THE RELATIONSHIP BETWEEN THE NUTRITIONAL STATUS OF CHILDREN WITHIN EARLY CHILDHOOD DEVELOPMENT CENTRES IN DELFT AND THEIR COMPLIANCE TO THE EXPANDED PROGRAMME OF IMMUNIZATION AND ROUTINE VITAMIN A SUPPLEMENTATION

MONIQUE CHRISTELLE JANSEN

3353909

A mini-thesis submitted in partial fulfilment of the requirements for the degree of Master in Public Health Nutrition at the Department of Dietetics and Nutrition, University of the Western Cape.

Supervisor: Prof Rina Swart

Co-supervisor: Dr Jaah Mkupete

December 2022

KEY WORDS

Nutritional status

Stunting

Wasting

Underweight

Vitamin A Supplementation

Expanded Programme on Immunization

Early Childhood Development Centres

Under-five

Delft

ABSTRACT

Background

Public health care interventions namely, the Expanded Programme on Immunizations (EPI) integrated with the Vitamin A supplementation programme (VAS) has been used for many years with the main intentions of preventing and decreasing the prevalence of child morbidity and mortality worldwide. Poor vaccination status has an effect on the nutritional status of children younger than five years. Child malnutrition in South Africa has been a challenge over decades with stunting largely unchanged and above 20% whilst wasting remains prevalent and obesity emerges. Malnutrition in children leads to mental, cognitive and long-term developmental delays.

Aim

This study was conducted to determine the compliance with the VAS and EPI programme amongst children under the age of five years in Early Childhood Development centres in Delft and its association with malnutrition.

Methodology

A cross sectional study was conducted in children between the ages of six months and five years who attended ECD centers in a selected area of Delft. Compliance with the two programmes was assessed through a review of the Road to Health Booklet (RtHB) of each child in the study sample. The nutritional status was determined based on the measurement of weight and height of the child and on the birth weight and birth length of the child recorded in the RtHB.

Results

Majority (65.2%) of the children were partial compliant and non-compliant for the VAS compliance status with the programme compared to those were compliant (34.8%). On the other hand, those that were compliant with the EPI programme was more (91%) than those who were non-compliant with the programme (9%). More children were stunted (16%) than they were underweight (6.3%), overweight (3.7%) and wasted (2.6%). The main finding of this study was that there was no statistically significant association between the nutritional status of the children and their compliance with the VAS and EPI programme on an individual regression analysis perspective. There was some positive statistical significant found between the nutritional status of the participants and the VAS and EPI status when they were grouped in an overall regression analysis with age group, birthweight and ECD registration status as independent variables.

Ethics statement

Ethics approval was obtained from the Biomedical Research Ethics committee (BMREC) of the University of the Western Cape (BM 21/8/13). Permission to include an ECD was obtained from the principal of the ECD as well as the relevant governing body. Written informed consent for anthropometric assessment and review of the RtHB of children at the ECD was requested from their parents or legal guardian. Potential benefits and risks, and ways in which confidentiality and anonymity was ensured, were included in the information sheet. Anonymity was assured by not recording the name (or personal information) of a child or the ECD, but to assign a code to each child/ECD. When a report was written it was done in

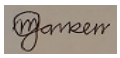
such a way that the identity of the child was not discovered. Parents/guardians and ECD principals were assured of the right to withdraw at any time from the study as well as the freedom of choice to not take part in the study. COVID-19 protocol was observed during data collection to ensure the safety of all involved in the study.

DECLARATION

I declare that this mini-thesis with the title “The relationship between the nutritional status of children within Early Development Centres of Delft and their compliance to the Expanded Programme of Immunization and routine Vitamin A supplementation” is my work and has not been submitted for any degree or examination at any other university and that all sources I have used has been acknowledged in text and is reflected in the reference list section.

Full Name: Monique Christelle Jansen

Date: 3 January 2023

Signed: 

ACKNOWLEDGEMENTS

First and foremost I would like to thank God for everything I found impossible to do yet He has graced me and guided me on this journey so that through His strength I managed to overcome and endure each and every challenge that came my way.

I would also like to express my gratitude to my parents, Maureen and Nico Jansen, for all their patience and love they extended towards me, not only through this journey but throughout my entire life. I would like to thank them for putting up and containing all the stress and tears from my side but also for engaging in the joy and excitement that this completion of this mini-thesis journey had to offer.

To my brother, Roscoe Jansen and my grandmother, Christine Van Willingh, I would like to thank them for the love and consideration they had towards me during this time as well.

I would like to thank my supervisor, Prof Rina Swart as well as my co-supervisor, Jaah Mkupete in the role they have played in guiding and encouraging me through the process of completing my mini-thesis.

My work supervisor, Mrs Winifred Le Fleur as well as Mr Le Fleur and to all my Touching Nations colleagues who had the heart to carry me and even assisted me at various points throughout this mini-thesis. A special thanks goes out to Professional Nurse Fell, Sinclair, Labhan, Smith and Erasmus as well as to EN Thomas, Marks and Nombewu, Amanda, Simone and Brenda.

To the Northern Tygerberg Substructure dietitians, I appreciate the heart in helping me out in areas I was lacking.

To each and every friend and family member who checked in on me and even went to the extent to offer their assistance I am really grateful.

A special thanks goes out to the NNC2 and D2 friends and family that contained and carried me throughout this journey

To the MPH7 crew- the support and motivation they have extended my way is something I am really thankful for.

The school of public health lectures and staff component, for their prompt communication and continuous support.

To all the ECD forum leaders, principles, parents and learners I would like to thank them for making this data collection process something to remember.

ABBREVIATIONS

ECD's	Early Childhood Development Centre's
VAS	Vitamin A supplementation
EPI	Expanded Programme on Immunization
HAZ	Height-for-age Z-score
WAZ	Weight-for-age Z-score
WHZ	Weight-for-height Z-score
RtHB	Road to Health Booklet
VAD	Vitamin A Deficiency
CSG	Child Support Grant
MUAC	Mid-Upper Arm Circumference

Table of Contents

LIST OF TABLES

LIST OF TABLES (CONTINUED)

LIST OF FIGURES

CHAPTER ONE: INTRODUCTION

1.1 Background

The global under-five mortality rate has shown improvement as it has declined from 93 deaths per 1000 live births in 1990 to 38 in 2019 (WHO, 2020). Despite this improvement there are still differences that exist across regions and countries regarding under-five mortality (WHO, 2020). South Africa, a country which forms part of the region with the highest under-five mortality rate, Sub-Saharan Africa, has also shown improvements since 1990 with 57 deaths per 1000 live births to 34.5 deaths in 2019 (World Bank Group, 2021). The leading causes of these deaths in South Africa are neonatal disorders, gastroenteritis, pneumonia, congenital abnormalities, malnutrition and HIV/AIDS (Bamford et al., 2018).

Most of these deaths are considered preventable and treatable with available access and use of child health interventions. The Expanded Programme on Immunization (EPI) as well as the Vitamin A Supplementation (VAS) Programme are two of the leading child health interventions recommended by the World Health Organization to reduce morbidity and mortality rates in the under-five year population worldwide (Comley et al., 2015).

The EPI was introduced in 1974 by WHO (Comley et al., 2015) and the goal of the programme is to provide universal access to vaccination against diseases such as diphtheria, measles, tetanus, poliomyelitis and tuberculosis (WHO, 2013). The vaccines included in the schedule are:

- the Polio vaccine (OPV) and the Bacille Calmette Guerin vaccine (BCG) vaccines for the prevention of polio virus and Tuberculosis (TB) given at birth;

- diptheria , tetanus, pertussis (DTP), Haemophilus influenzae b, hepatitis B Vaccines and inactivated polio combination vaccine is given at 6, 10 and 14 weeks (Cohen et al., 2016a);
- the Pneumococcal Conjugate Vaccine (PCV) and the Rotavirus Vaccine (RV) are given at 6 weeks and 14 weeks of age; and
- the measles and tetanus (Td) vaccine are given at 6 and 12 months of age (Cohen et al., 2016).

About 85% of children under the age of one year old world-wide had received at least three doses of DTP vaccine in 2010 (WHO, 2013). In South Africa 60.6% of children under the age of five years received all eight basic vaccinations in 2016 which is lower than the 1998 programme performance of 63.4% (USAID, 2016). Poor vaccination status influences the nutritional status of children younger than five years negatively (Samiak and Emeto, 2017).

Vitamin A plays an essential role in supporting the growth of a child and helps to combat infections (WHO, 2019). VAS is used as both a curative approach for severe malnutrition in children younger than the age of five years as well as a prophylactic for this group of children (WHO, 2011). WHO also recommends that children six months to five years who are severely malnourished should receive 5000IU of VAS daily as part of therapeutic foods (WHO, 2019). According to a systematic review and meta-analysis done in 2011, VAS helped to reduce childhood mortality, morbidity and blindness by 24% globally (WHO, 2011), however coverage remains a problem. In Sub-Saharan Africa, only 10 countries achieved high two-dose coverage in 2016 including South Africa (UNICEF, 2018).

South Africa is facing a triple burden of disease with undernutrition coexisting with overweight and obesity (Said-Mohammed et al., 2015). The prevalence of stunting in South African children has remained unchanged over the past 20 years at levels of high public health significance (i.e. >20%) (May, Witten and Lake, 2020; WHO, 2014). Poverty intensifies the risk of and from malnutrition in a negative direction. Malnutrition itself has a negative impact as it increases health care costs, reduces productivity, and slows economic growth which could in turn cause a cycle of poverty and ill-health (WHO, 2020).

1.2 Problem statement

Delft, a community in the City of Cape Town, has high unemployment rates (41.33%) ref. During Census 2011, the majority of the population reported a household monthly income of <R1600 with 16.6% having no income (SDI and GIS, 2013). There are three health care facilities in Delft as well as a Non-Profit Organization (NPO) providing community care workers (CCWs) (Western Cape Government, 2022). Each of these facilities provides the VAS integrated with the EPI, however poor health care seeking behaviour and thus poor uptake of EPI and VAS may be linked to the lack of education and communication regarding these health programmes in the area.

The purpose of this research project is to determine compliance with the VAS and EPI amongst children under the age of five years in Early Childhood Development centres (ECDs) in Delft and the association with their nutritional status.

.

1.3 Aim and objectives

Aim

The aim of this study was to determine compliance with the Vitamin A Supplementation programme and Expanded Programme on Immunization amongst children under the age of five years in Early Childhood Development centres (ECDs) in Delft and the association with their nutritional status.

Objectives

The objectives of the study were:

- To determine compliance with VAS programme of children (<5years) attending ECDs in Delft
- To determine the immunization status of children (<5 years) attending ECDs in Delft
- To assess the nutritional status of children (<5 years) attending ECDs in Delft
- To compare the nutritional status of the children under-five years who are compliant and those who are not compliant with VAS and immunization programmes

1.4 Outline of mini-thesis

The layout of this thesis is in six chapters beginning with chapter one, the introduction. The introduction chapter provides background information explaining the global as well as South African trends on childhood malnutrition as well as trends in VAS coverage and EPI coverage. It also includes the aims and objectives of the study.

Chapter two consists of a literature review where the latest literature is included regarding the factors pertaining to the VAS and EPI status worldwide and in South Africa, as well as

literature on childhood malnutrition and the relationship between the two programmes and malnutrition in children under the age of five years.

Chapter three provides details on the study methodology including study design, population, characteristics, data collection and analysis, data management, and validity and reliability.

The results of this study is presented in chapter four including linear regression explaining the relationship between VAS, EPI and the nutritional status of the children

In chapter five the results of this study is contextualized by comparisons with other relevant studies. The chapter ends off with limitations, recommendations and conclusion.

This literature review provides an overview of the nutritional status of children under the age of five years within a South African ECD setting and the relationship it has with the coverage of the EPI and VAS programmes. It covers the prevalence of childhood malnutrition at global and national level as well as the VAS and EPI coverage within South Africa. The factors related to childhood malnutrition are explored within the review.

2.1 Child Malnutrition

Malnutrition is a condition that results from deficiencies, excesses, and/or imbalances in the intake of energy and other macronutrients and micronutrients (WHO, 2020). It is divided into three conditions, namely: undernutrition, micronutrient malnutrition, overweight and obesity (WHO, 2020). Micronutrient malnutrition includes micronutrient deficiencies such as iron deficiency anaemia and vitamin A deficiency as well as micronutrient excess, like, vitamin A toxicity and excess and pyridoxine (vitamin B6) excess (Berger et al., 2022). When a child's weight is excessive for their length/height, they are said to be overweight, which coexists with obesity (WHO, 2020).

Malnutrition can be assessed through standardized anthropometric measures for the weight and height of the child (Win, Cooke and Mlambo, 2016). Z-scores below –2 (negative 2) indicate stunting in the case of Length/Height-for-Age (HAZ), wasting in the case of Weight-for-Height (WHZ) and underweight in the case of Weight-for-Age (WAZ) and below -3 (negative 3) is considered severely stunted (HAZ), severely wasted (WHZ) and severely underweight (WAZ) (Namakin et al., 2014).

The UNICEF Conceptual Framework on the Determinants of Maternal and Child Health, 2020 serves as the foundation for the UNICEF Nutrition Strategy 2020–2030 (UNICEF, 2020). Just like the 1990 conceptual framework by UNICEF, the 2020 Framework acknowledges the triple burden of malnutrition, which is growing- malnutrition, lack of certain nutrients, and overweight. The 2020 framework describes the factors for adequate nutrition in women and children in three categories namely enabling, underlying and immediate factors.

