | | | | | |
| Guavas | 3.3.184. Fresh | 3551 | Med (6cm) = 95g | | | | | |
| | 3.3.185. Canned in Syrup | 3553 | | | | | | |
| Pears | 3.3.186. Fresh | 3582 | 1 med (80x65mm) = 165g | | | | | |
| | 3.3.187. Canned in syrup | 3583 | | | | | | |
| Dried fruit (also as | 3.3.188. Raisins | 4232 | 1 handful = 27g | | | | | |

| Food | Description | Code | Quantity (g/ml) | Amount usually eaten (HHM / g) | P/D | D/W | P/M | Seldom |
|---|---|---|---|---|---|---|---|---|
| snack) | 3.3.189. Prunes (Raw) | 4230 | 1 T = 50g<br>½ c = 110g<br>1 med = 12g | | | | | |
| | 3.3.190. Other | | | | | | | |
| Other fruit | | | | | | | | |
| Tea | 3.3.191. Ceylon | 4038 | Teacup = 180ml<br>Mug = 250ml | | | | | |
| | 3.3.192. Rooibos | 4054 | | | | | | |
| Sugar per cup of tea | 3.3.193. Specify type: White | 3989 | 1t sugar = 6g | | | | | |
| | 3.3.194. Brown | 4005 | | | | | | |
| Milk per cup of tea | 3.3.195. Fresh / Long life Full cream | 2718 | 20ml – tea cup<br>35ml – tea cup<br>40ml – coffee cup<br>75ml – coffee mug | | | | | |
| | 3.3.196. Fresh / Long life 2% | 2772 | | | | | | |
| | 3.3.197. Fresh / Long Life skimmed / fat free | 2775 | | | | | | |
| | 3.3.198. Full cream milk powder<br>Reconstituted | 2831 | 1t = 4g | | | | | |
| | 3.3.199. Skimmed milk powder, Reconstituted | 2719 | 1 t = 4g | | | | | |
| | 3.3.200. Milk blend, reconstituted | 2771 | 20ml – tea cup<br>35ml – tea cup<br>40ml – coffee cup<br>75ml – coffee mug | | | | | |
| | 3.3.201. Whitener/non-dairy creamer | 2751 | 1t = 4g | | | | | |
| | 3.3.202. Condensed milk<br>(Full cream) | 2714 | 1t = 10g | | | | | |
| | 3.3.203. Condensed milk (Skimmed) | 2744 | | | | | | |

| Food | Description | Code | Quantity (g/ml) | Amount usually eaten (HHM / g) | P/D | D/W | P/M | Seldom |
|---|---|---|---|---|---|---|---|---|
| | 3.3.204. None | | | | | | | |
| 3.3.205. Coffee | | 4037 | Teacup = 180ml<br>Mug = 250ml | | | | | |
| Sugar per cup of coffee | Specify type:<br>3.3.206. White | 3989 | 1t = 6g | | | | | |
| | 3.3.207. Brown | 4005 | | | | | | |
| Milk per cup of coffee | 3.3.208. Specify type | | | | | | | |
| Milk as such:<br>Do you drink milk from a glass?<br>If yes, what type of milk? | 3.3.209. Fresh / Long life full cream | 2718 | To drink:<br>1 cup = 250ml | | | | | |
| | 3.3.210. Fresh / Long life 2% | 2772 | | | | | | |
| | 3.3.211. Fresh / Long life fat free (skimmed) | 2775 | 1 cup = 250ml | | | | | |
| | 3.3.212. Sour / Maas | 2787 | | | | | | |
| | 3.3.213. Flavored milk | 2774 | Carton = 250ml<br>S/s plastic = 350ml | | | | | |
| Yogurt | 3.3.214. Drinking yoghurt | 2756 | S/s plastic = 175ml<br>Yogisip = 350ml | | | | | |
| | 3.3.215. Thick yoghurt: plain, fat-free | 2778 | ½c = 125g | | | | | |
| | 3.3.216. Full cream Plain | 2757 | | | | | | |
| | 3.3.217. Fruit, low fat | 2732 | | | | | | |
| | 3.3.218. Other | | | | | | | |
| Squash | 3.3.219. Sweeto, Sixo, Kool Aid | 3982 | Small glass = 150ml<br>Med glass = 250ml | | | | | |
| | 3.3.220. Oros/Lecol with sugar | 3982 | Large glass = 500ml | | | | | |
| | 3.3.221. Artificial sweetener | 3990 | S/s bottle = 350ml<br>L/s bottle = 500ml<br>S/s can = 350ml | | | | | |
| | | | | | | | | |
| Fruit juice | 3.3.222. Fresh/Liquifruit/Ceres | 2866 | 1 Liquifruit s/s = 250ml<br>1 Liquifruit L/s = 500ml | | | | | |
| | 3.3.223. Tropica/mixture with | 2791 | | | | | | |

| Food | Description | Code | Quantity (g/ml) | Amount usually eaten (HHM / g) | P/D | D/W | P/M | Seldom |
|---|---|---|---|---|---|---|---|---|
| | milk | | S/s bottle = 350ml<br>L/s bottle = 500ml<br>S/s can = 350ml | | | | | |
| Fizzy Drinks (e.g. Coke, Fanta) | 3.3.224. Sweetened | 3981 | S/s bottle = 350ml<br>L/s bottle = 500ml<br>S/s can = 340ml | | | | | |
| | 3.3.225. Diet | 3990 | | | | | | |
| 3.3.226. Magou / Motogo | | 4056 | 1 carton = 500 ml | | | | | |
| 3.3.227. Potato crisps | | 3417 | Small = 30g | | | | | |
| Peanuts | 3.3.228. Roasted unsalted | 3452 | | | | | | |
| | 3.3.229. Roasted salted | 3458 | | | | | | |
| Cheese Curls (Nik Naks etc.) | 3.3.230. Average | 3267 | | | | | | |
| | 3.3.231. Savory | 3418 | | | | | | |
| Popcorn | 3.3.232. Plain | 3332 | | | | | | |
| | 3.3.233. Sugar Coated | 3359 | | | | | | |
| 3.3.234. Peanuts and Raisins (mixed) | Roasted, salted | P0047 | | | | | | |
| 3.3.235. Chocolates | Specify types and names: Assorted | 3992 | | | | | | |
| 3.3.236. Candies | Sugus, gums, hard sweets<br>(Specify) | 3986 | | | | | | |
| 3.3.237. Sweets | Toffee, fudge, caramels (Specify): | 3991 | | | | | | |
| 3.3.238. Biscuits/Cookies | Specify type: | | | | | | | |
| 3.3.239. Cakes & Tarts | Specify type: | | | | | | | |
| 3.3.240. Pancakes/Crumpets | Specify type: | | | | | | | |
| 3.3.241. Rusks | Specify type: | | | | | | | |

| Food | Description | Code | Quantity (g/ml) | Amount usually eaten (HHM / g) | P/D | D/W | P/M | Seldom |
|---|---|---|---|---|---|---|---|---|
| | | | | | | | | |
| 3.3.242. Scones | White | 3237 | 6cm diam = 35g<br>8cm diam = 35g | | | | | |
| Muffins | 3.3.243. Plain | 3408 | | | | | | |
| | 3.3.244. Bran | 3407 | | | | | | |
| 3.3.245. Koeksisters | | 3231 | 100x35 = 60g | | | | | |
| Savouries | 3.3.246. Sausage Rolls | 2939 | Roll x 35mm = 165g | | | | | |
| | 3.3.247. Samoosas (Meat) | 3355 | S/s = 42g | | | | | |
| | 3.3.248. Biscuits eg Bacon Kops | 3331 | 4g | | | | | |
| | 3.3.249. Other | | | | | | | |
| 3.3.250. Jelly | | 3983 | 1 T = 35g<br>1 SP = 75g<br>½ c = 110g | | | | | |
| 3.3.251. Baked puddings | Specify types | | Med serving = 30g<br>30x65x65=50g | | | | | |
| 3.3.252. Instant puddings | Specify types | | 1 T = 45g<br>1 SP = 95g<br>½ c = 145g | | | | | |
| Ice cream | 3.3.253. Commercial Regular | 3483 | Scoop = 40g<br>1 SP = 65g<br>½ c = 75g | | | | | |
| | 3.3.254. Commercial Rich | 3519 | | | | | | |
| | 3.3.255. Soft serve | 3518 | Plain = 135g + flake = 155g | | | | | |
| | 3.3.256. Sorbet | 3491 | Scoop = 40g<br>1 SP = 65g<br>½ c = 75g | | | | | |
| | 3.3.257. Ice Lollies | 3982 | | | | | | |
| | 3.3.258. Chocolate coated Individual Ice Creams (eg Magnum) | P0036 | | | | | | |
| Custard | 3.3.259. Home Made (Full cream milk) | 2716 | 1T = 13g<br>1 SP = 40g | | | | | |
| | 3.3.260. (Skimmed milk) | 2717 | | | | | | |
| 3.3.261. Tomato Sauce | | 3139 | 1t = 6g<br>1T = 25g | | | | | |

| Food | Description | Code | Quantity (g/ml) | Amount usually eaten (HHM / g) | P/D | D/W | P/M | Seldom |
|---|---|---|---|---|---|---|---|---|
| 3.3.262. Worcester Sauce | | P0037 | | | | | | |
| Chutney | 3.3.263. Fruit | 3168 | 1t = 14g | | | | | |
| | 3.3.264. Tomato | 3144 | 1T = 60g | | | | | |
| 3.3.265. Packet Soups | | 3165 | ½c = 125g | | | | | |
| Are there any foods that you eat which we haven't talked about? Please list them. | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |

## Section 3.4 – Food security

| No. | Question | Answer | | Code |
|---|---|---|---|---|
| **3.4.1** | In the past [4 weeks/30 days], was there ever no food to eat of any kind in your house because of lack of resources to get food? If no, skip to 3.4.2 | a. Yes | | |
| | | b. No | | |
| **3.4.1.1** | How often did this happen in the past [4 weeks/30 days]? | a. Rarely (1–2 times) | | |
| | | b. Sometimes (3–10 times) | | |
| | | c. Often (more than 10 times) | | |
| **3.4.2** | In the past [4 weeks/30 days], did you or any household member go to sleep at night hungry because there was not enough food? If no, skip to 3.4.3 | a. Yes | | |
| | | b. No | | |
| **3.4.2.1** | How often did this happen in the past [4 weeks/30 days]? | a. Rarely (1–2 times) | | |
| | | b. Sometimes (3–10 times) | | |
| | | c. Often (more than 10 times) | | |
| **3.4.3** | In the past [4 weeks/30 days], did you or any household member go a whole day and night without eating anything at all because there was not enough food? If no, skip the next question. | a. Yes | | |
| | | b. No | | |
| **3.4.3.1** | How often did this happen in the past [4 | a. Rarely (1–2 times) | | |

| | | | | |
|---|---|---|---|---|
| | weeks/30 days]? | b. Sometimes (3–10 times) | | |
| | | c. Often (more than 10 times) | | |

Scores will be assigned to questions 3.4.1.1, 3.4.2.1, and 3.4.3.1 in the following manner:

| Answer | Score |
|---|---|
| Rarely | 1 |
| Sometimes | 1 |
| Often | 2 |

| No. | Question | Answer | | Code |
|---|---|---|---|---|
| **3.4.4** | Food security classification: | a. Little/no hunger in household (0-1 score) | | |
| | | b. Moderate hunger in household (2-3 score) | | |
| | | c. Severe hunger in household (4-6 score) | | |

| No. | Question | Answer | | Code |
|---|---|---|---|---|
| **3.4.5** | In the last 3, 6, and 12 months, has anything changed with regards to food in the house and household hunger (choose on option)? | a. No | | |
| | | b. Yes, in the last 3 months, situation now worse | | |
| | | c. Yes, in the last 3 months, situation now better | | |
| | | d. Yes, 4 – 6 months ago, situation now worse | | |
| | | e. Yes, 4 – 6 months ago, situation now better | | |
| | | f. Yes, 7 – 12 months ago, situation now worse | | |
| | | g. Yes, 7 - 12 months ago, situation now better | | |

**Section 3.5 – Feeding habits**

| No. | Question | Answer | | Code |
|---|---|---|---|---|
| **3.5.1** | When do you feed your child? Choose one option. | a. According to a schedule. I will feed at a certain time even if he/she isn't hungry | | |
| | | b. When he/she starts looking hungry (mouthing, looking at food, reaching for food, asking for food) | | |
| | | c. When he/she is very hungry (crying) | | |
| **3.5.2** | How often do you talk to your child when he/she is eating and encourage him/her to eat? | a. Never | | |
| | | b. Sometimes | | |
| | | c. Most of the time | | |
| | | d. Always | | |
| **3.5.3** | If your child refuses food, what do you normally do? Choose one option. | a. Stop trying to feed him/her and put the food away | | |
| | | b. Pause for a while, and try again in a few minutes | | |
| | | c. Make your child eat the food, even though he/she doesn't want it | | |
| **3.5.4** | How often does your child feed himself/herself? | a. N/A (<6 months old) | | |
| | | b. Never | | |
| | | c. Sometimes | | |
| | | d. Most of the time | | |
| | | e. Always | | |
| **3.5.5** | How often do you force feed your child (force the food into his/her mouth even though he/she doesn't want it)? | a. Never | | |
| | | b. Sometimes | | |
| | | c. Most of the time | | |
| | | d. Always | | |

## APPENDIX E – QUESTIONNAIRE 4

### Section 4.1 - Medical history

The answers to the following questions will be obtained through looking at the hospital file and RTHB of the participant. If any clarity is required, the parent/guardian will be asked.

| No. | Question | Answer | | Code |
|---|---|---|---|---|
| **4.1.1** | Has the participant been admitted to hospital before (not including this admission)? | a. Yes | | |
| | | b. No | | |
| **4.1.2** | If yes, how many times? | a. 1 | | |
| | | b. 2-3 | | |
| | | c. 4-5 | | |
| | | d. >5 | | |
| **4.1.3** | Has the participant had diarrhoea in the last 12 months? | a. Yes | | |
| | | b. No | | |
| **4.1.4** | If yes, how many times in the last 12 months? | a. 1 – 2 times | | |
| | | b. 3 – 4 times | | |
| | | c. 5 – 6 times | | |
| | | d. > 6 times | | |
| **4.1.5** | Has the participant been admitted before with malnutrition? | a. Yes | | |
| | | b. No | | |
| **4.1.6** | If yes, what type of malnutrition? | a. Moderate malnutrition | | |
| | | b. SAM | | |
| | | c. Growth faltering | | |
| **4.1.7** | Has the participant's parent/guardian had previous education by a dietitian? | a. Yes | | |
| | | b. No | | |
| **4.1.8** | Is the participant up to date with immunisations? | a. Yes | | |
| | | b. No | | |
| **4.1.9** | Has the participant received vitamin A supplementation according to the Vitamin A schedule in the RTHB? | a. Yes | | |
| | | b. No | | |
| **4.1.10** | If no, how many has the participant missed? | a. 1 – 2 | | |
| | | b. 3 – 4 | | |
| | | c. 5 – 6 | | |
| | | d. 7 – 8 | | |

| | | | | |
|---|---|---|---|---|
| | | e. 9 – 10 | | |
| **4.1.11** | Has the participant been dewormed in the last 6 months? | a. Yes | | |
| | | b. No | | |
| | | c. N/A (<1yr) | | |
| **4.1.12** | What is the participant currently diagnosed with (mark all applicable)? | a. ARI | | |
| | | b. HIV | | |
| | | c. TB | | |
| | | d. AGE | | |
| | | e. CGE | | |
| | | f. Other_____ | | |
| **4.1.13** | Was the participant dehydrated when admitted to hospital (current admission)? | a. Yes | | |
| | | b. No | | |
| **4.1.14** | Will the participant need to be admitted for more than 48 hours? / Has your child been admitted for more than 48 hours? | a. Yes | | |
| | | b. No | | |
| **4.1.15** | What do you do when your child is sick? Choose on option. | a. I offer the same foods (no change) | | |
| | | b. I give less food/milk or dilute the food/milk | | |
| | | c. I give more food/milk | | |
| | | d. I stop all food and milk | | |

**Section 4.2 – Birth history**

| No. | Question | Answer | | Code |
|---|---|---|---|---|
| **4.2.1** | What method of delivery did your child have? | a. NVD | | |
| | | b. C/S | | |
| **4.2.2** | Does your child have any other siblings? | a. Yes | | |
| | | b. No | | |
| **4.2.3** | How many children are under 5 years old (including case)? | a. 1 | | |
| | | b. 2 | | |
| | | c. 3 | | |

| | | | | |
|---|---|---|---|---|
| | | d. 4 | | |
| | | e. > 4 | | |
| **4.2.4** | If your child has an older sibling, what is the age gap between your child and his/her older sibling? | a. < 9 months | | |
| | | b. 9 – 12 months | | |
| | | c. 13 – 18 months | | |
| | | d. 19 – 24 months | | |
| | | e. 2 – 3 years | | |
| | | f. >3 years | | |
| **4.2.5** | What is the birth order of your child? | a. 1 | | |
| | | b. 2 | | |
| | | c. 3 | | |
| | | d. 4 | | |
| | | e. 5 | | |
| | | f. > 5 | | |

## APPENDIX F – QUESTIONNAIRE 5

### Section 5 - Mother's anthropometry

| Growth parameter | 1st measurement | 2nd measurement | Difference between measurements | 3rd measurement (if needed) |
|---|---|---|---|---|
| Weight | | | | |
| Height/length | | | | |

| Growth parameter | Final figure |
|---|---|
| Weight | |
| Height | |
| BMI | |

| BMI classification | | Tick the applicable one | Code |
|---|---|---|---|
| a. | Underweight | | |
| b. | Normal | | |
| c. | Overweight | | |
| d. | Obese 1 | | |
| e. | Obese 2 | | |
| f. | Obese 3 | | |

**APPENDIX G – INFORMED CONSENT FOR MOTHERS OF PARTICIPANTS - ENGLISH**

| Code | | | |
|---|---|---|---|

**Participant information leaflet and consent form**

**Title of the research project:**

Risk factors in the development of severe acute malnutrition in vulnerable children under 5 years of age that live in region B or surrounding referral areas of City of Johannesburg, South Africa.

| | |
|---|---|
| Principal investigator | Jessica Ferguson |
| Address | PO Box 783435<br>Sandton 2146,<br>Gauteng |
| Contact number | 0847674884 |

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 doctor 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. We don't foresee circumstances that the project will be terminated but in such a case all participants will be notified.

**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?**

The study is being conducted at Rahima Moosa Mother and Child Hospital, and there are 159 participants taking part. This study aims to look at the risk factors for

developing severe acute malnutrition. Severe acute malnutrition is the most serious form of malnutrition, with the highest death rate. We are going to look at children who are well nourished, moderately malnourished, or severely malnourished and compare certain factors. This will help us find out which factors (such as diet, living conditions or medical history) contribute to severe acute malnutrition. This information will be important for us to develop programs to prevent severe acute malnutrition in children. Children will be chosen for the study if they fulfil certain criteria. These children will have certain measurements taken (weight, height, head circumference, and mid-upper arm circumference) and the parent/guardian of the child will be asked a series of questions. The child's mother will also have her weight and height taken.