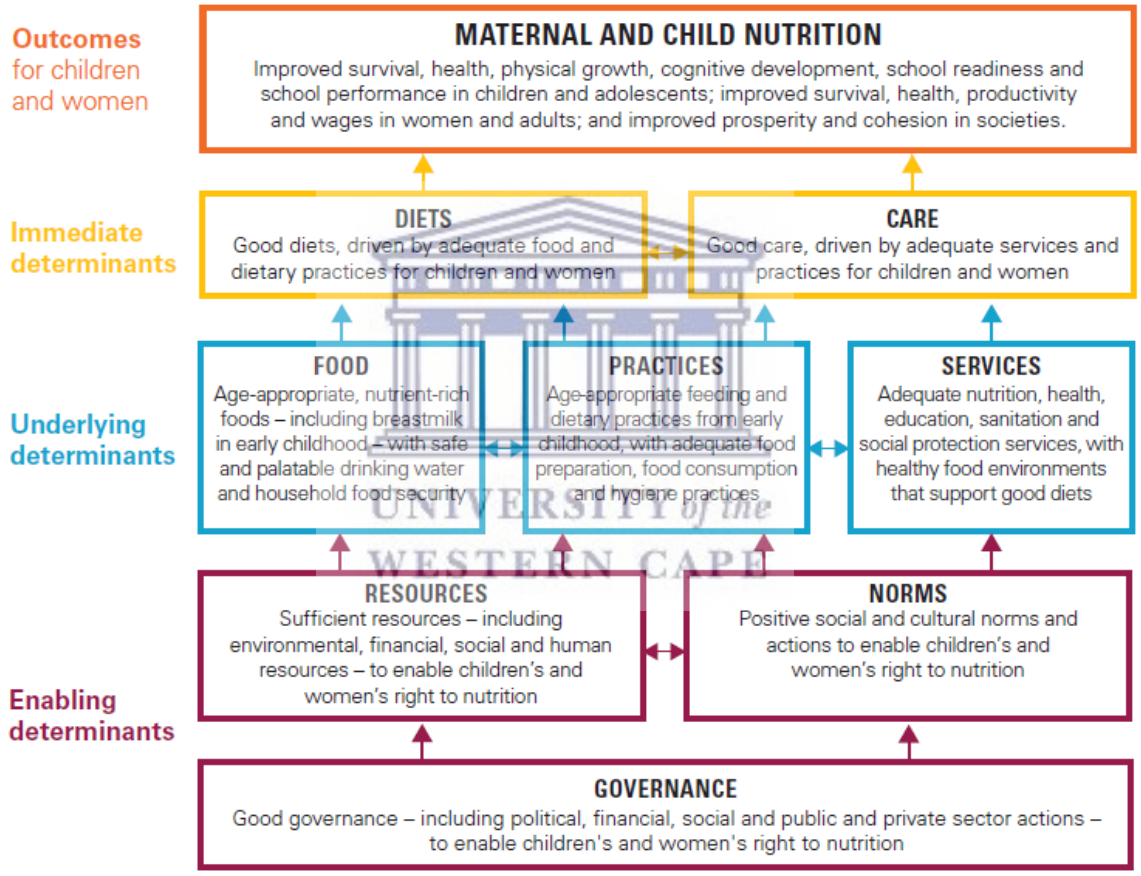


Figure 2.1 The UNICEF conceptual framework on the Determinants of Maternal and Child Nutrition 2020. (Source: UNICEF, 2020. Page 3)

Similarly, to the 1990 Framework which categorises the causes of childhood malnutrition into three levels namely: immediate causes, the underlying causes and the basic causes (UNICEF, 1998; Black et al., 2020). The 2020 framework demonstrates the enabling factors to be the economic, political, social, cultural, and environmental factors that permit healthy eating for mothers and children. The underlying factors include the food, behaviours, and services that are available to them. These services also speak to the VAS and EPI programmes. Periodic high dose VAS is routinely administered in countries where there is a public health problem of Vitamin A deficiency (VAD). VAS in children and post-partum pregnant women is generally accepted to be safe, however the advised amounts for individuals and groups should be decided based on usual vitamin A intake (ASSAf, 2013). Diets and parenting practices, which have an impact on one another, are the immediate factors (UNICEF, 2020).

2.1.1 Prevalence of malnutrition in children under-five years of age in the world.

Despite many efforts to combat the state of childhood malnutrition in children under-five years of age it remains a global challenge (UNICEF, 2020). The World Health Assembly global nutrition goals expanded with the Sustainable Development Goals 2030 includes the following indices: to reduce the number of under-five year old's who are stunted by 50%, decrease and maintain childhood wasting to less than three percent and lastly to reduce childhood overweight to less than three percent. Global stunting has decreased steadily since 2000 (33.1% to 22%), but more rapid development is required to meet the 2030 goal (UNICEF / WHO / World Bank Group, 2021). If the 2030 target is to be met, wasting

continues at concerning rates (6.7%), and the trajectory of overweight must be reversed (from 5.4% in 2000 to 5.7% in 2022) (UNICEF / WHO / World Bank Group, 2021). The impact that COVID-19 had on this condition cannot be overlooked. Elements that were affected during the COVID-19 pandemic in relation to childhood malnutrition is household wealth that has been diminished which in turn affected the availability and affordability of nutritious foods and important nutrition services (UNICEF / WHO / World Bank Group, 2021). Stunting is regarded as an indicator of children's well-being and is an outcome of prolonged undernutrition and recurring diseases, while wasting is a result of acute undernutrition and is a strong contributing factor for child mortality (May & Timæus, 2014). Both these conditions could lead to delays in mental and cognitive development, which in turn leads to difficulties in schooling (May & Timaeus, 2014), posing a future generational productivity challenge (Black et al., 2013).

2.2.2 Prevalence of malnutrition of children under-five years of age in South Africa.

The South African Demographic and Health survey of 2016 reported 27% of children under the age of five years to be stunted, 3% wasted and 6% were underweight, 12.9% were overweight with 44% having a vitamin deficiency, including vitamin A, iron and other micronutrient deficiencies (National Department of Health (NdoH), Statistics South Africa (STATSSA), and South African Medical Research Council (SAMRC), 2019). These percentages, except for wasting prevalence, are considered high according to the progress assessment against childhood malnutrition indices for Sustainable development Goal 2.2 (UNICEF / WHO / World Bank Group, 2021). During the last 20 years, South Africa has encountered a fast-approaching nutrition transition containing a high prevalence of obesity

and non-communicable diseases (Said-Mohamed et al., 2015). The prevalence of stunting has not seen many changes within this time period (Said-Mohamed et al., 2015).

Earlier studies have described different stunting levels and micronutrient intake levels by age bracket, gender of child and racial group. Villages in Mpumalanga have displayed a stunting level up to 32% prevalence at 1 year of age, scaling off to about 3% - 6% at 5 years, and rising to 14% - 15% in boys during adolescence (Kimani-Murage, 2010). Oelofse and colleagues reported that stunting and underweight were more prevalent in coloured infants (18% and 7%, respectively) compared to black infants (8% and 2%, respectively) whilst the dietary intake of micronutrients was lower in black infants than in coloured infants (Oelofse, 2002).

The National Food Consumption survey presented findings of vitamin A status within South Africa and indicated that six out of ten women respondents in Kwazulu-Natal had low vitamin A levels. This in turn reflected on the poor prevalence of vitamin A status in the children as well (Labadarios et al., 2008). Overall, VAD changed from being severe with prevalence range of 34.7 and 67.3% in 2001 (Charlton, Kolbe- Alexander and Nel, 2005) to a moderate public health problem with a prevalence of 1.4% to 16.1% in 2012 (Shisana et al., 2013)

2.1.2 Factors related to childhood malnutrition

Mkhize and Sibanda (2020) reviewed the literature to identify factors that are associated with nutritional status of children under-five years in South Africa and categorised these factors as household, caregiver and child related according to the UNICEF conceptual framework (UNICEF, 1998). This review identified the dearth of information on nutritional status of

children under-five and specifically on micronutrient deficiencies (Mkhize and Sibanda, 2020).

Following on Mkhize and Sibanda (2020) review, it is important to note that in South Africa poverty is a continuing concern, where about 40% of the population was living below the lower bound poverty line in 2015 (STASSA, 2017). Poverty is a constant factor of childhood malnutrition at household level in the sense that it is linked to household incomes not growing in proportion to that of food price inflation causing many households to struggle to feed themselves (Sanders et al., 2017). Statistics South Africa (Stats SA) released the Consumer Price Index (CPI) for August 2022, and it revealed that the annual headline CPI increased by 7.6%, while inflation for food and non-alcoholic beverages increased by 11.3%, the highest since early 2017. In 2018, 21% of households in the lowest income quintile reported hunger, compared to 3% of households in the highest income quintile. During the 2020 COVID-19 pandemic, levels of job losses and food insecurity have increased with the aggravation of control measures for the virus, such as lockdowns. According to the NIDS-CRAM (National Income Dynamics Study—Coronavirus Rapid Mobile) Survey, 40% of households reported a loss of income and hunger and food insecurity levels are expected to revert to levels seen in 2002 (Wills, Patel and Van Der Berg, 2020).

The Child Support Grant (CSG) is the largest cash transfer program in South Africa with the purpose of relieving childhood poverty (Zembe-Mkabile et al., 2018). High food price inflation has been defeating the purpose of the CSG in the sense that it has fallen short in improving child nutrition (Coetzee, 2014). South Africa falls in the middle-income country category and even though the statistics of childhood malnutrition seem low, these figures are

higher than that of the countries that fall in the same income category (May and Timæus, 2014).

In contrast Agüero, Carter and Woolard (2006) displayed that large doses of CSG treatment given early in life have been shown to significantly improve a child's nutrition. On average, a child who receives treatment for two-thirds of the window period (the first 36 months of the child's life) has 0.25 more HAZ than a child who receives treatment for only 1% of the window period (Agüero, Carter and Woolard, 2006).

In South Africa, certain ethnic groups are still transitioning from traditional-rural to urban lifestyles. A nutrition shift that has been accompanied by changes in dietary habits and nutrient intakes has also occurred alongside the transition (Alaba et al., 2021). This could also support the reason for health inequalities among children under-five that were reportedly getting worse in South Africa. Alaba et al. (2021) evaluated certain indicators such as vaccination among infants aged 0 to 9 months, food insecurity, and malnutrition among infants aged 0 to 59 months in India and South Africa and its relationship with socioeconomic disparities in child health. According to the study, poor maternal education increased health inequalities in relation to child nutrition. This demonstrates that, despite understanding earlier instructions that children should eat to prevent kwashiorkor and malnutrition, mothers have prioritized quantity (food security) over quality (nutrition) (Alaba et al., 2021). According to Mittal, Singh and Ahluwalia, (2007) the socioeconomic standing of mothers has an effect on children's health and nutrition. This justified the addition of women as the target audience alongside children in the new UNICEF 2020 Framework (Figure 1), due to their observable influence on child health.

Childcare practices are also important factors of childhood malnutrition. The globally accepted infant and young child feeding guidelines (WHO 1991, WHO 2002) recommends exclusive breastfeeding for the first six months of life and continued breastfeeding following the introduction of complimentary foods until 24 months of age and beyond (Victoria et al., 2016). The reason for this is because of breastfeeding's protective effect against obesity and non-communicable diseases such as type-2 diabetes, cardiovascular disease and certain cancers (Victoria et al., 2016). Globally the exclusive breastfeeding rate amongst the six months and younger community is 40% (Cai, Wardlaw and Brown, 2012). South Africa's exclusive breastfeeding rate in infants has shown some improvements between 2003 and 2016 with a 24%-point increase (National Department of Health (NdoH), Statistics South Africa (STATSSA), South African Medical Research Council (SAMRC) & ICF, 2019) (Jackson et al., 2019). Despite the improvement, there is still 25% of infants under the age of six months who are not breastfed at all. It is also noted that the exclusive breastfeeding rate, as well as the breastfeeding rate in general, declines as children increase in age, with 44% exclusive breastfeeding at 0-1 month. Only 28.2% of children at 2-3months and 19% at age 18-23 months continue to breastfeed (National Department of Health (NdoH), Statistics South Africa (STATSSA), South African Medical Research Council (SAMRC) & ICF, 2019). The low breastfeeding rate is also a contributing factor as to why the stunting rate within the country has shown no improvements for the past couple of years (Martin-Weisner, 2018). The Baby-Friendly Hospital Initiative (BFHI) policy is a strategy containing 10 steps to successful breastfeeding and it has come along since 1991 and was revised in 2018 in an attempt to practice promoting, protecting and supporting breastfeeding globally (WHO, 2018). Likewise for the UNICEF conceptual framework BFHI changed to MBFHI (Mother

Baby-Friendly Hospital Initiative) expanding the focus group to mothers and children (WHO, 2018).

Diarrheal disease is the second main cause of death in children younger than five years of age and the leading cause of malnutrition in these children (WHO, 2017). Poor nutritional status is one of the main contributing factors which makes children under the age of five years prone to diarrhea and dehydration(UNICEF, 2019). In return, diarrhea may worsen a child's nutritional status due to a lack of nutritional intake and loss of nutrients (UNICEF, 2019).

Water, Sanitation and Hygiene (WASH) factors, including water infrastructure such as access to piped water within the house, piped water on the property, access to safe and clean water through communal taps, from the rivers, streams, water dams, wells and springs, as well as sanitation and hygiene infrastructure has shown mixed effects on childhood diarrhea (Momberg et al., 2020). Introduction to formula feeding and even complimentary feeding at an earlier than the recommended stage of a child's life may lead to susceptibility of a child being exposed to pathogens resulting in poor immune function as well as environmental enteric dysfunction (Keusch et al., 2013 as cited by Momberg et al., 2020). This may also give rise to childhood diarrhea, especially if WASH factors are not considered. Interventions involving proper sanitation practices influence the improvement of the nutritional status of children. The outcome regarding the abovementioned intervention is a reduction in stunting between birth and six months, a reduction in wasting at one year and overall underweight between birth and one year (Momberg et al., 2020).

2.1.3 Nutritional status and eating habits of children under-five years within ECD centres in SA.

Early childhood development contains many aspects that influences children younger than five years' growth and development. An improvement for multiple sectoral approaches is therefore necessary, where the education sector, health and nutrition sector, and social and economic sector work together as one (Black et al., 2017). Children who are undernourished are prone to experience developmental problems, which highlights the importance of early childhood development integrated with input from the health and nutrition sectors (Black et al., 2017).

ECDs, also known as pre-schools or creches, are places where young children (aged six weeks to about five years) spend their day (Department of Basic Education, 2015). These centres within South Africa are mostly located in informal urban settings (Afolabi et al., 2018). Madiba et al. (2019) identified literature that discovered an association between preschool attendance and poor nutritional status of children under the age of five years. The findings showed that the day-care attendees were more likely to be underweight and wasted than those who were cared for at home (Afolabi et al., 2018). This could also be related to infectious diseases that children may be exposed to at ECD centres because of being in close contact with other children as well (Madiba et al., 2019). Another factor that can be tied to this is that in most cases, children that stay at home and do not attend ECDs are mostly under the care of mothers who have an education and earn a monthly income that is able to aid in household food security (Madiba et al., 2019).

According to the National Food Consumption Survey (NFCS) (Labadarios et al., 2005), to date the only national dietary intake study of young children, the eating patterns, as well as the nutrient intake of children under the age of five in South Africa, differed between the provinces. Most children (90%) in the country consumed a regular breakfast, the same goes for the practice where children share family's main meal (Labadarios et al., 2005). Less than half of the children consumed at least three main meals a day, and even fewer included an in-between snack within their eating pattern. The lack in implementing frequent small meals for young children may increase the chances of malnutrition in any form (Labadarios et al., 2005).

Children within each age group had an energy intake of less than half of their daily energy needs, specifically in provinces like Northern Cape, Mpumalanga and Free State (Labadarios et al., 2005). Mkhize and Sibanda (2020) share the same sentiments as the NFCS regarding the micronutrient intake of children, especially those under the age of five years. They found the diets of the children are mostly deficient in certain vitamins and minerals such as iron, calcium, zinc, folic acid, vitamin A and vitamin B12 (Mkhize and Sibanda, 2020).