**Why have you been invited to participate?**

You and your child have been asked to participate in this study because your child lives in Region B or surrounding referral areas of Johannesburg and fulfils the criteria for the study. We are looking for children in this area who are either severely malnourished, moderately malnourished, or well nourished. Your child falls into one of these categories.

**What will your responsibilities be?**

As the mother, you will be required to answer a variety of questions about your child's family, living conditions, diet, medical history, and birth history. A variety of measurements will need to be done on your child, such as weight, height, head circumference, and mid-upper arm circumference. Your weight and height will also need to be measured. The measurements and questionnaires should take approximately one hour to complete. Your child will have to be present for the measurements, and you will have to be present for all of the measurements and questionnaires.

**Will you benefit from taking part in this research?**

You or your child will not benefit directly from this study. However, from the results we can determine which factors increase the risk of severe acute malnutrition. Therefore, we will be able to use the information to develop strategies to reduce the occurrence of severe acute malnutrition.

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

There are no risks involved in taking part in this study, because there is no intervention taking place.

**Who will have access to your medical records?**

The principal investigator, Jessica Ferguson, will look at your child's medical records and Road to Health Booklet. However, the information that is used from these records will be treated as confidential and protected. If this study is used in a publication or thesis, the identity of you and your child will remain anonymous.

**What will happen in the unlikely event of some form of injury occurring as a direct result of your taking part in this research study?**

There is no risk to your child of this happening, as there is no intervention in this study.

**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 this study, and there will be no cost involved for you if you do take part.

**You can contact Jessica Ferguson at 0847674884 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: Risk factors in the development of severe acute malnutrition in vulnerable children under 5 years of age that live in region B of City of Johannesburg, South Africa.

**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 Rahima Moosa Hospital on (*date*) ……...…….. 2014.

_____

Signature of participant

**Declaration by investigator**

I, Jessica Ferguson, declare that:

I explained the information in this document to ……..

I encouraged him/her to ask questions and took adequate time to answer them.

I am satisfied that he/she adequately understands all aspects of the research, as discussed above

I did/did not use an interpreter. (*If an interpreter is used then the interpreter must sign the declaration below.*

Signed at (*place*) Rahima Moosa Hospital on (*date*) ……...…….. 2014.

_____

Signature of investigator

**Declaration by interpreter**

I *(name)* ……..…… declare that:

I assisted the investigator (*name*) …….. to explain the information in this document to (*name of participant*) ……..…….. using the language medium of Zulu/Sesotho.

We encouraged him/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 his/her question satisfactorily answered.

Signed at (*place*) .....…….. on (*date*) ……...……..

_____

Signature of interpreter

**APPENDIX H – INFORMED CONSENT FOR CAREGIVER OF PARTICIPANT - ENGLISH**

| Code | | | |
|---|---|---|---|

**Participant information leaflet and consent form**

**Title of the research project:**

Risk factors in the development of severe acute malnutrition in vulnerable children under 5 years of age that live in region B or surrounding referral areas of City of Johannesburg, South Africa.

| | |
|---|---|
| Principal investigator | Jessica Ferguson |
| Address | PO Box 783435<br>Sandton 2146,<br>Gauteng |
| Contact number | 0847674884 |

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 doctor 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 free to withdraw from the study at any point, even if you do agree to take part. We don't foresee circumstances that the project will be terminated but in such a case all participants will be notified.

**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?**

The study is being conducted at Rahima Moosa Mother and Child Hospital, and there are 159 participants taking part. This study aims to look at the risk factors for

developing severe acute malnutrition. Severe acute malnutrition is the most serious form of malnutrition, with the highest death rate. We are going to look at children who are well nourished, moderately malnourished, or severely malnourished and compare certain factors. This will help us find out which factors (such as diet, living conditions or medical history) contribute to severe acute malnutrition. This information will be important for us to develop programs to prevent severe acute malnutrition in children.

Children will be chosen for the study if they fulfil certain criteria. These children will have certain measurements taken (weight, height, head circumference, and mid-upper arm circumference) and the parent/guardian of the child will be asked a series of questions. The child's mother will also have her weight and height taken.

**Why have you been invited to participate?**

You and your child have been asked to participate in this study because your child lives in Region B or surrounding referral areas of Johannesburg and fulfils the criteria for the study. We are looking for children in this area who are either severely malnourished, moderately malnourished, or well nourished. Your child falls into one of these categories.

**What will your responsibilities be?**

As the caregiver/guardian, you will be required to answer a variety of questions about your child's family, living conditions, diet, medical history, and birth history. A variety or measurements will also need to be done on your child, such as weight, height, head circumference, and mid-upper arm circumference. The measurements and questionnaires should take approximately one hour to complete. Your child will have to be present for the measurements, and you will have to be present for all of the measurements and questionnaires.

**Will you benefit from taking part in this research?**

You or your child will not benefit directly from this study. However, from the results we can determine which factors increase the risk of severe acute malnutrition. Therefore, we will be able to use the information to develop strategies to reduce the occurrence of severe acute malnutrition.

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

There are no risks involved in taking part in this study, because there is no intervention taking place.

**Who will have access to your medical records?**

The principal investigator, Jessica Ferguson, look at your child's medical records and Road to Health Booklet. However, the information that is used from these records will be treated as confidential and protected. If this study is used in a publication or thesis, the identity of you and your child will remain anonymous.

**What will happen in the unlikely event of some form injury occurring as a direct result of your taking part in this research study?**

There is no risk to your child of this happening, as there is no intervention in this study.

**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 this study, and there will be no cost involved for you if you do take part.

**You can contact Jessica Ferguson at 0847674884 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: Risk factors in the development of severe acute malnutrition in vulnerable children under 5 years of age that live in region B of City of Johannesburg, South Africa.

**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 (*place*) Rahima Moosa Hospital on (*date*) ……...…….. 2014.

_____

Signature of participant

**Declaration by investigator**

I, Jessica Ferguson, declare that:

I explained the information in this document to ……..

I encouraged him/her to ask questions and took adequate time to answer them.

I am satisfied that he/she adequately understands all aspects of the research, as discussed above

I did/did not use an interpreter. (*If an interpreter is used then the interpreter must sign the declaration below.*

Signed at (*place*) Rahima Moosa Hospital on (*date*) ……...…….. 2014.

_____

Signature of investigator

**Declaration by interpreter**

I *(name)* ……..…… declare that:

I assisted the investigator (*name*) …….. to explain the information in this document to (*name of participant*) ……..…….. using the language medium of Zulu/Sesotho.

We encouraged him/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 his/her question satisfactorily answered.

Signed at (*place*) .....…..…….. on (*date*) ……...……..

_____

Signature of interpreter

**APPENDIX I – INGELIGTE TOESTEMMING VIR MOEDERS VAN DEELNEMERS - AFRIKAANS**

| Code | | | |
|---|---|---|---|

**Deelnemer inligtingstuk en toestemmingsvorm**

**Titel van die navorsingsprojek:**

Risikofaktore in die ontwikkeling van ernstige akute wanvoeding in kwesbare kinders onder 5 jaar oud wat in gebied B of omliggende voedings areas van die Stad Johannesburg, Suid-Afrika woon.

| | |
|---|---|
| Hoofnavorser | Jessica Ferguson |
| Adres | Posbus 783435<br>Sandton 2146,<br>Gauteng |
| Kontaknommer | 0847674884 |

Jy word uitgenooi om deel te neem aan 'n navorsingsprojek. Neem asseblief die tyd om die inligting wat volg, wat die besonderhede van die projek sal verduidelik, te lees. Vra asseblief die studiepersoneel of dokter enige vrae oor enige deel van die projek wat jy nie ten volle verstaan nie. Dit is baie belangrik dat jy heeltemal tevrede is en dat jy duidelik verstaan wat hierdie navorsing behels en hoe jy betrokke kan wees. Ook, jou deelname is **vrywillig** en jy is vry om te weier om deel te neem. As jy nee sê, sal dit jou geensins negatief beïnvloed nie. Jy is ook vry om enige tyd van die studie te onttrek, selfs nadat jy ingestem het om deel te neem. Ons voorsien nie omstandighede wat die projek sal beëindig nie, maar in so 'n geval sal al die deelnemers in kennis gestel word.

**Hierdie studie is deur die** Navorsingsetiekkomitee van Gesondheid aan die Universiteit van Stellenbosch **goedgekeur en sal uitgevoer word volgens die etiese riglyne en beginsels van die internasionale Verklaring van Helsinki, Suid-Afrikaanse riglyne vir goeie kliniese praktyk en die Mediese Navorsingsraad (MNR) se etiese riglyne vir navorsing.**

**Wat behels hierdie navorsing?**

Die studie word gedoen by Rahima Moosa Moeder en Kind-hospitaal, en daar is 159 deelnemers. Die doel van hierdie studie is om te kyk na die risikofaktore vir die ontwikkeling van ernstige akute wanvoeding. Ernstige akute wanvoeding is die mees

ernstige vorm van wanvoeding, met die hoogste sterftesyfer. Ons gaan kyk na kinders wat goed gevoed word, matig wangevoed word, of erg ondervoed word, en dan gaan onssekere faktore vergelyk. Dit sal ons help om uit te vind watter faktore (soos dieet , lewensomstandighede of mediese geskiedenis ) bydra tot ernstige akute wanvoeding. Hierdie inligting sal belangrik wees vir die ontwikkeling van programme om ernstige akute wanvoeding in kinders te voorkom. Kinders sal vir die studie gekies word indien hulle aan sekere vereistes voldoen. Sekere mates (gewig, hoogte, omtrek van kop en middel van bo-arm) sal van hierdie kinders gemeet word, en die ouer/voog van die kind sal gevra word om 'n aantal vrae te beantwoord. Die gewig en hoogte van die kind se ma sal ook geneem word.