2.2 VAS Programme

Children younger than five years old have a relatively high need for Vitamin A to help with rapid growth and to combat diseases and infections (WHO, 2011). As the dietary intake of children is often not adequate in vitamin A the National VAS programme includes the provision of high-dose vitamin A (200000IU) capsules to children between the ages of 12 and 59 months every six months, and one dose of 100000 IU to all children aged 6-11 months at

public health facilities (Coutsoudis et al.,2019). As mentioned before the programme is mostly aimed in countries where VAD is categorised as a public health programme.

The programme has two purposes. Firstly, to provide vitamin A to all children given the high prevalence of sub-clinical vitamin A deficiency (Labadarios et al., 2008) and low dietary intake of vitamin A (Labadarios et al., 2005) reported in national surveys; and secondly, to prevent the effects of VAD, such as night blindness as well as poor immune system functioning, increased occurrences of diarrhoea and measles and increased number of child deaths (Comley et al., 2015).

However, researchers have raised concerns as the high dose VAS has had almost no effect on reducing child morbidity and mortality or subclinical VAD (Coutsoudis, et al. 2019 and Comley et al. 2015). Another concern is the high vitamin A intake in selected localised studies (Faber et al., 2015) which may result in higher risk of acute lower respiratory tract infections when high dose VAS is given in addition to good nutrient intakes (Dhansay, 2003). Some also argue that VAS does not solve the main cause of VAD and that food fortification and dietary diversification are better health interventions for VAD (Coutsoudis et al., 2019; Mason et al., 2015). Compliance with the VAS programme should therefore always be considered carefully within the context of the specific environment within which children live. Mandatory food fortification was introduced in 2003 (Friesen et al., 2020). It is a low-cost intervention aimed at increasing the content of specific nutrients in commonly consumed foods in order to improve the nutritional quality of the food supply (Friesen et al., 2020). Nutrition education and dietary diversification is part of the general health education and nutrition promotion offered by the provincial Departments of Health, however, high poverty

and unemployment rates (STATSSA, 2020) impact negatively on successful implementation of dietary guidelines.

2.2.1 The coverage of the VAS programme in South African

The global VAS coverage had a dramatic shift during the COVID-19 pandemic. From 2016-2019 the global coverage was approximately around 65% of eligible children (Hasman et al., 2021). Looking at the beginning of the pandemic the global coverage dropped intensely from 60% to 41% in the first half of the pandemic (Hasman et al., 2021). This result is due to the occurrence of interrupted service delivery during the pandemic.

The South African National Coverage for VAS was 72.8% for children between 6-11 months and 13.9% for children between the ages of 12-59 months (Faber et al., 2015). More recent data has shown the coverage rate for the country to be 50% in the year 2018 (World Bank Group, Undated). This data is suggestive of poor clinic attendance after the completion of immunizations received at 12 months (Faber et al., 2015). Comley et al. (2015) has shown agreement with this reasoning and adds that a lack of education and poor understanding of the programme could serve as another factor in the poor coverage. Zegeye et al., (2022) agreed with this in a study where they analysed the trends of inequalities in the coverage of VAS amongst children between six and 59 months in Ethiopia. There have been reports of child health services being more accessible among educated women probably because education improves access to opportunities for women furthermore having the ability to communicate with healthcare providers (Zegeye et al., 2022). This association between VAS coverage and maternal education is comparable and a common observation that is also seen between maternal education and nutrition and/or immunizations (Zegeye et al., 2022).

A reappraisal of VAS programme compliance and any association with the child malnutrition situation in South Africa will therefore be useful.

2.2.2 Association between VAS and nutritional status/growth of children in SA

Many controversies are still in existence regarding the VAS programme. Vitamin A intake is associated with a significant reduction of malnutrition in that it reduces the susceptibility and risks of stunting as well as wasting (Villamor and Fawzi, 2021).

Chanie et al, (2021) supports the relationship between VAS coverage and nutritional status in that they measured the effect of VAS on acute malnutrition amongst children between 6-59 months and found that children who received vitamin A supplements had a lower risk of developing acute malnutrition. Correia et al., (2019) argues against this in that they demonstrated that stunted children have not benefited from the supplementation programme.

2.3 Expanded programme of immunization (EPI)

When the EPI was launched in 1974, its main objective was to administer primary immunization to about 90% of infants worldwide (WHO, 2013). Besides preventing specific infections, vaccines and immunizations also assist with the development of a healthy immune system in children younger than five years of age (Solis-Soto et al., 2020).

The National EPI schedule (Table 2.1) consist of vaccines that are administered on a routine basis during children under the age of five's life (Cohen et al., 2016a). The programme is practiced in public health services, and it is governed worldwide by the World Health Organization (WHO, 2015)

Table 2.1 The South African Vaccination schedule

Age	Vaccine name (Dose number)
Birth Vaccines Tuberculosis Vaccine (Bacille Calmette-Guerrin)	• Oral Polio Vaccine (OPV) (0) • BCG
6 weeks	• Oral Polio Vaccine (OPV) (1) • Rotavirus Vaccine (RV) (1) • Diphtheria-tetanus-acellular pertussis-injectable polio-Haemphilius influenzae b-Hepatitis B Vaccine (Hexavalent (DTaP-IPV-Hib-HBV) (1) • Pnemoccocal Conjugated Vaccine (PCV) (1)
10 weeks	Diphtheria-tetanus-acellular pertussis-injectable polio-Haemphilius influenzae b- Hepatitis B Vaccine (Hexavalent (DTaP-IPV-Hib-HBV) (2)
14 weeks	• RV (2) • (PCV) (2) • Hexavalent (DTaP-IPV-Hib-HBV) (3)
6 months	Measles Vaccine (Measles) (MCV) (1)
9 months	(PCV) (3)
12 months	Measles (2)
18 months	(Hexavalent (DTaP-IPV-Hib-HBV) (4)
6 years	Tetanus reduced dose diphtheria vaccine (Td) (1)
9 years	Human Papilloma Virus vaccine (HPV) (2 doses 6 months apart) (2)
12 years	Td (2)

Source: (Cohen et al., 2016).

2.3.1 Diseases that are vaccinated against within the EPI programme.

2.3.1.1 Polio

Poliomyelitis, also known as polio, is a viral infection that primarily affects young children. It is spread through the consumption of food or water contaminated with virus-containing feces (Cohen et al., 2016a). The vaccine against this virus is given to children at various stages of their lives, and if a child misses a dose, he or she can catch up at any time. The coverage for all three doses of the polio vaccine has increased between 2000 to 2019 from 73% to 86% (WHO,2021). During the COVID-19 pandemic the coverage from 86% in 2019 reduced to

80% in 2021 (WHO, 2021). South Africa's last wild case of polio occurred in 1989, however due to shortcomings in the nation's routine immunization coverage the country's polio-free status was revoked in 2017 (NICD, 2019). Numerous actions were taken in response to repair the situation. Making sure that all children received routine immunizations to protect them from polio has made progress. South Africa finally received its certified polio-free status from The African Regional Certification Commission (ARCC) of the WHO in September, 2019 (NCID, 2019).

2.3.1.2 Tuberculosis

Mycobacterium Tuberculosis is the bacteria that cause Tuberculosis (TB). South Africa is known for one of the worst TB epidemics in the world. It is spread through respiratory droplets from a person who has either pulmonary or laryngeal TB when that person coughs sneezes or sings (NdoH, 2015). Children can also contract the virus during birth via the mother's placenta if the mother has disseminated TB (NdoH, 2015). As a result, receiving the Bacille Calmette-Guérin (BCG) vaccine at birth is critical for children because it is the only vaccine against disseminated tuberculosis (TB) (Cohen et al., 2016).

2.31.3 Bacterial disease: Diptheria, Tetanus, Pertussis and Hemophilus Influenzae B

Bacterial diseases like diphtheria, tetanus, pertussis, and Haemophilus influenzae B can be fatal, especially in young infants. The vaccines against these viruses are given as a hexavalent vaccine at four points (6, 10 and 14 weeks with a booster at 18 months) within the first five years of a child's life. Diptheria and Pertussis are caused by bacteria and are spread from person to person through respiratory droplets (Cohen et al., 2016 and Kilgore et al., 2016).

Tetanus is caused by a bacteria called *Clostridium tetanii* and it is transmitted when this bacterium, which is found in soil, enters a wound of a person (NdoH, 2015). The symptoms include muscle spasm and rigidity.

Haemophilus influenzae type B (Hib) is the bacterium that is one of the leading causes for bacterial meningitis and pneumonia specifically in children under the age of five years (WHO, 2013).

2.3.1.4 Hepatitis B

Hepatitis B, a viral infection, can damage the liver and eventually result in liver cancer (Cohen et al., 2016). The virus is transmitted through bodily fluid during sexual intercourse, mother to child transmission during birth and pregnancy as well as through the cross-contamination from needles containing the HBV infected blood (WHO, 2017). The presence of chronic HBV infection is one of the reasons for South Africa having the highest rates of liver cancer worldwide (WHO, 2017). HBV prevalence rates ranged from 0.3% to 15% which is considered high before the HBV vaccine was added to the South African EPI in 1995 (NICD, 2019).

2.3.1.5 Pneumococcal disease

The bacterium that causes pneumococcal disease, which is the leading cause of meningitis, bacterial pneumonia and ear infection in South Africa is Streptococcus Pneumonia. Acute lower respiratory tract infections (LRTIs) and invasive pneumococcal disease (IPD) are more common in children who are HIV-infected and HIV-exposed-uninfected than in children who are HIV-unexposed-uninfected (Cohen et al., 2016). Invasive pneumococcal disease (IPD) incidence among children under the age of two years decreased by 69 percentage points by

2012 according to South African national surveillance statistics, with PCV and HIV-related treatments playing a part (von Gottberg et al., 2014).

2.3.1.6 Rotavirus

Rotavirus is one of the leading causes of diarrhea in children worldwide and two doses of the vaccine against it within the period of eight weeks is recommended for children younger than five years. Twenty to twenty-five percent of all diarrhea-related deaths and six percent of all fatalities in children under-five are caused by rotavirus.(Page, 2006). The results from the 2006 rollout of the rotavirus vaccine in South Africa indicated a 98% efficacy against severe rotavirus diarrhea and a 74% efficacy against any rotavirus diarrhea (Page, 2006).

2.3.1.7 Measles

Measles, a highly infectious viral disease affecting children, have become less common in South Africa after the introduction and implementation of the vaccination against it. Between 2000 and 2018, measles vaccination caused a 7 percentage point decrease in measles fatalities globally (WHO,2019). Measles was a prominent source of morbidity and mortality before the vaccine was developed in the 1960s (Moss, 2017). Cape Town recorded a cluster of measles infections in 2019 among four siblings who had visited Georgia (Hong, 2019). In the Northwest province's Rustenburg sub-district, Bojanala Platinum district, three cases of the measles were found in the lab over a four-week period. These incidents meet the requirements for a measles outbreak (NICD, 2019). MCV1 coverage in South Africa between 2012 and 2017 was 71.7%, whereas MCV2 averaged 68.8% (WHO, 2019). Since then, 2nd dose coverage of the measles has increased to 76.4% in 2018, but it is still below the 95% coverage level needed for elimination, thus random cases continue to occur (WHO, 2019).

2.3.1.8 Human Papillomavirus

Human Papillomavirus (HPV) is a virus which is primarily transmitted during sexual intercourse. It puts people at risk for developing specific cancers, including cancers of the cervix (cervical cancer) in women and cancers of the penis in men. Cervical cancer is the second most prevalent malignancy in women in South Africa, after breast cancer (Cohen et al., 2016). Every year, this disease claims the lives of 3 000 women in South Africa. Action is therefore encouraged by the National Development Plan towards collaboration between the Department of Basic Education (DBE) and Health in implementing the World Health Organization's advice to vaccinate sexually impressionable girls against HPV (Department of Basic Education, 2014).

2.3.2 Coverage of the EPI in South Africa

Recent data has shown that the South African coverage for all eight basic vaccinations has declined from 63.4% in 1998 to 61.2% in 2016. The BCG vaccination coverage has decreased to about 92.5 % in 2016 from 96.8% in 1998 as well as the DPT vaccination declined by 2 percentage points since 1998 and was 91.2% in 2016 (WHO, 2019). Currently the global coverage rate decreased to about 84% in 2021 due to the COVID-19 pandemic (WHO, 2019).

2.3.3 Factors associated with poor immunisation coverage.

A study was conducted to determine the causes of parents' decisions not to finish their child's vaccines (Syiroj, Pardosi and Heywood, 2019). They identified three categories, namely beliefs barriers (which focused on Islamic beliefs, belief in natural immunity and belief in alternative medicine), vaccine safety (which considered adverse effects and components of

vaccine) and trust and misinformation (distrust in government, trust in social network and misinformation and lack of knowledge) (Syiroj, Pardosi and Heywood, 2019). Alaba et al., (2021) presented results on child immunization displaying that household wealth, residence status, household head sex, antenatal care, postnatal care, place of delivery, and mother's education were the main causes of health inequalities in children not receiving their recommended doses of vaccines.

2.3.4 Association between immunisation and nutritional status/growth of young children

A few studies reviewed the relationship between immunization status and nutritional status. Both Das et al, (2017) and Verkerke et al, (2016) found the relationship between rotavirus disease and malnutrition to be disproportional in a negative direction. Das et al, (2017) observed that in the early 1990s, the proportion of all malnutrition categories (underweight, wasting, and stunting) was relatively high among children under the age of five, but the incidence of rotavirus was low. However, beginning of 1993, the proportion of children under the age of five who were malnourished rapidly declined, whereas rotavirus diarrhoea increased. Verkerke et al, (2016) noticed a strong association between better nutritional status and higher risk of rotavirus. Malnutrition associated with environmental enteropathy inhibits the attenuating function of the rotavirus oral vaccine which can therefore be hypothesized that rotavirus will better replicate in the intestinal area of well-nourished children (Verkerke et al, 2016).

Other studies support a more proportional relationship between immunizations and nutritional status in children. Incomplete immunizations negatively relate to malnutrition as poor vaccination status is associated with stunting, wasting and being underweight among children

under-five years old (Solis-Soto, Paudel and Nicoli, 2020; Kaushal, 2019). Kaushal (2019) also found a relationship between the immunization status of a child and low birth weight. This may indicate that because vaccination has a protective element in the reduction of morbidity, it may also improve nutritional status in the long run (Kaushal, 2019).

2.4 The Road to Health Booklet

The Road to Health Chart (RTC) developed in 1975 was replaced with the Road to health booklet (RtHB) in 2011 which is used within South African primary healthcare facilities and is designed as a monitoring tool and a national assessment for the health of children between the ages of birth and five years (Du Plessis et al., 2017). Records of interventions that are embedded within these monitoring tools include: immunization, developmental screening, oral health, health promotion, growth monitoring, infectious diseases such as HIV and TB and then VAS as well as deworming (Du Plessis et al., 2017). The potential in identifying children who are malnourished, who require VAS, deworming and immunization, who are infected with a particular disease lies in continuous utilization of the booklets by healthcare workers as well as caregivers (Cloete et al., 2013).

The RtHB has been redesigned in the year 2018 incorporating a side-by-side campaign which purposes to consider children under the age of five years to gain proper access to health care interventions and ensure that it is monitored closely (Commons et al., 2018). The campaign also aims to support the relationship between parent/caregiver and child as well as the relationship between healthcare workers and practitioners who play a vital role within the health of under-five year old children (Commons et al., 2018).

Together with the 2018 redesign of the RtHB, the structure has also changed in that EPI schedule is laid out differently than that of the old RtHB design. In the revised RtHB the EPI schedule consists of an additional “at 12 months” (Table 2.1) when the child needs to attend the clinic to receive a vaccination. Another change within the schedule is that the Hepatitis B vaccine was added to the three vaccines in one injection (DTap IPV- Hib) to make a Hexavalent vaccine (Table 2.1). This was done to avoid the child receiving multiple injections at the age of 6 weeks when the first of this vaccine should be administered and then at 10 and 14 weeks of age when the boosters are normally administered (Cohen et al., 2016). The VAS programme schedule layout is a bit different as within the new RtHB the schedule only goes up until 18 months with blank spaces that follows with intentions to fill in as the child receives his/her supplementation on a bi-annual basis.

Another change regarding the 2018 revised RtHB that is necessary to be discussed is the fact that the old RtHB had one for boys (green colour) and one for girls (pink colour), whereas the new RtHB has information and documentation records for both girls and boys compacted into one booklet.

2.5 Conclusion

Child malnutrition remains a challenge in the South African context. To ensure the health and the well-being of young children, opportunities to support the current public health interventions should be pursued until evidence to the contrary result in policy/programme changes.

CHAPTER THREE: METHODOLOGY

3.1 Introduction:

This chapter describes the research methods applied in this study. The objectives of the study is presented followed by the research design used and a motivation for the choice of study design to achieve the aim and objectives. Thereafter the study setting where data collection took place is described, followed by a description of the population and how the sample of the study was selected. The subsequent sections describe the methods of data collection, analysis, data management and how rigour was established throughout the data collection process. Lastly the limitations of the study as well as the ethics considerations are presented.

3.2 Study objectives

The aim of this study was to determine the compliance with the VAS and EPI programme amongst children under the age of five years in ECD centres in Delft and its association with malnutrition

Specific objectives for this study were:

1) To determine compliance with the VAS programme of children (<5years) attending ECDs in Delft.
2) To determine the immunization status of children (<5 years) attending ECDs in Delft.
3) To assess the nutritional status of children (<5 years) attending ECDs in Delft.
4) 4) To compare the nutritional status of the children under 5 years who are compliant and those who are not compliant with VAS and EPI programmes.

3.3 Study Design

This study was quantitative in nature based on cross-sectional data. An observational cross-sectional descriptive study design is useful for determining an association of a prevalence within a period of time (Kesmodel, 2018). In this study, data was only collected at a single point in time i.e. from October 2021 till February 2022. A multi-stage-selection process was used to first select ECDs and thereafter select children to be included from each ECD. The variables on which data was collected in this study includes, date of birth, birth weight, birth length, the registration status of the ECD Centre the child attends, VAS status (whether the child received supplements according to the child's age and the schedule), immunization status (whether the child received vaccines according to the child's age and the schedule). In addition, to the descriptive analyses of these variables the researcher also compared the nutritional status of those children who were compliant with the VAS and EPI programmes and those who were not compliant to understand potential associations between VAS, and/or EPI with nutritional status.

The null hypothesis of this mini-thesis was that there was no association between the compliance of children with VAS and EPI and the nutritional status of those children. The alternative hypothesis of this mini-thesis was children who were compliant and up to date with their routine VAS and EPI schedule would have better nutritional health than those who were not compliant

3.4 Research Setting

This study took place in Delft community. Delft is situated east of central Cape Town in the Western Cape Province of South Africa. The area of Delft is home to African (46,2%) and

Coloured (51%) ethnicity with an estimated population size of 152,030 (*The Kuyasa Fund*, 2005). The majority of population in the area is aged between 40-49 years (16.2%) followed by 0-9 years (16.0%) (STATSSA2022). It is estimated that about 23. 9% of households in Delft fall in the income bracket of R19,601-R38,200, whereas 16.6% fall in the no income bracket (See Table 3.1) (STATSSA, 2022).

Table 3.1: Sociodemographic profile of Delft (STATSSA, 2022)

Variables	Percentage
Ethnicity	
• Black African	• 46.2%
• Coloured	• 51.5%
• Indian/Asian	• 0.3%
• White	• 0.2%
• Other	• 1.8%
Age	
• 0-9 years	• 16.0%
• 10-19	• 13.6%
• 20-29	• 12.2%
• 30-39	• 14.0%
• 40-49	• 16.2%
• 50-59	• 13.8%
• 60-69	• 9.2%
• 70+	• 5.0%
Education	
• No schooling	• 2.2%
• Some Primary	• 11.5%
• Completed Primary	• 7.1%
• Some Secondary	• 52.4%
• Matric	• 23.7%
• Higher education	• 3.1%

Source: Statistics South Africa: Census 2022

Table 3.1: Sociodemographic profile of Delft (STATSSA, 2022) (Continued)

Income • No Income • R1-R4800 • R4801-R9600 • R9601-R19600 • R19601-R38200 • R38201-R76400 • R76401-R153800 • R153801-R307600 • R307601-R614400 • R641401-R1228600+	 • 16.6% • 5.6% • 8.1% • 14.8% • 23.9% • 17.8% • 9.4% • 2.9% • 0.7% • 0.1%

Source: Statistics South Africa: Census 2022

3.5 Sampling Strategy

The study used Epi-info version 7.2.4.0 to determine the sample size required to achieve the stated objectives. At a 95% confidence interval, an expected prevalence of 64% of vitamin A coverage, and 80% power for an estimated population size of 2000, a sample of 301 children was sufficient. The sampling method used in this study was non-probability quota sampling which included the purposeful selection of 30 ECDs within the entire area of Delft with ten children to be selected per ECD. A mixture of registered and unregistered ECDs were included.

All under-five children attending the 30 selected ECDs were invited to be part of the study. The inclusion criteria was a child being aged between six months and 59 months who attended the selected ECDs in Delft during the data collection period. Before being included in the sample, the availability of a RtHBs were checked, and willingness to be weighed. Exclusion criteria were children who were infected with diseases such as diarrhea at the time of data collection and children who had not received informed consent from the parent or guardian to be part of the study. A total of ten children were included from each of the 30

ECD centres to make up the 300 children between the ages of six months and 59 months. All 30 ECDs had more than ten consent forms at hand before data collection and all those with consent forms were weighed, measured, and screened, however, only the first ten consent forms in the pack received from the principle/teacher (who organised forms according to date received back) were included in the study.

3.6 Data Collection

The dates for data collection were arranged between the researcher, the head of the ECD forums and the principles of each ECD centre. A short presentation was done during each meeting before the date for data collection was set. Data was collected between November 2021 and February 2022. In December, many ECDs had fewer than the required number of ten children under-five years, as many of the parents were on holiday and children stayed at home during this time. Thus, data collection was rescheduled to the end of January 2022. The researcher communicated with the ECD principles on a Monday to confirm the number of children present on the day and to estimate the number of children expected to be attending for that week.

After permission for inclusion of the ECD was obtained from the principal of the ECD, an information sheet (see Appendix 1) and consent form (see Appendix 2) for each child within the inclusion criteria, were distributed to the parent/guardian of the child by the ECD. The information sheet and consent form were given in the language that the parents were most comfortable to engage in. These included English, Afrikaans and Isixhosa. All eligible children were weighed and measured and the data on immunization and VAS was extracted

from the RtHB to determine whether or not the children were compliant to the above-mentioned programmes.

The key information collected during the data collection process were the immunization status, VAS status and the child's anthropometric measurements (weight, height, and Mid-Upper Arm Circumference). The immunization status was assessed based on whether a child received all the scheduled vaccinations or missed some and which ones missed. Similarly, the VAS status of the children was obtained from the routine schedules embedded within the RtHB of the children. A data extraction sheet (see Appendix 3) was used to document each variable that was collected from the RtHB. The extraction sheet was constructed by the researcher with the assistance of the thesis supervisor and was based on the research question. The parents/guardian of the children were requested to send the RtHB with the child on the day of data collection.

On the day of data collection, children were weighed, their heights/lengths and their MUAC measurements were taken. Weight was measured using a calibrated scale (Charder scale) to the nearest 0.01 decimal. The height measurement was performed for all children at and older than 24 months using a portable stadiometer (Prestige). Length was determined for children younger than 2 years of age using a length board (UWC). Body weight and height/ length are the principle anthropometric measurements used to calculate indices such as weight-for-age z-scores (WAZ), height-for-age z- scores (HAZ) and weight-for-height z-scores (WHZ) which are basic for assessing and monitoring growth and nutritional status of children under the age of five years (Corsi, Subramanyam and Subramanian, 2011). Reference data such as World Health Organization growth standards are normally used to compare the anthropometric data of children of various age groups. The nutritional status was

calculated by observing the divergence of child's weight and height from the median of the standard reference population data (Corsi, Subramanyam and Subramanian, 2011).

The data collection tool was piloted at one of the ECDs in the area of Delft where 11 children <5 years were screened, weighed and measured and their measurements were documented on the sheets. The tool was then revised accordingly after anthropometric assessments were done with each child individually. Those that were included in the pilot study were included in the main study. The researcher then extracted information regarding immunisation status, VAS dosages received as well as birth weight and length from the RtHB of each child. All information was captured on the data extraction sheet. After all assessments and data extraction was done, vitamin A supplements and deworming tablets were provided to the children who were due for another dosage. This was part of the researcher's daily work activities where a professional nurse would administer the vitamin A supplement and deworming tablet as part of an outreach event. The anthropometric data collected as well as VAS given were recorded on the RtHB of each child. Children with incomplete immunisation was provided with a referral letter to the local public health facility.

Data collection took place in the midst of the COVID-19 pandemic and thus regulations to protect participants involved in the study were adhered to. Hand sanitizers were available at each station (i.e weighing, measuring and screening the RtHB of the children). The data collector (whom was a professional nurse trained by the researcher) and researcher sanitized their hands as well as the equipment after weighing and measuring a child and before the next child was weighed and measured. Surgical masks were required to be worn by each person involved in the weighing and measuring process of the child as well as each of the teachers that was present on the day of data collection. Social distancing was also practiced as much

as possible. Most of the children were quite comfortable regarding the process. The teachers were of great assistance for children who did not completely understand the process and who refused to stand on the scale or spat out the supplementation droplets.

3.7 Data Analysis

Data was captured in Excel. Data was analysed using SPSS (Statistical Package for Social Sciences version 28) as well as WHO calculator. Categorical variables such as compliance with VAS and EPI were generated based on the information recorded from the RtHB on the data extraction sheet. VAS status was divided into three levels for the analysis. Full compliance indicated the children who received all their vitamin A dosages up to date in accordance with their age, partial compliance referred to those who missed one or more vitamin A doses according to their age and non-compliance included children who received no vitamin A doses at all. This classification is coherent with (Nair et al., 2022) compliant status of VAS amongst children under the age of five years. For example, a child who was three years old on the day of data collection and has received 6 doses was compliant for the VAS programme.

EPI compliance was estimated based on the immunisation schedule to have been completed for that particular age bracket (See Table 2.1). The EPI status categories were also further divided into three categories of immunization: Fully compliant, partially compliant and non-compliant. The fully compliant category contained children who have received BCG, and full doses of the following vaccines: hepatitis B, diphtheria, tetanus, pertussis (DPT), OPV, rotavirus and measles according to the age of the child. The partially compliant section comprised children who has one of those vaccine doses but not all of them according to age.

Lastly the non-compliant category identified children who has not received any doses of the vaccine in accordance with their age. This is consistent with how National Family Health Survey-3 (NFHS) presents findings regarding immunization in children (Agarwal et al., 2019). In order to construct binary variables for VAS status the categories were arranged where those who were fully compliant fell into the 'compliant' variable whereas those who were partially compliant and non-compliant were grouped into the 'non-compliant' variable. The binary variables for the EPI status were as follows: Fully compliant variable was arranged into the compliant category whereas the partially compliant and non-compliant category were grouped into the non-compliant variable.

Anthropometric assessments were used to calculate age- and sex-specific variables namely (WAZ), (HAZ), and (WHZ) using WHO calculator. Each individual participant's weight, height, date of birth, date of data collection was punched into the software programme to calculate WAZ, HAZ and WHZ. In order to determine the nutritional status of the children four indicators were created namely stunted, wasted, underweight and overweight, severely stunted, severely wasted, severely underweight and overweight. These indicators are contained within the WHO Global Reference list of 100 core health indicators and are defined in the following way: stunting is shown as height-for-age less than negative 2 standard deviation of the WHO growth standards median, wasting displays as weight-for-height less than negative 2 standard deviation of the WHO growth standards median (WHO, 2014). Overweight is defined as weight-for-height more than positive 2 standard deviations whereas underweight is displayed weight-for-age less than negative 2 standard deviation (WHO, 2014). Regarding the birth weight, less than 2500 g is considered low weight, between 2500 and 5500 g is 'normal weight,' and more than 5500 g is considered overweight

(WHO, 2006). The mean (±standard deviation) and median (with interquartile range) were calculated for continuous variables such as birth weight, birth length, WAZ, HAZ, and WHZ. The cut-off points that were used for MUAC measurements was 11-11.5cm together with a WHZ less than negative 3 standard deviations from WHO's growth standard median indicated severe malnutrition. The nutritional status of children was used in bi-variate analyses (cross-tabulations) with the newly created categorical variable on EPI and VAS compliance. Linear regression was used to determine the differences of the nutritional status of the children within the sample between those who were compliant or non-compliant with VAS programme as well as the differences in the nutritional status of children who were either compliant or non-compliant with the EPI programme whist controlling for birth weight, age and ECD registration status.

3.8 Data management

Data was stored on the UWC Kikapu platform. The data was also stored on the secure local drive of the researcher and accessed using password protected devices. The paper copies of the data extraction sheets were stored in a locked secure storage system for five years and then will be shredded. Information from this study will be shared through a publicly released report (mini-thesis submitted for examination and possibly an academic publication) with an abbreviated communication brief to the participating ECDs and parents/guardians of children.