**Hoekom is jy is uitgenooi om deel te neem?**

Jy en jou kind is gevra om aan hierdie stude deel te neem omdat jou kind in Streek B of omliggende voedings areas van Johannesburg woon en voldoen aan die vereistes vir die studie. Ons is op soek na  kinders in hierdie gebied wat, óf erg ondervoed is, matig wangevoed is, of goed gevoed is. Jou kind val in een van hierdie kategorieë.

**Wat sal u verantwoordelikhede wees?**

As die moeder, sal jy gevra word om sekere vrae oor jou kind se familie, lewensomstandighede, dieet, geboorte en mediese geskiedenis, te beantwoord. 'n Aantal mates sal ook van jou kind geneem word, soos gewig, hoogte, omtrek van kop en middel van bo-arm. Jou gewig en lengte sal ook moet gemeet word. Die mates en vraelyste sal ongeveer een uur neem om te voltooi. Jou kind moet teenwoordig wees om die mates te neem, en jy moet teenwoordig wees vir al die mates en vraelyste.

**Sal jy voordeel trek daaruit om aan hierdie navorsing deel te neem?**

Jy of jou kind sal nie direk baat vind uit hierdie studie nie, maar die resultate van hierdie studies sal dit vir ons moontlik maak om te bepaal watter faktore verhoog die risiko vir ernstige akute wanvoeding. Ons sal in staat wees om die inligting te gebruik om strategieë te ontwikkel om ernstige akute wanvoeding te verminder.

**Is daar risiko’s betrokke met jou deelname aan hierdie navorsing?**

Daar is geen risiko's betrokke met jou deelname aan hierdie studie nie, want daar is geen intervensie nie.

**Wie sal toegang hê tot jou mediese verslae?**

Die hoofnavorser, Jessica Ferguson, sal na jou kind se mediese verslae en na sy/haar Road to Health boekie kyk. Die inligting wat van hierdie verslae gebruik word, sal egter as vertroulik en beskerm behandel word. As hierdie studie in 'n publikasie of tesis gebruik word, sal die identiteit van jou en jou kind anoniem bly.

**Wat sal gebeur in die onwaarskynlike geval van 'n besering as 'n direkte gevolg van jou deelname aan hierdie navorsing?**

Daar is geen risiko vir jou kind van enige besering nie, want daar is geen intervensie in hierdie studie nie.

**Sal jy betaal word om deel te neem aan hierdie studie en is daar enige koste aan verbonde?**

Nee, jy sal nie betaal word om deel te neem aan hierdie studie nie, en daar sal geen koste verbonde wees aan jou deelname nie.

**Jy kan Jessica Ferguson kontak by 0847674884 indien jy enige verdere navrae het of enige probleme ondervind.**

**Jy kan met die Navorsingsetiekkomitee van Gesondheid by 021-938 9207 kontak maak indien jy enige probleme of klagtes het wat nie bevredigend deur jou studiedokter aangespreek word nie.**

**Jy sal 'n afskrif van hierdie inligting en toestemmingsvorm ontvang vir jou eie rekords**.

**Verklaring deur deelnemer**

Deur hier onder te teken, stem ek …….. in om deel te neem aan 'n navorsingstudie genaamd: Risikofaktore in die ontwikkeling van ernstige akute wanvoeding in kwesbare kinders onder 5 jaar oud wat in gebied B van die Stad Johannesburg, Suid-Afrika woon.

**Ek verklaar dat:**

Ek hierdie inligting en toestemmingsvorm gelees het, of dit aan my gelees is in 'n taal wat ek vloeiend en gemakllik in is.

Ek het 'n kans gehad het om vrae te vra en dat al my vrae bevredigend beantwoord is.

Ek verstaan dat deelname aan hierdie studie vrywillig is en dat ek nie onder druk geplaas is om deel te neem nie.

Ek kan kies om die studie op enige tyd om te verlaat en dat ek nie gestraf sal word of op enige manier benadeel sal word nie.

Ek gevra kan word om die studie te verlaat voordat dit klaar is, indien die studiedokter of navorser voel dat dit in my beste belang is, of as ek nie die studieplan, soos ooreengekom, volg nie.

Geteken te (plek) Rahima Moosa Hospital op (datum) ..... 2014.

_____

Handtekening van deelnemer

**Verklaring deur navorser**

Ek (naam) Jessica Ferguson verklaar dat:

Ek die inligting in hierdie dokument verduidelik het aan: .....

Ek hom/haar aangemoedig het om vrae te vra en voldoende tyd spandeer het om hulle te beantwoord.

Ek oortuig is dat hy/sy alle aspekte van die navorsing, soos hierbo bespreek, voldoende verstaan.

Ek 'n tolk/nie ‘n tolk gebruik het (As 'n tolk gebruik is,dan moet die tolk die onderstaande verklaring teken).

Geteken te (plek) Rahima Moosa Hospital op (datum) ..... 2014.

_____

Handtekening van ondersoeker

**Verklaring deur tolk**

Ek (naam ) ..... verklaar dat:

Ek die ondersoeker (naam) ..... bygestaan het om die inligting in hierdie dokument aan (naam van deelnemer) ..... te verduidelik deur die gebruik van Afrikaans as taal.

Ons het hom/haar aangemoedig om vrae te vra en het voldoende tyd gegee om hulle te beantwoord.

Ek 'n feitelik-korrekte weergawe van wat aan my gesê is, oorgedra het.

Ek oortuig is dat die deelnemer die inhoud van hierdie ingeligte toestemmingsdokument ten volle verstaan en dat al sy /haar vrae bevredigend beantwoord is.

Geteken te (plek ) ..... op (datum) .....

_____

Handtekening van tolk

**APPENDIX J – INGELIGTE TOESTEMMING VIR VERSORGERS VAN DEELNEMERS - AFRIKAANS**

| Code | | | |
|---|---|---|---|

**Deelnemer inligtingstuk en toestemmingsvorm**

**Titel van die navorsingsprojek:**

Risikofaktore in die ontwikkeling van ernstige akute wanvoeding in kwesbare kinders onder 5 jaar oud wat in Streek B of omliggende voedings areas van die Stad Johannesburg, Suid-Afrika woon.

| | |
|---|---|
| Hoofnavorser | Jessica Ferguson |
| Adres | Posbus 783435<br>Sandton 2146,<br>Gauteng |
| Kontaknommer | 0847674884 |

Jy word uitgenooi om deel te neem aan 'n navorsingsprojek. Neem asseblief die tyd om die inligting wat volg, wat die besonderhede van die projek sal verduidelik, te lees. Vra asseblief die studiepersoneel of dokter enige vrae oor enige deel van die projek wat jy nie ten volle verstaan nie. Dit is baie belangrik dat jy heeltemal tevrede is en dat jy duidelik verstaan wat hierdie navorsing behels en hoe jy betrokke kan wees. Ook, jou deelname is **vrywillig** en jy is vry om te weier om deel te neem. As jy nee sê, sal dit jou geensins negatief beïnvloed nie. Jy is ook vry om enige tyd van die studie te onttrek, selfs nadat jy ingestem het om deel te neem. Ons voorsien nie omstandighede wat die projek sal beëindig nie, maar in so 'n geval sal al die deelnemers in kennis gestel word.

**Hierdie studie is deur die** Navorsingsetiekkomitee van Gesondheid aan die Universiteit van Stellenbosch **goedgekeur en sal uitgevoer word volgens die etiese riglyne en beginsels van die internasionale Verklaring van Helsinki, Suid-Afrikaanse riglyne vir goeie kliniese praktyk en die Mediese Navorsingsraad (MNR) se etiese riglyne vir navorsing.**

**Wat behels hierdie navorsing?**

Die studie word gedoen by Rahima Moosa Moeder en Kind-hospitaal, en daar is 159 deelnemers. Die doel van hierdie studie is om te kyk na die risikofaktore vir die

ontwikkeling van ernstige akute wanvoeding. Ernstige akute wanvoeding is die mees ernstige vorm van wanvoeding, met die hoogste sterftesyfer. Ons gaan kyk na kinders wat goed gevoed word, matig wangevoed word, of erg ondervoed word, en dan gaan onssekere faktore vergelyk. Dit sal ons help om uit te vind watter faktore (soos dieet , lewensomstandighede of mediese geskiedenis ) bydra tot ernstige akute wanvoeding. Hierdie inligting sal belangrik wees vir die ontwikkeling van programme om ernstige akute wanvoeding in kinders te voorkom. Kinders sal vir die studie gekies word indien hulle aan sekere vereistes voldoen. Sekere mates (gewig, hoogte, omtrek van kop en middel van bo-arm) sal van hierdie kinders gemeet word, en die ouer/voog van die kind sal gevra word om 'n aantal vrae te beantwoord. Die gewig en hoogte van die kind se ma sal ook geneem word.

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**Wat sal u verantwoordelikhede wees?**

As die versorger, sal jy gevra word om sekere vrae oor jou kind se familie, lewensomstandighede, dieet, geboorte en mediese geskiedenis, te beantwoord. 'n Aantal mates sal ook van jou kind geneem word, soos gewig, hoogte, omtrek van kop en middel van bo-arm.  Die mates en vraelyste sal ongeveer een uur neem om te voltooi. Jou kind moet teenwoordig wees om die mates te neem, en jy moet teenwoordig wees vir al die mates en vraelyste.

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Geteken te (plek ) Rahima Moosa Hospital op (datum) ..... 2014.