3.9 Reliability and validity

Heale and Twycross (2015) describes 'validity' as the extent to which a concept is precisely measured in quantitative and qualitative studies. To ensure representation of the ECDs and generalisability of the results, registered and unregistered ECDs were selected throughout the

entire community of Delft and not limited to only one area within the community. However, given the non-probability sample of the ECDs included, the sample may not be representative of children attending ECDs in Delft.

Reliability refers to how consistent the research instrument is when results are extracted (Heale and Twycross, 2015). The scale has been calibrated to 0.00kg before each child was measured. Each weight and height measurement were repeated three times during the anthropometric assessments.

3.10 Ethical considerations

Participation in the study was voluntary for all the proposed participants and the right to withdraw was also made known to the parents of the participants. As more than ten children attended each ECD information sheets and consent forms were given to each child and all those whose parents granted consent for them to participate in the study were weighed and measured along with the study sample. The study provided a benefit for both the parents of the children and teachers of the ECD centres as VAS was provided to all children who were due for supplementation after the assessments were completed. If their immunizations were not up to date, they would gain quicker access to the health services within the facilities via the referrals we issued which also saved them long waiting time in a queue. COVID-19 regulations were complied with. To ensure the child's anonymity, his/her name was not included on the data collection sheet, a code was placed on the data collection sheet. Each ECD was also identified through a code. Through the use of an identification key, the researcher is able to link the code on the data sheet to the child's identity, but only the researcher has access to the identification key. To ensure confidentiality, hard copies of data

extraction sheets was stored in locked cabinets. Electronic data was also only accessible to the researcher and supervisor through password-protected computers. Ethics approval for the study was received from the Biomedical Research Ethics Committee (BMREC) of the University of the Western Cape (reference BM 21/8/13; see Appendix 4).

Since part of the researcher's job description is to provide services (such as issuing vitamin A supplements and deworming tablets as well as screening for malnutrition) to the children of the ECD centres within Delft, these services were provided to the children immediately after the assessments have been completed at the ECD.

Ethics was considered through stating and identifying the possible risks that could appear during the study and the service rendering. As deworming and vitamin A droplets were administered (following the parents' consent) to the child in the event that the child has not received it within six months before the collection of data, there was a risk that the child might gag (vomit) or not chew and swallow the deworming tablet properly due to the taste. Parents were advised of the service that will be provided to children after the study. Children for whom consent was not provided, did not receive the service either as parental consent is required for rendering of the services at the ECD.

CHAPTER FOUR: RESULTS AND FINDINGS

4.1 Introduction

This chapter presents the findings and results of the data collected. It includes a description of the study sample based on the ECD registration status, the number of under-five children within each ECD, the age groups of the children and the proportion of male vs female participants. Other subtopics that are incorporated are those relating to and formulated from the objectives of the study. These includes VAS and how it was observed within the age groups, ECD status, gender of the sample; EPI status and how it was observed and analysed within the age groups, and gender of the sample as well as the analysis of the relationship between the two programmes with the nutritional status of the sample.

4.2 Characteristics of study sample

The total sample used in this study included 300 children aged 6-59 months from 30 ECD centres. The frequency distribution of the variables mentioned above was done. Linear regression was done to find association between nutritional status, VAS status, and EPI status. Missing values that were found as part of the results were due to certain RtHBs with incomplete information. The missing values mostly affected the birthweight and birth length variables as this information was missing from some of the booklets. Only one child had missing values for VAS and EPI compliance status due to the RtHB which was damaged and therefore the primary investigator was not able to extract data for those two variables. This would potentially affect the analysis of the relationship between the nutritional status of the children and their compliance with the two programmes as the total for the two programmes was less than the total for the nutritional status.

4.2.1 Registration status of ECDs

Out of the 30 ECDs that were included in the study sample, three (10%) were registered with the Department of Social Development[1], whereas the rest (90%) were not registered with DSD but eighteen of them belonged to either one of two community-based fora within Delft. The average number of under-five children per ECD was 16 (Table 4.1)

4.2.2 Age and gender of children

A total of 300 children under the age of five years with consent from their parents participated in the study after the researcher included children according to the first ten consent forms received from the principal in each ECD. Children were grouped into nine age brackets in increments of six months: 6-11, 12-17, 18-23, 24-29, 30-35, 36-41, 42-48, 49-53, and 54-59 months. The majority of the participants (17%) were between 42-47 months, of which 37.3% were girls and 62.7% were boys. Children aged 6-11 months were the least (1.6%) (Table 4.2). The same was observed for the participants who were between the age of 24-29 months (12%) and had an equal gender distribution (50% boys and girls respectively) (Table 4.2).

Table 4.1: Registration status of ECDs by number of children within ECD

ECD ID	Number of children attending	Registration status (Yes/No)
1	14	No
2	10	No
3	14	No
4	14	No
5	10	No
6	10	No
7	12	No
8	10	No
9	36	No
10	10	No
11	16	No
12	11	No
13	23	No
14	23	No
15	35	Yes
16	13	No
17	11	No
18	14	Yes
19	18	No
20	12	No
21	20	No
22	30	No
23	23	No
24	10	No
25	11	No
26	14	No
27	12	Yes
28	18	No
29	24	No
30	15	No
Average number of children per ECD		16 (range 10-36)

[1]As of 1 April 2022, ECDs are registered with the Department of Basic Education and no longer with the Department of Social Development as per Government Gazette regulation 2021/2022

Table 4.2: Age group by child's gender

Age category	Boys (n)%	Girls (n)%	Total (n) %
6-11 months	(3) 40.0%	(2) 60.0%	(5) 1.7%
12-17 months	(10) 62.5%	(6) 37.5%	(16) 5.3%
18- 23 months	(23) 60.5%	(15) 39.5%	(38) 12.7%
24-29 months	(18) 50.0%	(18) 50.0%	(36) 12.0%
30-35months	(23) 54.8%	(19) 45.2%	(42) 14.0%
36-41 months	(15) 42,9%	(20) 57.1%	(35) 11.7%
42-47 months	(32) 62.7%	(19) 37.3%	(51) 17.0%
48-53 months	(20) 52.6%	(18) 47.4%	(38) 12.7%
54-59 months	(19) 48.7%	(20) 51.3%	(39) 13.0%
TOTAL	163	137	300

4.2.3 Documentation of the RtHBs

During the data collection period, it was observed that some of the RtHBs were not documented appropriately and were not updated. The birth weights and birth lengths of some of the children were not documented at all or were not plotted on the growth charts. There were 17 missing values for the birth weight and 38 missing values for the birth length of the children due to incomplete documentation (Table 4.3). Another common observation was that majority of the RtHBs had no plotting done on the length-for-age as well as weight-for-height charts.

Table 4.3 The number of children with complete birth weight and birth length information recorded from RtHB

	Birth weight n (%)	Birth length n (%)
Complete cases	(283) 94.3%	(262) 87,3%
Missing values	(17) 5.7%	(38) 12.7%

4.3 Vitamin A compliance

Vitamin A compliance status was assessed by checking the RtHB's of the children on the VAS schedule page if the child received the required number of vitamin A supplement doses according to the child's age. Full compliance denoted children who received all of their vitamin A dosages on time for their age, partial compliance denoted children who missed one or more vitamin A doses on time for their age, and non-compliance denoted children who received no vitamin A doses at all. For example, if the child was 36 months old, the required number of vitamin A doses he/she should have received as per his/her age is at least six times or doses. This is based on the national 6 monthly VAS schedule. Children aged 6-11 months, were supposed to receive one dosage of VAS , 12-17months were supposed to receive two doses of VAS, 18-23 months were supposed to receive three doses of VAS, 24-29 months were required to receive four, 30-35 months required up to five doses, 36-41 months needed up to six doses, 42-47 months required up to seven doses, 48-53 months required up to eight doses, 54-59 months needed up to nine-ten doses (Table 4.4).

4.3.1 Vitamin A compliance by child's age

It was observed that the children with the highest (100.0%) compliance rate were between 6 and 11 months of age and reduced as age increased (Table- 4.4). On the other hand, those who did not comply with the programme were mostly from the 48-53 age group (Table 4.4). Those who were between the ages of 12-17 months and 18-23 months also displayed a good compliance result (75% and 63.16% respectively). The differences in VAS compliance status between the age groups was statistically significant (p value= 0.00) .

Table 4.4 Number of VAS dosages received by age group

#VAS dosages	Age bracket (months)									TOTAL
	6-11	12-17	18-23	24-29	30-35	36-41	42-47	48-53	54-59	
0	0	1	0	0	3	0	0	0	0	4 (1%)
1	5 100%	3	5	0	1	1	0	0	1	16 (5%)
2	0	12 75%	9	4	2	4	8	5	4	48 (16%)
3	0	0	23 62%	11	11	7	1	5	6	64 (21%)
4	0	0	0	17 52%	11	8	8	6	7	57 (19%)
5	0	0	0	0	16 36%	8	8	10	6	48 (16%)
6	0	0	0	0	0	8 22%	9	8	1	26 (9%)
7	0	0	0	0	0	0	17 33%	3	4	24 (8%)
8	0	0	0	0	0	0	0	2 5%	5	7 (2%)
9	0	0	0	0	0	0	0	0	4 10%	4 (1%)
10	0	0	0	0	0	0	0	0	1 3%	1 (<1%)
TOTAL	5	16	37	32	44	36	51	39	39	299 (100%)

**Highlighted cells indicate the number of children who obtained the desireable number of VAS dosages per age bracket of the child*

Most of the children (63.9%) were partially compliant with the VAS progamme (Table 4.5)

i.e. they missed one or more of the VAS supplements.

Table 4.5 Vitamin A compliance amongst study sample

	Frequency	Percent
Non-compliant	4	1.3
Partial compliant	191	63.9
Total non-compliant (Non- compliant and Partial compliant)	195	65.2
Compliant	104	34.8
Total	299	100

4.3.2 Vitamin A compliance status by child's gender

More boys were compliant with the VAS programme compared to girls (39.3% vs 29.4 %). There was no substantial gender difference in the partially compliance rate between boys (60.1%) and girls (68.3%) children. There were 2.2% of girls who were non-compliant with the programme compared to 0.6% of boys who were non-compliant (Table 4.6). There was no statistical significant association between gender and VAS compliance status (p value= 0.08)

Table 4.6 Vitamin A compliance by gender of a child

Sex category	Non-compliant (Has not received any VAS to date) (n) %	Partial compliant (Has missed more than one VAS dosages)(n) %	Compliant (Has received all VAS dosages up to date) (n) %	Total
Girls	(3) 2.2%	(93) 68.4%	(40) 29.4%	(136) 45.5%
Boys	(1) 0.6%	(98) 60.1%	(64) 39.3%	(163) 54.5%
Total	(4) 1.3%	(191) 63.9%	(104) 34.8%	299

4.3.3 Vitamin A status by child's gender and ECD status

Both boys and girls were non-compliant for VAS and attended unregistered ECDs (Table 4.7). Despite this, the highest proportion of boys and girls who were compliant with VAS also attended unregistered ECDs. However, the compliance status of boys and girls by registration status of ECD was not statistically significant (girls p value=0.41, boys p value=0.49). This indicates that the gender of the children has not impacted on whether the children who attended a registered or unregistered ECD affected their VAS compliance status. Gender stereotypes and biases can emerge in a child's early years. Children as young

as three years old begin to understand cultural gender stereotypes. They begin to develop gender stability around three and a half years old, and gender biases about girls' and boys' intelligence can form as early as six years old (UNICEF, 2020). Teachers may have based their decision on gender on the general characteristics that society links to boys compared to girls.

Table 4.7 Vitamin A status by child's gender and ECD status

Sex	ECD Registration (Yes/No)	Non-compliant n (%)	Partial Compliant n (%)	Compliant n (%)	Total	p-Value
Girls	Yes	(0) 0.0 %	(10) 83.3%	(2) 16.7%	(12)	0.41
	No	(3) 2.4%	(83) 66.9%	(38) 30.6%	(124)	
	Total	(3) 2.2%	(93) 68.4%	(40) 29.4%	(136)	
Boys	Yes	(0) 0.0%	(13) 72.2%	(5) 27.8%	(18)	0.49
	No	(1) 0.7%	(85) 58.6%	(59) 40.7%	(145)	
	Total	(1) 0.6%	(98) 60.1%	(64) 39.3%	(163)	
Total (Yes)		(0) 0.0%	(23) 76.7%	(7) 23.3%	(30)	
Total (No)		(4) 1.5%	(168) 62.5%	(97) 36.1%	(269)	
Total		(4) 1.3%	(191) 63.9%	(104) 34.8%	(299)	

4.4 EPI compliance.

4.4.1 EPI compliance by age group.

Immunization status was assessed through screening the RtHBs of the sample. A child was considered compliant if he/she received all of the scheduled vaccinations to date according to his/her age (see Table 2.1 in Chapter two for a complete immunisation schedule). Most of the

children under the age of 5 years (91%) comply with the EPI programme (Table 4.8). Twenty seven children (9%) have not received any vaccination.

It was observed that the majority of those who were compliant fell within the 6-11 months (100%) whereas those who were non-compliant mostly came from the 36-41 month age group (14.3%) (Table 4.8).

Table 4.8 EPI compliance by age group

Age category	Non-compliant (n) %	Compliant (n) %	Total
6-11 months	(0) 0.0%	(5) 100%	5
12-17 months	(3) 18.8%	(13) 81.3%	16
18-23 months	(7) 18.9%	(30) 81.1%	37
24-29 months	(3) 9.4%	(29) 90.6%	32
30-35 months	(6) 13.6%	(38) 86.4%	44
36-41 months	(2) 5.6%	(34) 94.4%	36
42-47 months	(3) 5.9%	(48) 94.1%	51
48-53 months	(2) 5.1%	(37) 94.9%	39
54-59 months	(1) 2.6%	(38) 97.4%	39
TOTAL	(27) 9%	(272) 91%	299

4.4.2 EPI status by child's gender and ECD registration status

There was no substantial difference in EPI status among girls and boys who attended registered ECDs and unregistered ECDs. It was observed that 91.7% of girls who attended registered ECDs were compliant with EPI compared to 91% from unregistered ECD. This

difference was not statistically significant (p value= 0.71). For boys the difference in compliance level between those who attended registered ECD (94.4%) and those who attended unregistered ECD's (90.3%) was not statistically significant (p value=0.49) (Table 4.9). The results indicates that there was no statistically significant difference between the registration status of the ECD and EPI compliance of children for girls and boys. The gender of the children has not impacted on whether the children who attended a registered or unregistered ECD affected their EPI compliance status.

Table 4.9 EPI status by child's gender and ECD registration status

Sex	ECD Registration (Yes/No)	Non-compliant n (%)	Compliant n (%)	Total	p-Value
Girls	Yes	(1) 8.3%	(11) 91.7%	(12)	0.71
	No	(11) 8.9%	(113) 91%	(124)	
	Total	(12) 8.8%	(124) 91.2%%	(136)	
Boys	Yes	(1) 5.6%	(17) 94.4%	(18)	0.49
	No	(14) 9.7%	(131) 90.3%	(145)	
	Total	(15) 9.2%	(148) 90.8%	(163)	
Total (Yes)		(2) 6.7%	(28) 93.3%	(30)	
Total (No)		(25) 9.3%	(244) 90.7%	(269)	
Total		(27) 9.0%	(272) 91.0%	(299)	

4.5 Nutritional status of the study sample

The proportion of children with a birthweight of under the standard 2.5 kg cut-point for low-birthweight was 34 out of 283 children which is about 12.0% (Table 4.10). Most children presented as stunting (16%), underweight was the second most prevalent (6.3%), then overweight (3.7%) and wasted (2.6%) (Figure 4.1).

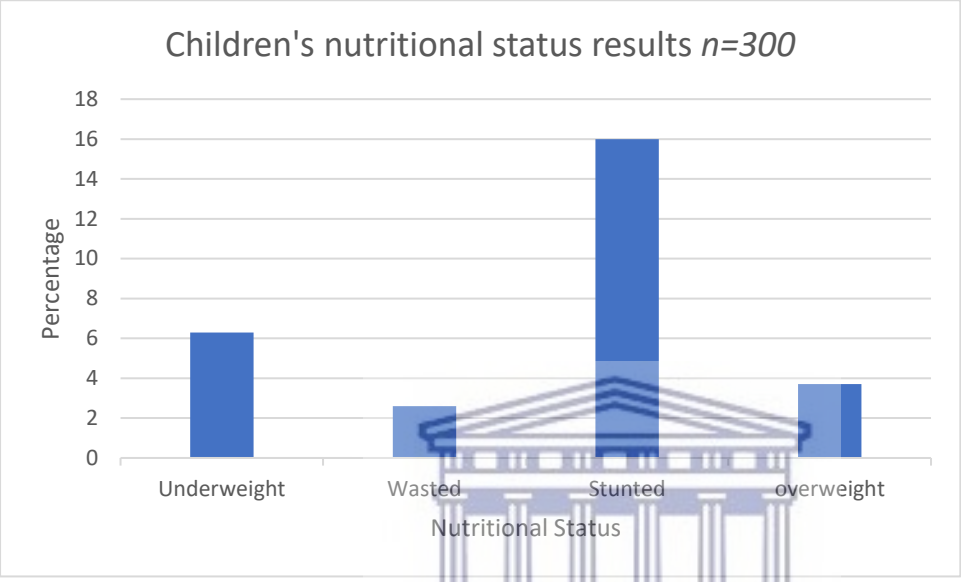


Figure 4.1: Proportionate distribution of underweight, wasting, stunting and overweight of the study sample

Table 4.10 Birthweight status

	Frequency	Valid percent
Under 2.5kg	34	12.0
2.5kg and over	249	88.0
Total	283	100.0
Missing from RtoHB	17	5.7
Total	300	100.0

The mean birthweight for this sample (3.12kg) was greater than the 2.5kg standard for determining low-birth weight and therefore it can be said on average the sample had a

relatively normal birthweight. The standard deviation for birthweight (0.57) indicates consistency as the data was spread tight around the mean. The distribution for the observation of birth lengths was symmetrical as the mean (49.92cm) and median (50.00 cm) were just about equal to one another (Table 4.11).

Table 4.11 Descriptive measures of birth weight and length

	Birth weight	**Birth Length**
Mean	3.12	49.92
Median	3.11	50
Mode	2.9	50
Standard deviation	0.57	4.06
Quartile 1	2.77	48.00
Quartile 3	3.48	52.00
N	283	262
Missing Values	17	38

On average the sample shows normal nutritional status as the mean for the z-scores (WAZ=-0.15, L/HAZ= -0.83 and WHZ= 0.48) all fall within the normal spectrum. The standard deviation shows that there is some variation within the data for each z-score category as all are greater than 0 (Table 4.12). Although the minimum for each z score category is below -3 indicating some severe malnutrition, 75% of the sample has a WAZ, HAZ and WHZ that is only lower than 0.58, -0.04 and 1.16 which is normal for each z-score meaning there are not many with z scores lower than -3 (Table 4.12)

Table 4.12 Descriptive measures of z-score

	WAZ	L/HAZ	WFZ
Mean	-0.15	-0.83	0.48
Median	-0.24	-0.85	0.44
Mode	-0.21	-0.72	1.31
Standard deviation	1.23	1.36	1.20
Quartile 1	-0.87	-1.67	-0.27
Quartile 3	0.58	-0.04	1.16
Minimum	-3.51	-6.08	-3.24
Maximum	5.29	6.98	7.01
Range	8.8	13.04	10.25
N	300	300	300

4.5.1 Tracking the nutritional status with birth anthropometry

Besides the current anthropometry measurements taken, only the birth weight and lengths could be extracted from the RtHB therefore growth progress was measured based on the birth measurements in comparison to that of the current anthropometry measurements using an increase to categorise an "improvement" and a decrease as an indication of "no improvement". For the WAZ just more than half (54.1%) of the sample showed improvement in their weights between birth and current status. The L/HAZ indicator had more children who showed no improvements (67.6%) compared to those who showed improvements (32.4%) and the opposite was true for the WHZ (74.9% improved, whereas 25.1% did not) (Table 4.13)

Table 4.13 Tracking of nutritional status

Nutritional status tracking	WAZ	L/HAZ	WHZ
Improvement	(153) 54.1%	(85) 32.4%	(179) 74.9%
No improvement	(130) 45.9 %	(177) 67,6%	(60) 25,1%

Total	(283) 100 %	(263) 100%	(239) 100%
Missing values	17	38	61

4.5.2 Nutritional status by child's gender and ECD type

Within the registered ECDs more girls (25.0%) were stunted than boys (11.2%) (Table 4.14). Whereas those that attended unregistered ECDs more boys (20.0%) were stunted than girls (11.2%). All boys who attended a registered ECD were of a normal weight for age (Table 4.15). The unregistered ECDs within this study had an almost equally distributed result for wasting amongst girls and boys (8.3% and 5.6%). Majority of those who were overweight were girls coming from unregistered ECDs (7.2%). There were more girls who belonged to a registered ECD who were underweight (25.0%) compared to those who attended an unregistered ECD. This result showed statistical significance as the p value was 0.03 (Table 4.15). The rest of the differences found within these results were not statistically significant as the p values were greater than the significant value of 0.05 (HAZ, girls p=0.25 boys p= 0.38; WAZ boys p=0.26; WHZ girls p= 0.23 boys p=0.42).

Table 4.14 L/HAZ status by children's gender and ECD status

Sex	ECD Reg (Yes/No)	Stunted	Not stunted	Total	P-Value
Girls	Yes	(3) 25.0%	(9) 75.0%	(12) 8.8%	0.25
	No	(14) 11.2%	(111) 88.8%	(125) 91.2%	
Boys	Yes	(2) 11.1%	(16) 88.9%	(18) 11.1%	0.38
	No	(29) 20.0%	(116) 80.0%	(145) 89.0%	
Total (Y)		(5) 16.7%	(25) 83.3%	(30) 10.0%	
Total (N)		(43) 15.9%	(227) 84.1%	(270) 90.0%	
Total		(48) 16.0%	(252) 84.0%	(300) 100.0%	

Table 4.15 WAZ status by children's gender and ECD status

Sex	ECD Registration (Yes/No)	Underweight	Normal	Total	
Girls	Yes	(3) 25.0%	(9) 75.0%	(12) 8.8%	0.03
	No	(5) 4.0%	(120) 96.0%	(125) 91.2%	
Boys	Yes	(0) 0.0%	(18) 100.0%	(18) 11.0%	0.26
	No	(11) 7.6%	(134) 92.4%	(145) 89.0%	
Total (Yes)		(3) 10.0%	(27) 90.0%	(30) 100.0%	
Total (No)		(16) 5.9%	(254) 94.1%	(270) 90.0%	
Total		(19) 6.3%	(281) 93.7%	(300) 100.0%	

Table 4.16 WHZ status by children's gender and ECD status

Sex	ECD Reg (Yes/No)	Wasted	Normal	Overweight	Total	p-value
Girls	Yes	(1) 8.3%	(11) 91.7%	(0) 0.0%	(12) 8.8%	0.23
	No	(3) 2.4%	(113) 90.4%	(9) 7.2%	(125) 91.2%	
Boys	Yes	(1) 5.6%	(17) 94.4%	(0) 0.0%	(18) 11.0%	0.42
	No	(3) 2.1%	(140) 96.6%	(2) 1.4%	(145) 89.0%	
Total(Yes)		(2) 6.7%	(28) 93.3%	(0) 0.0%	(30) 10.0%	
Total (No)		(6) 2.2%	(253) 93.7%	(11) 4.1%	(270) 90.0%	
Total		(8) 2.6%	(281) 93.7%	(11) 3.7%	(300) 100%	

4.5.3 Nutritional status by child's age

It was observed that children between the age group of 6-11 months were not wasted or underweight, only one child was stunted. The children who belonged to the (18-23 months) age group presented with the highest proportion of stunting (24.3%) compared to the rest of the age groups. Those who were wasted and underweight mostly came from children who were 18 months and older. The prevalence of overweight was highest in the 6-11 month category (20%) whereas none of the 18-23 month category were overweight. Only overweight was statistically significantly different for the different age brackets (p=0,049) (Table 4.17).

Table 4.17 Nutritional status of children by age bracket

	Nutritional status			
Age group (months)	Underweight (WAZ <-2SD) (n) %	Wasted (WHZ <-2SD) (n)%	Stunted (L/HAZ <-2SD) (n) %	Overweight WHZ ≥+2SD) (n) %
6-11	(0) 0.0%	(0) 0.0%	(1) 20.0%	(1) 20.0%
12-17	(0) 0.0%	(0) 0.0%	(1) 6.3%	(2) 12.5%
18-23	(1) 2.7%	(0) 0.0%	(9) 24.3%	(0) 0.0%
24-29	(3) 9.1%	(0) 0.0%	(5) 15.2%	(1) 3.0%
30-35	(3) 6.8%	(2) 4.5%	(8) 18.7%	(1) 2.4%
36-41	(3) 8.4%	(1) 2.9%	(6) 16.7%	(0) 0.0%
42-47	(4) 7.8%	(3) 5.9%	(8) 15.7%	(0) 0.0%
48-53	(4) 10.3%	(2) 5.1%	(7) 18.0%	(1) 2.6 %
54-59	(1) 2.6%	(0) 0.0%	(3) 7.7%	(5) 12.8 %
Total	(19) 5.0%	(8) 2.6%	(48) 16.0%	(11) 3.7%
Chi-square p-value	0.60	0.50	0.56	0.049

Those who underweight, wasted, stunted and overweight mostly came from those who were non-compliant with the VAS programme compared to those who were compliant. Whereas

those who were underweight, wasted, and stunted were mostly complaint with the EPI programme compared to those who were non-complaint (Table 4.18)

Table 4.18 Nutritional status of study sample by gender/registration status of ECD and VAS and EPI status of children

Compliance status	Nutritional status			
	Underweight (WAZ <-2SD) (n) %	Wasted (WHZ <-2SD) (n)%	Stunted (HAZ <-2SD) (n) %	Overweight WHZ ≥+2SD) (n) %
VAS compliant	(4) 3.8%	(4) 3.9%	(13) 12.5%	5 (4.8%)
VAS non-compliant	(15) 7.7%	(4) 2.0%	(35) 17.9%	6 (3.1%)
EPI compliant	(18) 6.6%	(7) 2.6%	(41) 15.0%	(0) 0.0%
EPI non-compliant	(1) 3.7%	(1) 3.7%	(7) 25.9%	(11) 4.0%
Total	(19) 5.0%	(8) 2.6%	(48) 16.0%	(11) 3.7%
Chi-square p-value	0.64	0.19	0.24	0.3

4.6 Regression result

4.6.1 Regression model for the relationship of VAS status with nutritional status

The overall regression models for the variance in WAZ, L/HAZ status and VAS status were significant as both p-values were less than the 0.05 significance level (WAZ p value= 0.02 and L/HAZ p value= 0.00) (Table 4.19). The regression models for the variance in WHZ and VAS status was not significant. The R squared values indicate the amount of variance for WAZ, L/HAZ and WHZ that the independent variables account for when taken as a group. Taken as a set the predictors, VAS status, age group, birthweight and ECD registration status account for 4% of the variance in WAZ and 53% in L/HAZ.

The linear regression results of the relationship between child growth and VAS is presented below (Table 4.20). The p-value of the coefficient of the VAS is greater than five percent significance level (Column 1,2 and 3). In that regard, there is no evidence for the null hypothesis for no association between VAS and WAZ, L/ HAZ and WHZ to be rejected with 95 % confidence. It can therefore be said that compliance with VAS does not significantly associate with WAZ, WHZ and L/HAZ. However, controlling for other independent variable, birth weight positively and significantly influence L/HAZ and WAZ.

Table 4.19 Overall regression table

Variable	R^2	P value
WAZ	0.04	0.02
L/HAZ	0.53	0.00
WHZ	0.03	0.12

Table 4.20 Association between VAS and nutritional status of children in study sample

	(1)	(2)	(3)	(4)	(5)	(6)
	WAZ	P-value	WHZ	P-value	L/HAZ	P-value
VAS	B -0.04 SE (0.04)	0.36	B -0.02 SE (0.04)	0.63	B 0.05 SE (0.07)	0.5
Birthweight	B 0.93 SE (0.33)	0.00	B -0.05 SE (0.03)	0.18	B 0.02 SE (0.06)	0.00
Age group	B -0.00 SE (0.01)	0.82	B -0.00 SE (0.10)	0.74	B 0.02 SE (0.02)	0.27
Registered ECD(1=yes)	B -0.09 SE (0.06)	0.17	B 0.14 SE (0.06)	0.03	B 0.04 SE (0.10)	0.73
Constant	B 1.42 SE (0.18)	0.01	B 1.63 SE (0.18)	0.00	B 0.94 SE (0.30)	0.00

4.6.2 Regression model for the relationship of EPI status with nutritional status.

The overall regression models for the variance in WAZ, L/HAZ and EPI status were statistical significant as both p-values were less than 0.05 significance level (WAZ p value=

0.02 and L/HAZ p value= 0.00) (Table 4.21). Taken as a set the predictors, EPI status, age group, birthweight and ECD registration status account for 4% of the variance in WAZ and 5% in L/HAZ. WHZ is not statistically significantly associated with EPI status.