_____

Handtekening van deelnemer

**Verklaring deur navorser**

Ek (naam) Jessica Ferguson verklaar dat:

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Ek hom/haar aangemoedig het om vrae te vra en voldoende tyd spandeer het om hulle te beantwoord.

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Geteken te (plek ) Rahima Moosa Hospital op (datum) ..... 2014.

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Handtekening van ondersoeker

**Verklaring deur tolk**

Ek (naam ) ..... verklaar dat:

Ek die ondersoeker (naam) ..... bygestaan het om die inligting in hierdie dokument aan (naam van deelnemer) ..... te verduidelik deur die gebruik van Afrikaans as taal.

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Geteken te (plek ) ..... op (datum) .....

_____

Handtekening van tolk

**APPENDIX K – INFORMED CONSENT FOR MOTHERS' OF PARTICIPANTS - ISIZULU**

| Code | | | |
|---|---|---|---|

**Iphepha lemvume no lwazi lwaba bamba iqhaza:**

Ingozi enomthelela ekuthuthukiseni izngane ezine (SAM) noma ukungondleki okuyingozi ezingaphansi kweminyaka emihlanu ubudala ezihlala esifundeni B noma maduzane kwi City of Johannesburg, South Africa

| | |
|---|---|
| Oyinhloko umphenyi | Jessica Ferguson |
| Akheli | PO Box 783435<br>Sandton 2146,<br>Gauteng |
| Inomboro | 0847674884 |

Uyamenywa ukuba uhlanganyele ube ingxenye yeproject. Ucelwa ukuthi uthathe isikhathi ufunde mayelana nemininingwane ehambisana ne study. Uma ingabe unemibuzo wamkelekile ukuthi ungabuza abasebenzi noma udokotela we study. Kubalulekile ukuthi uzwisise futhi weneme ngolwazi olumayelana ne study, ukuba kwenzakalani ngaso nokuthi ungabamba kanjani iqhaza. Okunye okubalulekile ukuthi **kufanele wazi ukuthi ukubamba kwakho iqhazakuphuma kuwe kanti futhi ukuzithandela**, ungenqaba na ungathandi. Ukwenqaba kwakho ukubamba iqhaza ngeke kukuphazamise nangayiphi indlela kanti futhi wamkelekile ukuthi ungashiya phansi kwi study na noma kunini noma ingabe ubus'uvumile. Asiboni ukuthithi iproject inganqanyulwa kodwa na kungenzeka bonke ababambe iqhaza bazokwaziswa

Lolu cwaningo luvunyelwe yi **Health Research Ethics Committee** yase **Stellenbosch University** futhi kuyobe kwenziwa ngokuvumelana neziqondiso nezimiso zokuziphatha ze **Declaration of International of Henlesk**i, iziqondiso zase ningizimu afrika **for good clinical practice** kanye ne **Medical Research Council (MRC)** yokuziphatha yocwaningo

**Lumayelana nani ucwaningo**

Lolucwaningo luqhutshwa e Rahima Moosa Mother and Child Hospital. Lunabantu abangu159 asebethatha iqhaza. Lolucwaningo luhlose ukubheka izingozi ezihambisana nokugula okwaziwa nge severe acute malnutrition noma ukungondleki okuyingozi. Isona sifo esiphakeme ekuqedeni isizwe. Sifuna ukubheka izingane

ezondlekile, ezingondlekanga, nezi ngondlekanga kakhulu bese siqhathanisa izici ezithile. Lokhu kuyosisiza ukuthi sithole izici ezifana (nokudla okudliwayo, izimo zokuphila, kanye nemilando yokwelashwa) neqhaza ezilibambayo ekondlekeni okuyingozi. Lolwazi lubalulekile ukuze sikwazi ukuqala izinhlelo ezizovikela ukungondleki okuyingozi. Izingane zizoqoshwa uma zigcwalisa izidingo ezithile. Lezi zingane zizokwenziwa izilinganiso ezithile (njenge sisindo, ubude, inhloko yonke nobungaphezulu bengalo yonke) umzali wengane uzobuzwa imibuzo ethile bese athathwe nesisindo somzimba kanye no bude

**Kungani umenyiwe ukuthi uzobamba iqhaza?**

Umeny'we ukuthi uzobamba iqhaza ku le study ngoba ingane yakho ihlala e region b yase Johannesburg noma maduzane kanti futhi inezidingo ezithile ezingenza ukuthi ikwazi ukubamba iqhaza. Sifuna ukubheka izingane ezondlekile, ezingondlekanga, nezi ngondlekanga kakhulu. Ingane yakho iwela kwenye yalama qhaza

**Yini izibopho zakho?**

Njengo mama wengane kuzofanele uphendule imibuzo ethile mayelana nomndeni wakho,izimo eniphila kuzo, ukudla enikudlayo, nomlando wezokwelashwa. Ingane izokwenziwa izilinganiso ezithile njenge sisindo, ubude, inhloko yonke nobungaphezulu bengalo yonke. Nawe uzokwenziwa izilinganiso zesisindo nobude. Izilinganiso nesisindo kumele zithathe cishe ihora elilodwa ukuqedela. Ingane yakho kudingeka ukuba ibekhona ukuze kwenziwe lezizilinganiso kanti nawe kudingeka ukuba ubekhona kulezizilinganiso ukuze uphendule imibuzo.

**Ingabe uyozuza na ekuthatheni iqhaza kulo cwaningo?**

Wena negane yakho ngeke nizuze ngokuqondile uma nithatha iqhaza kulocwaningo. Kodwa, imiphumela yalocwaningo ingasibonisa ukuthi eziphi izici ezandisa amathuba wokuthi izingane zibe nokungondleki okuyingozi. Ngakho sizokwazi ukusebenzisa lolwazi ukuthuthukisa amasu okunciphisa ukuvela kokungondleki okuyingozi.

**Zikhona yini izingozi ezihlelekile ekuthatheni iqhaza kulolu cwaningo**

Azikho izingozi ezihlangene nokuthatha iqhaza kulolucwaningo, ngoba kungekho ukungenela okuthatha indawo.

**Obani abayofinyelela kuma rekhodi wakho wokwelashwa**

Umseshi uJessica Ferguson, uzobheka ama rekhodi wengane yakho wezempilo kanye ne khadi lase kliniki (Road to Health Card). Imiringwane le eyophuma kulama rekhodi iyophathiswa ekwemfihlo futhi ivikelwe. Uma ucwaningo lolu lungasetshenziswa kwi ncwadi noma kwi zifundo zemiqondo eziphakeme, igama lakho noma elengane yakho ngeke lisetshenziswe.

**Kuyokwenzekani na kungenzeka ube kwi ngozi ngenxa yokubamba iqhaza kulo cwaningo?**

Abukho ubungozi kuwena noma ingane yakhe ngoba kungekho ukungenela okuthatha indawo

**Ingabe uzobhadalwa yini ukuthi ubambe iqhaza kanti zikhona na ezinye izindleko na?**

Cha, angeke ukhokhelwe ukuba ubambe iqhaza kulolu cwaningo, kanti futhi angeke kubekhona ezinye izindleko kwaba bamba iqhaza

**Ungathinta u Jessica Ferguson ku 084 7674 884 na Ingabe unemibuzo nomakukhona ukukukhathazayo**

**Ungathinta I Health Research Ethics Committee ku 021 938 9207na Ingabe kukhona okukukhathazayo noma unezikhalazo ezithilemayelana no dokotela wengane yakhe ezingazange zalungiswa**

**Uzotholaikhophi laleli phepha ukuze uhambe nalo ekhaya elinye lizobekwa kuma rekhodi wakho**

**Isibopho somhlanganyeli**

Ngokusayina ngezansi, Mina…….. ngivumaukubamba iqhaza kulo cwaningo elinisihloko esithi: Ingozi enomthelela ekuthuthukiseni izngane ezine (SAM) noma ukungondleki okuyingozi ezingaphansi

kweminyaka emihlanu ubudala ezihlala esifundeni B kwi City of Johannesburg, South Africa

**Ngiyavuma ukuthi:**

Ngifunde noma ngifundelwe ulwazi kanye ne fomu lemvume elilotshiwe noma elibhalwe nge limi engilizwisisayo futhi engeneme ngalo

Ngibe nethuba lokubuza yonke imibuzo futhi ngaphendlwa ngendlela engeneme ngayo

Ngiyazwisisa ukuthi ukuhlanganyela kulolu cwaningo kuyinto yokuzithandela futhi akekho ongiphoxayo ukuthi ngibe yingxenye

Ngingacelwa ukuba ngingasabambi iqhaza ngaphambi kokuthi ucwaningoluphele, uma ingabe udokotela wocwaningo ebona kungilulngele, noma na ingabe angilanfdeli imigomo, ngokufaneleyo

Isayinwe e (indawo) Rahima Moosa Hospital ngosuku (date)……

_____

Signature yombambi qhaza

**Isibopho somphenyi**

Mina, Jessica Ferguson, ngizibopha ukuthi:

Ngichazile imininingwane ya leform ku……..

Ngamkhuthaza ukuba abuze imibuzo efanele ngazinikanesikhathi sokuyiphendula.

Ngenelisekileukuba uyazwisisa futhi uyazazi zonke izici ezimayelana no cwaningo, njengoba kuxoxwa ngenhla.

Angizange ngisebenzise utoliki.(uma Ingabe utoliki usetshenzisiwe kufanele asyine ngezansi)

Isayinwe e (indawo) Rahima Moosa Hospital ngosuku (date)……

Signature yomphenyi

**Isibopho sika toliki**

Mina (igama)……..ngizibopha ukuthi:

Ngincedise umphenyi (igama)…….ukuchaza ulwazi kulencwajana ku (mhlanganyeli)…….. ngisebenzisa ulwimi lwe Sizulu.