The EPI coefficients across the three specifications (columns (1), (3) and (5)) are insignificant at 5 percent significance levels. In other words, there is no sufficient evidence to reject the null hypothesis and thus it can be said that there is no relationship between EPI and HAZ, WAZ and WHZ (Table 4.22). Birthweight negatively influenced WAZ and positively influenced L/HAZ, yet the association was still statistically significant (Table 4.22).

Table 4.21 Overall Linear Regression Table

Variable	R^2	P value
WAZ	0.04	0.02
L/HAZ	0.05	0.00
WHZ	0.03	0.12

Table 4.22 Association between EPI and Child Nutrition

	(1)	(2)	(3)	(4)	(5)	(6)
	WAZ	P-value	WHZ	P-value	L/HAZ	P-value
EPI	B -0.04 SE (0.06)	0.53	B 0.04 SE (0.06)	0.54	B 0.05 SE (0.11)	0.60
Birthweight	B -0.09 SE (0.03)	0.00	B 0.04 SE (0.03)	0.18	B 0.21 SE (0.06)	0.00
Age group	B -0.00 SE (0.01)	0.61	B -0.00 SE (0.01)	0.75	B 0.01 SE (0.01)	0.42
Registered ECD(1=yes)	B -0.09 SE (0.03)	0.12	B 0.14 SE (0.06)	0.03	B -0.04 SE (0.11)	0.71
Constant	B 1.52 SE (0.17)	0.01	B 1.56 SE (0.18)	0.00	B 0.97 SE (0.29)	0.00

CHAPTER FIVE: DISCUSSION

5.1 Introduction

This chapter provides a detailed discussion of the results of the study. The discussion centres around compliance with the VAS and EPI programmes amongst children under the age of five years in ECD's in Delft and the association with their nutritional status. Comparisons with other studies that are similar in nature with this study will be presented within this chapter. Lastly this chapter will explore the possible reasons behind some findings.

The findings for VAS compliance status showed majority were non-complaint and partial compliant (those that haven't received the required amount of VAS according to their age) with the programme compared to those were compliant. Regarding the EPI programme the opposite was true in that most were compliant compared to those who were non-compliant. Stunting was the most prevalent condition compared to the rest of the nutritional status categories. This is concurrent to the prevalence at provincial level as stunting (20,8%) is also the most apparent condition within the Western Cape compared to underweight (5.8%), wasting (2.1%) and overweight (14.8%) (National Department of Health (NDoH), Statistics South Africa (STATSSA), South African Medical Research Council (SAMRC), and ICF, 2019). The main finding of this study was that overall according to the regression analysis the nutritional status of the under-five participants had some statistically significant association with the VAS and EPI compliance status when they were grouped in an overall regression analysis with age group, birthweight and ECD registration status as independent variables. On an individual level there was no statistically significant association between the nutritional status of the children and VAS status as well as EPI status.

5.2 Early Childhood Development Centre's

According to the Lancet series on early childhood development which refers to the development of children under the age of six years, aspects such as health, nutrition, safety and security as well as responsive care should be key components of ECD centres/programmes (Black et al., 2017). Malnutrition, together with poor health as well as environments that lack stimulation and encouragement for learning are inconducive to children's development (Social Development and Early Childhood Development Directorate, 2015). ECD services in South Africa has the intentions to expand the health of children both physically and mentally, support and augment school readiness, and improve enrolment as well as performances in academic learning.

ECD centres in South Africa provides a service package which unites various stakeholders and departments namely Department of Social Development (DSD), Department of Health (DoH) as well as Department of Basic Education (DBE) to address the developmental needs of children using an intersectoral approach (Social Development and Early Childhood Development Directorate, 2015). As of 1 April 2022, the ECD sector has shifted the registration process of ECDs from DSD to DBE (Western Cape Government, 2022). The registration process of ECD's within the City of Cape Town considers compliance with the health, safety and educational requirements embedded within the Children's Act (Social Development and Early Childhood Development Directorate, 2015). Some ECDs stay unregistered because they don't meet the requirements of the standard of DSD. Their failure to register with DSD and DBE has placed them in a position of not benefitting from any funding from DSD (Mbarathi. et al., 2016). Unregistered ECDs are connected to ECD forum

groups which support them with the necessities regarding the internal programmes of the ECDs.

Early childhood development in South Africa has been improving since 1994, but there are still many challenges that need to be addressed within this area. The registration process of an ECD includes contacting a local DSD office closest to that ECDs area. The local municipality will then need to be approached to start up the right of use and set up the health clearance certificate to run the centre in a specific place (Department of Social Development & UNICEF, 2003). Majority of the fundings that are received by ECDs are sourced at provincial level from DSD and DOE (Department of Education, 2001). Other parties who are also involved in the funding process are the Expanded Public Works Programme (EPWP), Community Works Programme (CWP), and lastly from local government of which not much evidence exists (Giese et al., 2011). The two main channels contained within the DSD funding process is the subsidy given to registered ECDs which is calculated per child per day for children four years and younger provided their parents pass an income means test, and the other channel involves subsidy provided to NPO's focused on ECD programmes (Giese et al., 2011). Despite certain challenges within funding, subsidy has increased over the past decade (Giese et al., 2011). During the pandemic, relief funding has been offered through the Presidential Employment Stimulus Package to assist ECD services in recovering from the loss of income caused by COVID-19 (Department of Social Development, 2020).

A study was conducted in 2011 by DSD, DBE and UNICEF which presented findings showing that the infrastructure of community based ECD centres in South Africa was of poor quality (DBE, DSD and UNICEF, 2010). The unregistered ECDs were highlighted in this regard (DBE, DSD and UNICE, 2010). This is one of the main reasons why many facilities

within the country remain unregistered due to their lack of meetingthe standard quality of infrastructure required for registration (Atmore, 2012). The principal components regarding the infrastructure of ECDs include the following: i) Health and safety. According to the Children's Act all children have the right to a healthy and safe environment therefore the environment where the ECD is located should ensure that this right is upheld for all children and caregivers; ii) Equity of physical access. ECD facilities must be within an appropriate physical reach for all children especially those with disabilities and underserviced areas; iii) Quality. The quality of infrastructure needs to be in a good state to ensure that the quality provided is also exceptional (DSD and UNICEF, 2015).

ECDs within Delft community that were identified through a networking process for this study consisted of a mixture of ECDs registered with DSD, unregistered ECDs as well as ECDs registered with two networking fora that were not connected to DSD. As the data collection took place before the month of April all the registered ECDs were still affiliated with DSD, although one centre was in the process of preparing to register with DBE. Recent data has shown that there are about 40% of ECDs within South Africa that are registered or tentatively registered, 33% of the registered ECDs receives subsidies from DSD, 60% are enrolled within urban areas and 40% within rural areas (Department of Basic Education, 2021). Those that have flushed toilets includes 60% of ECDs within South Africa and 73% of the ECDs have a tap with running water on the premises (Department of Basic Education, 2021). Of the 30 ECDs included in this study, only three ECDs were registered, and the rest were either unregistered or registered with the two ECD fora. There was no difference in the number of under-five children within the registered ECDs compared to the unregistered ones. The mean number of children under the age of five years within the ECDs was 16 children.

Countrywide, there are about 39 children per ECD centre, including children between the ages of 5-6 years, with a 3.9 teacher ratio per ECD (Department of Basic Education, 2021).

5.3 Reporting and documentation within the RtHBs

As noted in the results of this study poor documentation of the respective health programmes was one of the aspects that constantly came about throughout data collection. It was evident throughout the study that after the child's 18-month vaccination, health care workers would stop documenting or writing the next clinic date to receive Vitamin A and deworming. This could be a reason why VAS compliance status is lower than the EPI compliance status. The date for the next clinic visit for the VAS programme is normally written in the front of the RtHB. Health care workers could make use of the blank spaces on the page where the VAS programme is monitored and recorded and should inform the caretaker/mothers where they should check within the booklet.

Within the 2018 revised RtHB the growth charts for boys and girls are found together within one RtHB. This can create some confusion amongst healthcare staff who needs to plot the anthropometric measurements of the child. This was evident in this study where all of the RtHB presented with inconsistent plotting of weights and lengths/heights on the relevant graphs. Birth weights and lengths were sometimes not recorded in the RtHB and were often not plotted on the growth charts. This posed challenges to accurately interpret the growth trend of the child and contributed to missing information in this study.

The reason for the low coverage at 12 months found in this study could also be due to the revision of the schedule and RtHB done in 2018 consisting of an additional "at 12 month" within the EPI schedule. Some parents might still be used to the previous schedule where 12

months was not included. Changes in schedules and poor documentation of immunisation and VAS raise concerns for the NPOs who collaborate with the health facilities and work in the domain of community care of children under-five. NPO care workers can't administer vaccination, but they might falsely report on children who still need vaccinations or VAS.

Poor documentation of VAS was also reported by (du Plessis et al., 2007), who found that only 21% of nurses that were interviewed reported that they document VAS administration within the RtHB. Poor documentation of VAS could lead to misinformation on when the required doses were given and could lead to over-dosage and possible toxicity (du Plessis et al., 2007). Some children in this study presented with duplicate RtHBs of which the second booklet had no documentation within.

5.4 Compliance with the VAS programme

In this study, 34.8% of children were compliant with the VAS programme meaning that they received the proposed number of doses of VAS within the period they were considered eligible. This result is low compared to the most recent national coverage rate of the VAS programme of 50% (World Bank Group, 2021; Faber, 2015). Those who have not received all doses (partially compliant) made up 63.9% and those who received no vitamin A supplements (non-compliant) made up the remaining 1.3%. This was inconsistent with a study done in Nelson Mandela Bay, Eastern Cape Province, where the coverage of vitamin A supplementation, deworming and immunizations were assessed against the nutritional status of children under the age of five and found that majority of the children presented as up to date with the VAS coverage (61.5%). Almost four out of ten children (38.5%) were indicated as being non-compliant (McLaren & Steenkamp, 2022). Non-compliance and partial

compliance could be due to similar reasons established in other settings i.e. lack of awareness, health-related issues, unavailability and inaccessibility (Nair et al., 2022).

Another possible explanation for partial compliance may be linked to poor clinic attendance and/or poor documentation for the older age groups. Irregular clinic visits after the 18-month DTaP-IPV-Hib4 and second measles vaccination before their 6 years injection has been documented. (Danneskiold-Samsøe et al., 2013) showed a higher occurrence of VAD if the children's most recent vaccine received was DTP compared with a live vaccine (MV, BCG and OPV).

There was no statistically significant relationship between the gender of the children, their ECD registration status and their VAS compliance status in this study. This is similar to the study on VAS coverage in thirteen African countries including South Africa by (Janmohamed, Klemm and Doledec, 2017) who showed that gender was not a significant predictor of VAS.

5.5 Compliance with the EPI programme.

This study showed that about 91% of the sample was compliant with the EPI programme. The majority of those who were non-compliant missed their 12-month second measles vaccination and their 18-month Hexavalent vaccination. A study done by Rahman and Obaida-Nasrin (2010) shared similar results regarding the coverage of immunizations amongst children under the age of five years in Bangladesh. They reported that the measles vaccine had the lowest coverage rate as well as the DPT (now part of the hexavalent vaccine) and that coverage rate decreased as more doses were given according to the schedule (Rahman and Obaida- Nasrin, 2010).

Children in this study who were between the ages of 6-11 months (100%) were most compliant, and boys (94.4%) were more compliant than girls (91.7%) although the difference was not statistically significant. Compliance with the EPI programme was higher in registered ECDs than in unregistered ECDs (93,3% vs 90.7%).This result was statistically significant. This does point towards higher compliance in registered ECDs, but these findings should be considered with caution given the low proportion of registered ECDs included in the study. Some literature describes unregistered ECDs as informal ECDs which often lack proper nutritional programmes as well as experienced educator/personnel. They also have a high turnover rate of the personnel (UNICEF, 2005, as cited by Mbarathi. et al., 2016). This may impact the compliance rate for the child health programme in a sense because personnel lack knowledge within these ECDs they won't necessarily prioritize and support the parents for them to take their children to the health facilities to receive vitamin A and immunizations on their scheduled dates. The financial resources made available by DSD (and DBE in future) to registered ECDs is linked to improved quality of care for young children. This is critical and registration of ECDs should therefore be encouraged and facilitated where possible.

5.6 Nutrition status of the study sample.

Regarding the anthropometry assessments that were done, it was noted that both undernutrition and overnutrition coexist within the study sample, which is consistent with otherstudies on nutritional status of young children. Of the sampled children, stunting prevalence was 16%, underweight was 6.3%, wasting was 2.6%, and overweight/obesity was 3.7%. This is aligned to the prevalence of childhood malnutrition at provincial and national level.

The mean birthweight was 3.12 kg, and the mean birth length was 49.92cm for the sample, which fell within the normal range. The means for the z scores were within the normal

growth curve (WAZ=-0.15, L/HAZ= -0.83 and WHZ= 0.48). Given the relatively high prevalence of tobacco smoking and alcohol consumption during pregnancy (Hartel et al., 2022) in low socioeconomic status populations such as Delft, and their negative impact on birth outcomes this result was not expected.

Due to the inconsistent plotting of anthropometry measurements on the respective graphs of the RtHB, tracking of the nutritional status of the sample was done using the children's birth anthropometry measurements as well as their current measurements. It was noted that the measurement that had the lowest improvement rate (32.4%) was the L/HAZ. This suggests that children were not necessarily born at lower length for age, but that the higher prevalence of stunting was the result of failure to grow according to their potential after birth. Stunting in early childhood is cause by multiple factors, most commonly, inadequate diet, repeated infections and diseases leading to poor nutrient intake as well as metabolism (Dewey and Begum, 2011).

Girls who attended unregistered ECDs had the highest overweight prevalence. This result showed statistical significance (p value= 0.03). These results could be due to many factors, such as the dietary intake of the sample, socio-economic status and even household food security or lack thereof as well as the educational status of parents. Education and poverty go hand in hand when it comes to interaction with malnutrition and even diseases in the under-five population (Bain et al., 2013). What also needs to be considered is that majority of the meals that are offered to these children within the unregistered ECDs are mostly provided by the ECD itself and not funded by anyone. Some of the personnel are not really educated when it comes to nutrition and therefore provide meals that lack the proper basic nutrition (Atmore, 2012). Considering that this study was done within a learning environment, it is important to note that the impact malnutrition can have on a child' education, in that it can affect the

child's ability to focus and concentrate effectively (Atmore, 2012). Due to registered ECDs being funded by DSD and unregistered ECDs not being funded, better provisioning of food, facilities and infrastructure is expected in registered ECDs (Ronaasen et al.,2017).