Ngiyisombulule ngayona ndlela ye qiniso ebeyi hlobene kimi

Ngenelisekile ukuthi umbambi qhaza uyayizwisisa imibandakanyo emayelana no cwaningo kanti futhi nemibuzo yakhe iphendulwe ngokugcwelefuthi uyazwisisa

Isayinwe e (indawo)…….ngosuku (date)……

I signature ka toliki

**APPENDIX L – INFORMED CONSENT FOR CAREGIVERS OF PARTICIPANTS - ISIZULU**

| Code | | | |
|---|---|---|---|

**Iphepha lemvume no lwazi lwaba bamba iqhaza:**

Ingozi enomthelela ekuthuthukiseni izngane ezine (SAM) noma ukungondleki okuyingozi ezingaphansi kweminyaka emihlanu ubudala ezihlala esifundeni B noma maduzane kwi City of Johannesburg, South Africa

| | |
|---|---|
| Oyinhloko umphenyi | Jessica Ferguson |
| Akheli | PO Box 783435<br>Sandton 2146,<br>Gauteng |
| Inomboro | 0847674884 |

Uyamenywa ukuba uhlanganyele ube ingxenye yeproject. Ucelwa ukuthi uthathe isikhathi ufunde mayelana nemininingwane ehambisana ne study. Uma ingabe unemibuzo wamkelekile ukuthi ungabuza abasebenzi noma udokotela we study. Kubalulekile ukuthi uzwisise futhi weneme ngolwazi olumayelana ne study, ukuba kwenzakalani ngaso nokuthi ungabamba kanjani iqhaza. Okunye okubalulekile ukuthi **kufanele wazi ukuthi ukubamba kwakho iqhazakuphuma kuwe kanti futhi ukuzithandela**, ungenqaba na ungathandi. Ukwenqaba kwakho ukubamba iqhaza ngeke kukuphazamise nangayiphi indlela kanti futhi wamkelekile ukuthi ungashiya phansi kwi study na noma kunini noma ingabe ubus'uvumile. Asiboni ukuthithi iproject inganqanyulwa kodwa na kungenzeka bonke ababambe iqhaza bazokwaziswa

Lolu cwaningo luvunyelwe yi **Health Research Ethics Committee** yase **Stellenbosch University** futhi kuyobe kwenziwa ngokuvumelana neziqondiso nezimiso zokuziphatha ze **Declaration of International of Henlesk**i , iziqondiso zase ningizimu afrika **for good clinical practice**kanye ne **Medical Research Council (MRC)** yokuziphatha yocwaningo

**Lumayelana nani ucwaningo**

Lolucwaningo luqhutshwa e Rahima Moosa Mother and Child Hospital. Lunabantu abangu159 asebethatha iqhaza. Lolucwaningo luhlose ukubheka izingozi ezihambisana nokugula okwaziwa nge severe acute malnutrition noma ukungondleki okuyingozi. Isona sifo esiphakeme ekuqedeni isizwe. Sifuna ukubheka izingane

ezondlekile, ezingondlekanga, nezi ngondlekanga kakhulu bese siqhathanisa izici ezithile. Lokhu kuyosisiza ukuthi sithole izici ezifana(nokudla okudliwayo, izimo zokuphila, kanye nemilando yokwelashwa) neqhaza ezilibambayo ekondlekeni okuyingozi. Lolwazi lubalulekile ukuze sikwazi ukuqala izinhlelo ezizovikela ukungondleki okuyingozi. Izingane zizoqoshwa uma zigcwalisa izidingo ezithile . lezi zingane zizokwenziwa izilinganiso ezithile (njenge sisindo, ubude, inhloko yonke nobungaphezulu bengalo yonke) umzali wengane uzobuzwa imibuzo ethile bese athathwe nesisindo somzimba kanye no bude

**Kungani umenyiwe ukuthi uzobamba iqhaza?**

Umeny'we ukuthi uzobamba iqhaza ku le study ngoba ingane yakho ihlala e region b yase Johannesburg noma maduzane kanti futhi inezidingo ezithile ezingenza ukuthi ikwazi ukubamba iqhaza. Sifuna ukubheka izingane ezondlekile, ezingondlekanga, nezi ngondlekanga kakhulu. Ingane yakho iwela kwenye yalama qhaza

**Yini izibopho zakho?**

Njengo umnakekeli wengane kuzofanele uphendule imibuzo ethile mayelana nomndeni wakho,izimo eniphila kuzo, ukudla enikudlayo, nomlando wezokwelashwa. Ingane izokwenziwa izilinganiso ezithile njenge sisindo, ubude, inhloko yonke nobungaphezulu bengalo yonke. Izilinganiso nesisindo kumele zithathe cishe ihora elilodwa ukuqedela. Ingane yakho kudingeka ukuba ibekhona ukuze kwenziwe lezizilinganiso kanti nawe kudingeka ukuba ubekhona kulezizilinganiso ukuze uphendule imibuzo.

**Ingabe uyozuza na ekuthatheni iqhaza kulo cwaningo?**

Wena negane yakho ngeke nizuze ngokuqondile uma nithatha iqhaza kulocwaningo. Kodwa, imiphumela yalocwaningo ingasibonisa ukuthi eziphi izici ezandisa amathuba wokuthi izingane zibe nokungondleki okuyingozi . Ngakho sizokwazi ukusebenzisa lolwazi ukuthuthukisa amasu okunciphisa ukuvela kokungondleki okuyingozi.

**Zikhona yini izingozi ezihlelekile ekuthatheni iqhaza kulolu cwaningo**

Azikho izingozi ezihlangene nokuthatha iqhaza kulolucwaningo, ngoba kungekho ukungenela okuthatha indawo.

**Obani abayofinyelela kuma rekhodi wakho wokwelashwa**

Umseshi uJessica Ferguson, uzobheka ama rekhodi wengane yakho wezempilo kanye ne khadi lase kliniki (Road to Health Card). Imininingwane le eyophuma kulama rekhodi iyophathiswa ekwemfihlo futhi ivikelwe. Uma ucwaningo lolu lungasetshenziswa kwi ncwadi noma kwi zifundo zemiqondo eziphakeme, igama lakho noma elengane yakho ngeke lisetshenziswe.

**Kuyokwenzekani na kungenzeka ube kwi ngozi ngenxa yokubamba iqhaza kulo cwaningo?**

Abukho ubungozi kuwena noma ingane yakhe ngoba kungekho ukungenela okuthatha indawo

**Ingabe uzobhadalwa yini ukuthi ubambe iqhaza kanti zikhona na ezinye izindleko na?**

Cha, angeke ukhokhelwe ukuba ubambe iqhaza kulolu cwaningo, kanti futhi angeke kubekhona ezinye izindleko kwaba bamba iqhaza

**Ungathinta u Jessica Ferguson ku 084 7674 884 na Ingabe unemibuzo nomakukhona ukukukhathazayo. Ungathinta I Health Research Ethics Committee ku 021 938 9207na Ingabe kukhona okukukhathazayo noma unezikhalazo ezithilemayelana no dokotela wengane yakhe ezingazange zalungiswa. Uzotholaikhophi laleli phepha ukuze uhambe nalo ekhaya elinye lizobekwa kuma rekhodi wakho**

**Isibopho somhlanganyeli**

Ngokusayina ngezansi, Mina…… ngivumaukubamba iqhaza kulo cwaningo elinisihloko esithi: Ingozi enomthelela ekuthuthukiseni izngane ezine (SAM) noma ukungondleki okuyingozi ezingaphansi kweminyaka emihlanu ubudala ezihlala esifundeni B kwi City of Johannesburg, South Africa

**Ngiyavuma ukuthi:**

Ngifunde noma ngifundelwe ulwazi kanye ne fomu lemvume elilotshiwe noma elibhalwe nge limi engilizwisisayo futhi engeneme ngalo

Ngibe nethuba lokubuza yonke imibuzo futhi ngaphendlwa ngendlela engeneme ngayo

Ngiyazwisisa ukuthi ukuhlanganyela kulolu cwaningo kuyinto yokuzithandela futhi akekho ongiphoxayo ukuthi ngibe yingxenye

Ngingacelwa ukuba ngingasabambi iqhaza ngaphambi kokuthi ucwaningoluphele, uma ingabe udokotela wocwaningo ebona kungilulngele , noma na ingabe angilanfdeli imigomo, ngokufaneleyo

Isayinwe e (indawo) Rahima Moosa Hospital ngosuku (date)……

_____

Signature yombambi qhaza

**Isibopho somphenyi**

Mina, Jessica Ferguson, ngizibopha ukuthi:

Ngichazile imininingwane ya leform ku……..

Ngamkhuthaza ukuba abuze imibuzo efanele ngazinikanesikhathi sokuyiphendula.

Ngenelisekileukuba uyazwisisa futhi uyazazi zonke izici ezimayelana no cwaningo, njengoba kuxoxwa ngenhla.

Angizange ngisebenzise utoliki.(uma Ingabe utoliki usetshenzisiwe kufanele asyine ngezansi)

Isayinwe e (indawo) Rahima Moosa Hospital ngosuku (date)……

_____

Signature yomphenyi

**Isibopho sika toliki**

Mina (igama)……..ngizibopha ukuthi:

Ngincedise umphenyi (igama)…….ukuchaza ulwazi kulencwajana ku (mhlanganyeli)…….. ngisebenzisa ulwimi lwe Sizulu.

Ngiyisombulule ngayona ndlela ye qiniso ebeyi hlobene kimi

Ngenelisekile ukuthi umbambi qhaza uyayizwisisa imibandakanyo emayelana no cwaningo kanti futhi nemibuzo yakhe iphendulwe ngokugcwelefuthi uyazwisisa

Isayinwe e (indawo)…….ngosuku (date)……

_____

I signature ka toliki

**APPENDIX M – INFORMED CONSENT FOR MOTHERS OF PARTICIPANTS - SESOTHO**

| Code | | | |
|---|---|---|---|

**Participant information leaflet and consent form**

**Lebitso La Projeke ya Dipatlisiso:**

Dikotso tsa ditlamorao ts phepo e mpe baneng ba disono ba dilemo tse ka tlase hotse 5 (hlano) ba dulang region B mona motseng ya Johannesburg, South Africa

| | |
|---|---|
| Principal investigator | Jessica Ferguson |
| Address | PO Box 783435<br>Sandton 2146,<br>Gauteng |
| Contact number | 0847674884 |

O memelwa ho onka karolo diphuputsong. O kopua ho nka nako hobala ditabatse ngotsweng mona, ho tla hlaloseha ka boteng. O kgothaletswa ho botsa ngaka kappa mosebeletsi dipotso ka seo o sa se utlwisesing ka diphuphutsong tsena. Ke bo hlokwa ho re o otlwisise ka hoo phetahetseng sepheo sa dipatlisiso tsena le maikemisetso a sona ha mmoho le karolo o ka e bapalang. Kahodimo karolo ya hao ke baoithaopo ka ho phethahesteng hape o lokolohile ho se dumele ho nka karolo. Mme ha o kgetha ho sanke karolo sena hase no ho ama ka tselaefengkapaefeng. Hape o lokolohile hoikhuladithutong nako efe kappa efe le hao one o dumetsehonka karolo. Ha re a labella maemo a ka susumetsanghoreprojeke e emisweempahaokaetsahalabohlebankang karolo batlatsebiswa.

Mme dipatlisiso tsena diananetswe ke ba committee/mokgahlo wa dipaltisiso ya tsa bophelo bo botleunivesiting ya Stellenbosch mmediphuputso di lokewla ho etswa ka tlasaditataiso tsa machaba (declaration of Helsinki, South African Guidelines for good clinical practice and the medical research council (MRC) Ethical Guidelines Research)

**Dipatlisiso tsena di mabapi le eng?**

Dipatlisiso tsena di tlotshwarelwa ha RahimaMoosasepetle sa bo mme le bana, hona le banka karolo ba 159. Dipatlisiso tsena dimabapi le dikotsi tsa banaba fokolangmmele ba tshwereng ke malnutrition. Re etsa dipatlisiso ka phepo empe le maemo a hlokolotsi a ka bakwang ke yona. Bohlokolotsi ba pephoempe ke yonantho

e bolayang ban aba bangata. Re tlosheba ban aba fepuwanghantle le bang ba sa fepuwenghaholwanyane, le bana ba sa fepuwang ho fetisisa re be re tshantsha ditlamorao tsa bona. Dintla tsena dibohlokwa ho ronahore re tle re tsebe ho etsamananeo a tlodithebaleng ho kula ha bana ke phepo empe. Bana bat la kgethwa hot la nka karolo dipatlisisong tsena ka ho fapana ha bona. Banabanabatlakaduwajwale ka (mebele, bolelele, le sedika kappa didika tsa hloho tsa bona) le batswadikapabahlokomedi ba bana ba tla botswa dipotso tse mmalwa tse itseng. Mme motwsadi wa ngwana o tla kaluwabotenya kappa bosesane bammele le bolele ba hae.

**Hobaneng ho Kgethiwewena hot la nka karolo?**

Wena le ngwana wa hao le kgethuwehore le tlelenke karolo dipatlisisong tsena ka hobane ngwana wa hao o dulalebatowa/ Mabatowa B mona Johannesburg hape o dumelane le di kgetho tsa dipatlisiso tsena. Re batla ban aba dulang lebatonglena ba elenghore ba kulak e phepo empe kappa ba sokang ba kulahaholo ka baka la phepo empe le bang e ba tswherenghanyenyane. Ngwana wa hao o welatlasamahlakoreng a dipatlisiso tsena.

**Maikarabelo/Boikarabelo ba hao wena ke eng?**

Jwalo ka mme wa ngwanaotlatlameha ke hore o arabe dipotso tse mmalwa ts itseng ka lelapa la ngwana, mokgwabodulelapeng, dijo tse jowang ke ngwana, pale ya dikalafo tsahae le tlhao ya hae. Ngwanaotlakaduwa ka mekgwa e fapanengjwalo ka mmele (ho theoha, monono le hofokola), botelele le bodika ba hloho. Le wena o tla kaduwajwalofelammele le botelele kappa bophahamo. Ho kaduwa le dipotso tseo di tla be dibotswa di tla nka nako e kalo ka hora (1 hour) hore di fele. Ngwana wa hao o tla tlamehahorea betenghotlakaduwa le wenajwalo ka motswadi.

**Ke eng se o tla se tholang ho nka karolong ha hamodipatlisisong?**

Wena le ngwana wa hao ha honaletho seo letlasefumanang ka ho nka karolo dipatlisisong tsena. Empa, re tla kgona ho bona kappa hotholahorepheempe e eketswa kappa ho atiswa ke eng le ditlamorao tsa yonaditotiswa ke eng.Jwale re tla kgonahore re sebedisedintlatseno re tla kgona hot la ka matsapaa hoetheola kappa hona ho e phekolabotebo.

**Hona le kotso kappa dikotsi ka honka karolo dipatlisisong tsena?**

Hahonakotsi e tla tholahalangdipatlisiong tsena, kahobane ha honatshebeletsoetloetsuwa

**Ke mang ya tlotholaditokelo tsa ho kenamagolong/pampiri tsa hao tsa dikalafo/kalafong?**

Mosuwehloho wa dipatlisiso, e leng Jessica Ferguson, ke yena a tla beng a shebamagoloangwana wa hao a kalafo le Road to Health Booklet. Empa, dintla tse tlofumanehamangolong a hao a kalafo di tla ba lekunutu di baballwe kappa ho tshwara ka paballo. Haeba dipatlisiso tsena di tlotsebisahatswadibukeng, ngwana wa hao boitsebiso ba hae e tla ba sephiri kappa ho babalwa.

**Ho tla etsahalaengmabapi le holemalanakongeo o nkang karolo dipatlisisong tsena?**

Hahonakotsieo e tla etsahala ho ngwana wa hao karolongena ya dithuto

**O tlopatalwa ho nka karolo dithutong tsena kappa ho na le ditjheletetseo o tlameang ho dintsha kappa ho di patala?**

Tjhee ha o tlopatalwa ho nka karolo dithutong tsena hape ha ho letholeo o tlameang ho lepatala ho nka karolo

**O ka letsetsa Jessica Ferguson at 0847674224 mabapi le dipotso le dintlhakaofeela le ha o ka fumanamathataamang le amang**

**O ka letsetsakomitilefaphaleletle la Bophelo ho 021-938 9207 ha o na le ditletlebo kappa matshwenyehoao a sa kgonang ho a rarolla le ho a totobatsa le ngaka ya hae**

**O tla fumantshwapampiri ya bopaki ba le dintlha le di tumellanotseo o dinkileng**

**Ditumellano ho tswa ho motho ya nkang karolo**

Ho tekena ka fatshe, nna…… Ke dumela ho nka karolo modithutong tsa dipatlisiso: Dikotso tsa ditlamorao ts phepo e mpe baneng ba

disono ba dilemo tse ka tlase hotse 5 (hlano) ba dulang region B mona motseng wa Johannesburg, South Africa

**Ke dumela ho**

Ke badiledintlha ka kutlwisiso tse ngotsweng ka puoeoelenghore ke ya etseba hape ke phuthulluhile ka yona

Ke bile monyeka  wa ho botsa dipotso ebile dipotso tse di arabuwe ka botshepehi ka ofeela

Ke ya utlwisisahorehonka karolo dithutong tsena ke ho sebetsakantle le ho lefuwa hape ha ka hatelwahonka karolo

Nka nkaqeto ya ho tsamaya nako engwe le engwedithutong tsena hahonamehatoetlonkuwahonna

Nka kupuwa ho tloheladithutopele di feela ,hamorutadithuto a bona hore ke molemongwakahore ke tlohele kappa ha ke sa latelemelao kappa seo ke dumellaneng ka sona hore ke tla se etsa

Ke tekennesebakeng sa Rahima Moosa Hospital la letsatsi la di……..…. 2014

_____

Ho tekenahotswamothoankang karolo

**Ditumellano ho tswa ho mohlahlubi**

Nnalebitso, Jessica Ferguson ke dumela ho ke hlalositsedintlha tse mona pampering document ho……..…….

Ke mokgothalleditse ho botsa dipotso le honka nako ho di araba ka botlalo

Ke kgotsofetsehore o utlwisisaditlhakaofeela tsa dipatlisiso/researchtseo re buisaneng ka tsona

Ke sebedisitse kappa hakasebedisatoloko

Tekennekosebala Rahima Moosa Hospital ka letsatsi……..…....2014

_____

Ho tekenahotswa

**Ditumellanohotswa ho tokolo**

Nnalebiyso……..…… Ke dumelahore

Ke thusitsemohlahlubilebitso……..… ho hlalosadintlha mona pampering documentho lebitso la moithuti……..…ho sebedisapua ya Sesotho

re mokgothalleditse ho botsa dipotso le honka nako ho di araba ka botlalo

ke hlalositse le ho bua ka nnete ya ditaba tseoelenghore di amana le nna

ke kgotsofetsehoremoithuti kappa motho a nkang karolo o utlwisisatsohle ka moreroonaebile o butsitse dipotso tseoelenghorekarabo tsa teng o kgotsofetse ka tsona

tekennesebaka ……..…. Ka letsatsi……..…

_____

Ho tekena ho tswa ho toloko

**APPENDIX N – INFORMED CONSENT FOR CAREGIVERS OF PARTICIPANTS - SESOTHO**

| Code | | | |
|---|---|---|---|

**Participant information leaflet and consent form**

**Lebitso La Projeke ya Dipatlisiso:**

Dikotso tsa ditlamorao ts phepo e mpe baneng ba disono ba dilemo tse ka tlase hotse 5 (hlano) ba dulang region B mona motseng ya Johannesburg, South Africa

| | |
|---|---|
| Principal investigator | Jessica Ferguson |
| Address | PO Box 783435<br>Sandton 2146,<br>Gauteng |
| Contact number | 0847674884 |

O memelwa ho onka karolo diphuputsong. O kopua ho nka nako hobala ditabatse ngotsweng mona, ho tla hlaloseha ka boteng. O kgothaletswa ho botsa ngaka kappa mosebeletsi dipotso ka seo o sa se utlwisesing ka diphuphutsong tsena. Ke bo hlokwa ho re o otlwisise ka hoo phetahetseng sepheo sa dipatlisiso tsena le maikemisetso a sona ha mmoho le karolo o ka e bapalang. Kahodimo karolo ya hao ke baoithaopo ka ho phethahesteng hape o lokolohile ho se dumele ho nka karolo. Mme ha o kgetha ho sanke karolo sena hase no ho ama ka tselaefengkapaefeng. Hape o lokolohile hoikhuladithutong nako efe kappa efe le hao one o dumetsehonka karolo. Ha re a labella maemo a ka susumetsanghoreprojeke e emisweempahaokaetsahalabohlebankang karolo batlatsebiswa.

Mme dipatlisiso tsena diananetswe ke ba committee/mokgahlo wa dipaltisiso ya tsa bophelo bo botleunivesiting ya Stellenbosch mmediphuputso di lokewla ho etswa ka tlasaditataiso tsa machaba (declaration of Helsinki, South African Guidelines for good clinical practice and the medical research council (MRC) Ethical Guidelines Research)

**Dipatlisiso tsena di mabapi le eng?**

Dipatlisiso tsena di tlotshwarelwa ha RahimaMoosasepetle sa bo mme le bana, hona le banka karolo ba 159. Dipatlisiso tsena dimabapi le dikotsi tsa banaba fokolangmmele ba tshwereng ke malnutrition. Re etsa dipatlisiso ka phepo empe le maemo a hlokolotsi a ka bakwang ke yona. Bohlokolotsi ba pephoempe ke yonantho

e bolayang ban aba bangata. Re tlosheba ban aba fepuwanghantle le bang ba sa fepuwenghaholwanyane, le bana ba sa fepuwang ho fetisisa re be re tshantsha ditlamorao tsa bona. Dintla tsena dibohlokwa ho ronahore re tle re tsebe ho etsamananeo a tlodithebaleng ho kula ha bana ke phepo empe. Bana bat la kgethwa hot la nka karolo dipatlisisong tsena ka ho fapana ha bona. Banabanabatlakaduwajwale ka (mebele, bolelele, le sedika kappa didika tsa hloho tsa bona) le batswadikapabahlokomedi ba bana ba tla botswa dipotso tse mmalwa tse itseng. Mme motwsadi wa ngwana o tla kaluwabotenya kappa bosesane bammele le bolele ba hae.

**Hobaneng ho Kgethiwewena hot la nka karolo?**

Wena le ngwana wa hao le kgethuwehore le tlelenke karolo dipatlisisong tsena ka hobane ngwana wa hao o dulalebatowa/ Mabatowa B mona Johannesburg hape o dumelane le di kgetho tsa dipatlisiso tsena. Re batla ban aba dulang lebatonglena ba elenghore ba kulak e phepo empe kappa ba sokang ba kulahaholo ka baka la phepo empe le bang e ba tswherenghanyenyane. Ngwana wa hao o welatlasamahlakoreng a dipatlisiso tsena.

**Maikarabelo/Boikarabelo ba hao wena ke eng?**

Jwalo ka motlhokomedi wa ngwana ke hore o arabe dipotso tse mmalwa ts itseng ka lelapa la ngwana, mokgwabodulelapeng, dijo tse jowang ke ngwana, pale ya dikalafo tsahae le tlhao ya hae. Ngwanaotlakaduwa ka mekgwa e fapanengjwalo ka mmele (ho theoha, monono le hofokola), botelele le bodika ba hloho. Ho kaduwa le dipotso tseo di tla be dibotswa di tla nka nako e kalo ka hora (1 hour) hore di fele. Ngwana wa hao o tla tlamehahorea betenghotlakaduwa le wenajwalo ka motswadi.

**Ke eng se o tla se tholang ho nka karolong ha hamodipatlisisong?**

Wena le ngwana wa hao ha honaletho seo letlasefumanang ka ho nka karolo dipatlisisong tsena. Empa, re tla kgona ho bona kappa hotholahorepheempe e eketswa kappa ho atiswa ke eng le ditlamorao tsa yonaditotiswa ke eng.Jwale re tla kgonahore re sebedisedintlatseno re tla kgona hot la ka matsapaa hoetheola kappa hona ho e phekolabotebo.

**Hona le kotso kappa dikotsi ka honka karolo dipatlisisong tsena?**

Hahonakotsi e tla tholahalangdipatlisiong tsena, kahobane ha honatshebeletsoetloetsuwa

**Ke mang ya tlotholaditokelo tsa ho kenamagolong/pampiri tsa hao tsa dikalafo/kalafong?**

Mosuwehloho wa dipatlisiso, e leng Jessica Ferguson, ke yena a tla beng a shebamagoloangwana wa hao a kalafo le Road to Health Booklet. Empa, dintla tse tlofumanehamangolong a hao a kalafo di tla ba lekunutu di baballwe kappa ho tshwara ka paballo. Haeba dipatlisiso tsena di tlotsebisahatswadibukeng, ngwana wa hao boitsebiso ba hae e tla ba sephiri kappa ho babalwa.

**Ho tla etsahalaengmabapi le holemalanakongeo o nkang karolo dipatlisisong tsena?**

Hahonakotsieo e tla etsahala ho ngwana wa hao karolongena ya dithuto

**O tlopatalwa ho nka karolo dithutong tsena kappa ho na le ditjheletetseo o tlameang ho dintsha kappa ho di patala?**

Tjhee ha o tlopatalwa ho nka karolo dithutong tsena hape ha ho letholeo o tlameang ho lepatala ho nka karolo

**O ka letsetsa Jessica Ferguson at 0847674224 mabapi le dipotso le dintlhakaofeela le ha o ka fumanamathataamang le amang**

**O ka letsetsakomitilefaphaleletle la Bophelo ho 021-938 9207 ha o na le ditletlebo kappa matshwenyehoao a sa kgonang ho a rarolla le ho a totobatsa le ngaka ya hae**

**O tla fumantshwapampiri ya bopaki ba le dintlha le di tumellanotseo o dinkileng**

**Ditumellano ho tswa ho motho ya nkang karolo**

Ho tekena ka fatshe ,nna…… Ke dumela ho nka karolo modithutong tsa dipatlisiso: Dikotso tsa ditlamorao ts phepo e mpe baneng ba disono ba dilemo tse ka tlase hotse 5 (hlano) ba dulang region B mona motseng wa Johannesburg, South Africa

**Ke dumela ho**

Ke badiledintlha ka kutlwisiso tse ngotsweng ka puoeoelenghore ke ya etseba hape ke phuthulluhile ka yona

Ke bile monyeka  wa ho botsa dipotso ebile dipotso tse di arabuwe ka botshepehi ka ofeela

Ke ya utlwisisahorehonka karolo dithutong tsena ke ho sebetsakantle le ho lefuwa hape ha ka hatelwahonka karolo

Nka nkaqeto ya ho tsamaya nako engwe le engwedithutong tsena hahonamehatoetlonkuwahonna

Nka kupuwa ho tloheladithutopele di feela ,hamorutadithuto a bona hore ke molemongwakahore ke tlohele kappa ha ke sa latelemelao kappa seo ke dumellaneng ka sona hore ke tla se etsa

Ke tekennesebakeng sa Rahima Moosa Hospital la letsatsi la di……..… 2014

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Ho tekenahotswamothoankang karolo

**Ditumellano ho tswa ho mohlahlubi**

Nnalebitso Jessica Ferguson ke dumela ho ke hlalositsedintlha tse mona pampering document ho……..…….

Ke mokgothalleditse ho botsa dipotso le honka nako ho di araba ka botlalo

Ke kgotsofetsehore o utlwisisaditlhakaofeela tsa dipatlisiso/researchtseo re buisaneng ka tsona

Ke sebedisitse kappa hakasebedisatoloko

Tekennekosebala Rahima Moosa Hospital ka letsatsi……....2014

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Ho tekenahotswa

**Ditumellanohotswa ho tokolo**

Nnalebiyso…….…… Ke dumelahore

Ke thusitsemohlahlubilebitso……..…….… ho hlalosadintlha mona pampering documentho lebitso la moithuti…….……..…ho sebedisapua ya Sesotho

re mokgothalleditse ho botsa dipotso le honka nako ho di araba ka botlalo

ke hlalositse le ho bua ka nnete ya ditaba tseoelenghore di amana le nna

ke kgotsofetsehoremoithuti kappa motho a nkang karolo o utlwisisatsohle ka moreroonaebile o butsitse dipotso tseoelenghorekarabo tsa teng o kgotsofetse ka tsona

tekennesebaka …….…. Ka letsatsi……

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Ho tekena ho tswa ho toloko