5.7 The relationship between the VAS compliance status and nutritional status of the study sample.

All of the children who were non-compliant with the VAS programme had a higher prevalence of underweight, stunting, wasting and overweight than those who were compliant with the programme. However, these results showed no statistical significant association as the p values were all greater than the standard 0.05 (Table 4.18). Even though there is no statistical significance in this study, authors such as Chanie et al, (2021) found a lower risk of developing acute malnutrition in children six months- fifty-nine months who have received their scheduled VAS. However, Comley et al, (2015) suggested that vitamin A distribution in SA communities should be reconsidered because there is a significant disparity between vitamin A and vaccination uptake.

The linear regression analysis revealed that overall when VAS status was grouped with age group, ECD registration status and birthweight, these independent variables displayed a statistically significant association with the nutritional status of the children (WAZ and L/HAZ specifically). On an individual level there was no statistically significant relationship between the nutritional status within all three spectrums of nutrition (WAZ, HAZ and WAZ) and VAS compliance (p value=0.36, 0.5 and 0.63 respectively).

Therefore, whether the child is wasted, stunted or underweight or not there is not enough evidence to say that it was due to the child being compliant with the VAS programme or non-compliant. This is compatible with another study on the efficacy of multiple micronutrient

supplementation on improving anaemia status and growth in South African children where the groups that were supplemented showed no significant difference in the growth of the children when compared to the control group and therefore concluded that the micronutrient supplements didn't have the effect of preventing the poor anthropometric status that was investigated within the study (Smuts et al., 2005). The low prevalence of stunting in the South African sample used within the study by Smuts et al., (2005) could be an explanation for the lack of growth response to micronutrient supplementation (Smuts et al., 2005).

5.8 The relationship between the EPI compliance status and nutritional status of the study sample

The children who were compliant with the EPI programme had a higher prevalence of underweight, stunting, wasting than those who were non-compliant with the programme. However, these results showed no statistically significant difference as the p values were all greater than the standard 0.05 (Table 4.18). The linear regression analysis revealed that overall, when EPI status was considered with age group, ECD registration status and birthweight. Linear regression for the outcomes for the anthropometric variables being not stunted or wasted or underweight or overweight, exposed no association with the EPI status on an individual level. This result was different to the study by Solis-Soto, Paudel and Nicoli, (2020) which analysed the relationship between vaccination and nutritional status in children using demographic and health surveys (DHS) and provided evidence that incomplete immunizations negatively relate to malnutrition as poor vaccination status is associated with stunting, wasting and being underweight among children under-five years old and this result was statistically significant. The WHO has issued a strong recommendation for EPI coverage in at-risk communities as it reduces childhood mortality. However, the evidence for efficacy in improving other child health indicators, such as growth, is limited (NICD, 2015).

5.9 Other determinants of child nutrition

While we hypothesize VAS and EPI as the primary determinants of child anthropometry, it is worth speaking of other determinants that appear to significantly influence child growth. The results show that birthweight positively and significantly influenced L/HAZ and WAZ (Table 4.20). Whereas in the other results birthweight negatively influenced WAZ only, yet the association was still statistically significant (Table 4.22). While controlling for ECD registration, results also displayed a statistically significant association with WHZ, showing that those who belonged to registered ECDs had a better chance of not being wasted (Table 4.20 and Table 4.22).

5.10 Limitations

A limitation of this study is that a non-probability, convenient sample was used which does mean that the findings were not generalizable to the entire study population or to children under-five years in other areas. The study sample included more unregistered ECDs than registered ECDs. The fact that mothers were not interviewed during this study could also pose as a limitation given the fact that some RtHB's were not fully completed, and some were even damaged and therefore proper information couldn't be extracted. Doing recalls with mothers within facility settings where better access to the mothers can be achieved would potentially result in a more accurate representation of the child's VAS and EPI status and has the chance to combat the poor documentation problem. Another limitation to consider is that the anthropometry measurements were not documented routinely within the RtHB and therefore only the birthweight was extracted and the most recent weight that was taken on the day of data collection was documented. This limited the tracking of nutritional status of children which was set as an objective as it wasn't possible to use the growth chart to obtain information on the growth trajectory of the child.

5.11 Conclusion

The aim of this research study was to determine the compliance with the VAS and EPI programme amongst children under the age of five years in ECD centres in Delft and its association with malnutrition. The study included a mixture of unregistered and registered ECDs. The two programmes that were assessed showed no significant association with the nutritional status of the under-five sample found within the ECDs. Therefore, it can be said that VAS and EPI compliance are not associate with nutritional status of children under five years old in the selected ECDs in Delft.

5.12 Recommendations

A recommendation would be to conduct the research within the health facilities within the area and interviewing health care staff members as well as parents to get a holistic overview of the child growth, immunisation and vitamin A supplementation.

Training and education regarding the VAS programme as well as the EPI programme for health care staff is the recommended approach to improve the poor documentation as well as to improve implementation of these programmes. Improving tools to provide proper feedback to the district and provincial managers of the child health service facilities is also recommended. Information campaigns aimed at pregnant women and mothers of young children may also raise their awareness to ensure health care seeking behaviour which could result in higher compliance with VAS and EPI.

Additional research on bigger samples of children would need to be conducted for a comprehensive understanding of the effect that VAS and EPI has on the growth of children younger than five years of age in South Africa. From an ethics perspective, true experimental studies are inappropriate given the proven benefits of both EPI and VAS for child health.

REFERENCE LIST

Academy of Science of South Africa (ASSAF). (2013). Consensus Study on Improved Nutritional Assessment of Micronutrients, ISBN- 978-0-9869835-8-0

Afolabi, O.T. *et al.* (2018). Are Creches a Haven for Child Care or Cesspool for Infection?, *Global Journal of Health Science*, 10(8), p. 143. Available at: https://doi.org/10.5539/gjhs.v10n8p143.

Agarwal, K. *et al.* (2019). Study of immunization status of under: five children in relation to various demographic variables of their mothers, *International Journal of Contemporary Pediatrics*, 6(5), p. 1964. Available at: https://doi.org/10.18203/2349-3291.ijcp20193706.

Agüero, J.M. Carter, M.R. Woolard, I. (2006). The Impact of Unconditional Cash Transfers on Nutrition: *The South African Child Support Grant. Southern Africa Labour and Development Research Unit Working Paper Number 06/08.* Cape Town: SALDRU, University of Cape Town.

Alaba, O.A. *et al.* (2021). Leaving no child behind: Decomposing socioeconomic inequalities in child health for India and South Africa, *International Journal of Environmental Research and Public Health*, 18(13). Available at: https://doi.org/10.3390/ijerph18137114

Atmore, E. (2012). Challenges facing the early childhood development sector in South Africa, *South African Journal of Childhood Education*, 2(1), pp. 120–139. Available at: https://doi.org/10.4102/sajce.v2i1.25.

Bain, L.E. *et al.* (2013). Malnutrition in Sub - Saharan Africa: Burden, causes and prospects, *Pan African Medical Journal*, 15, pp. 1–9. Available at: https://doi.org/10.11604/pamj.2013.15.120.2535.

Bamford, L. J., McKerrow, N. H., Barron, P., Aung, Y. (2018). Child mortality in South Africa: Fewer deaths, but better data are needed SAMJ 108(March), pp. S25–S32. doi: 10.7196/SAMJ.2018.v108i3.12779.

Berger, M. M., Shenkin, A., Schweinlin, A., Amrein, K., Augsburger, M., Biesalski, H. K., Bischoff, S. C., Casaer, M. P., Gundogan, K., Lepp, H. L., de Man, A. M. E., Muscogiuri, G., Pietka, M., Pironi, L., Rezzi, S., & Cuerda, C. (2022). ESPEN micronutrient guideline. *Clinical Nutrition*, *41*(6), 1357–1424. https://doi.org/10.1016/j.clnu.2022.02.015

Black RE, Allen LH, Bhutta ZA. (2013). Maternal and child undernutrition: Executive Summary of The Lancet Maternal and Child Nutrition Series. *The Lancet* 2013.

Black, MB, Lutter CK & Trude ACB. (2020). All children surviving and thriving: re-envisioning UNICEF's conceptual framework of malnutrition' *The Lancet Global Health* 8(6):E766-E767. Available [online] https://doi.org/10.1016/S2214-109X(20)30122-4.

Black, M.M. *et al.* (2017). Early childhood development coming of age: science through the life course, *The Lancet*, 389(10064), pp. 77–90. Available at: https://doi.org/10.1016/S0140-6736(16)31389-7.

Cai, X., Wardlaw, T. and Brown, D.W. (2012). Global trends in exclusive breastfeeding, *International Breastfeeding Journal*, 7. Available at: https://doi.org/10.1186/1746-4358-7-12.

Chanie, E.S. *et al.* (2021). The effect of timely initiation of complementary feeding and vitamin A supplementation on acute malnutrition among children aged 6–59 months attending Hamusit Health Centre, Northwest Ethiopia, 2021: A cross-sectional study, *Heliyon*, 7(11). Available at: https://doi.org/10.1016/j.heliyon.2021.e08449.

Charlton KE, Kolbe-Alexander TL, Nel JH. (2005). 'Micronutrient dilution associated with added sugar intake in elderly black South African women'. Eur. J. Clin. Nutr. 59, 1030–1042.

Coetzee, M. (2014). Do poor children really benefit from the child support grant? Available at: http://www.econ3x3.org/article/do-poor-children-really-benefit-child-support-grant.

Cohen, C., Adu, C., Redman, K. (2016). Vaccine Information. Available at: http://www.amayezainfo.co.za/%0Ahttp://www.cdc.gov/vaccines/hcp/vis/%0Ahttp://www.who.int/mediacentre/factsheets/en/%0Ahttp://www.health.gov.za/.

Cohen C, Moyes J, Tempia S, Groome M, Walaza S, Pretorius M. (2016). Epidemiology of Acute Lower Respiratory Tract Infection in HIV-Exposed Uninfected Infants. Pediatrics. 2016; 137(4). https://doi.org/10.1542/peds.2015-3272 PMID: 27025960

Comley, V., Nkwanyana, N., Coutsoudis, A. (2015). Immunisation and vitamin A capsule coverage in a semi-urban area of KwaZulu-Natal Province, South Africa, *SAJCH* 9(4), pp. 2–5. doi: 10.7196/SAJCH.2015.v9i4.925.

Commons, C. et al. (2018). The new Road to Health Booklet demands a paradigm shift, 12(3). Available at: https://doi.org/10.7196/SAJCH.2018.v12i3.1595

Correia, L.L. et al. (2019). Interaction between vitamin a supplementation and chronic malnutrition on child development, *Ciencia e Saude Coletiva*, 24(8), pp. 3037–3046. Available at: https://doi.org/10.1590/1413-81232018248.22242017

Corsi, D.J., Subramanyam, M.A. and Subramanian, S. V. (2011). Commentary: Measuring nutritional status of children, *International Journal of Epidemiology*, 40(4), pp. 1030–1036. Available at: https://doi.org/10.1093/ije/dyr108

Coutsoudis, A., Sanders, D., Dhansy, M. (2019). Is it time for South Africa to end the routine high-dose vitamin A supplementation programme?, *South African Medical Journal*, 109(12), pp. 907–910. doi: 10.7196/SAMJ.2019.v109i12.14203.

Danneskiold-Samsøe, N. et al. (2013). Determinants of vitamin a deficiency in children between 6 months and 2 years of age in Guinea-Bissau, *BMC public health*, 13, p. 172. Available at: https://doi.org/10.1186/1471-2458-13-172.

Das, S.K. et al. (2017). Long-term impact of changing childhood malnutrition on rotavirus diarrhoea: Two decades of adjusted association with climate and socio-demographic factors from urban Bangladesh, *PLoS ONE*, 12(9). Available at: https://doi.org/10.1371/journal.pone.0179418.

Department of Basic Education.(2014). Basic Education on roll-out of human papillomavirus (HPV) vaccine programme. [Online]. Available: https://www.gov.za/hpv-vaccine-be-rolled-outschools?gclid=CjwKCAjw2OiaBhBSEiwAh2ZSP8SndndKM5PhSeg1WpP0zSJCyv3WU5pkepKIk12SM8V-0oyTsLVmOhoCKEEQAvD_BwE [Downloaded: 27/10/2022 09:05am].

Department of Basic Education. (2015). The South African National Curriculum Framework for children from Birth to Four. Pretoria: Department of Basic Education

Department of Basic Education. (2021). Early Childhood Development Census to build data management information systems. [Online]. Available: https://www.education.gov.za/ArchivedDocuments/ArchivedArticles/ECDCensus2021.aspx [Downloaded: 27/10/2022 05:58am]

Department of Education (DoE). (2001). The Nationwide Audit of ECD Provisioning in South Africa. Department of Education, Pretoria, South Africa.

Department of Social Development & United Nations Children's Fund (UNICEF). (2006). Guidelines for Early Childhood Development Services. South Africa.

Department of Social Development & United Nations Children's Fund(UNICEF) .(2015). National Integrated Early Childhood Development Policy. Pretoria: Government Printers.

Department of Social Development (DSD). (2020).ECD Employment Stimulus Relief Fund (ECD-ESRF) supported by the Presidential Employment Stimulus, *Building a Caring Society. Together.* South Africa. [Online]. Available: https://www.dsd.gov.za/index.php/latest-news/21-latest-news/328-presidential-employment-stimulus-for-early-childhood-development-ecd-services [Downloaded: 24/12/2022].

Dewey, K.G. and Begum, K. (2011). Long-term consequences of stunting in early life, *Maternal and Child Nutrition*, 7(SUPPL. 3), pp. 5–18. Available at: https://doi.org/10.1111/j.1740-8709.2011.00349.x.

Dhansay MA. (2003). Vitamin A supplementation: A case of not seeing the wood for the trees? *S Afr J Clin Nutr* 2003;16(4):116-117

Dube, W. G., Makoni, T., Ndyadzayo, T.K., Covic, N.M. (2014). A strategy for scaling up vitamin A supplementation for young children in a remote rural setting in Zimbabwe ,*South African Journal of Child Health*, 8(2), pp. 64–67. doi: 10.7196/SAJCH.618.

du Plessis, L. M., Najaar, B., Koornhof, H. E., Labadarios, D., Petersen, L., Hendricks, M., Kidd, M. (2007). Evaluation of the implementation of the vitamin A supplementation programme in the Boland/Overberg region of the Western Cape Province, *South African Journal of Clinical Nutrition*, 20(4), pp. 126–132. doi: 10.1080/16070658.2007.11734139.

Du Plessis, L. M., Koornhof, H. E., Marais, M. L., & Blaauw, R. (2017). Implementation of the road-to-health-booklet health promotion messages at primary health care facilities, Western Cape province, South Africa. *SAJCH South African Journal of Child Health*, *11*(4), 164–169. https://doi.org/10.7196/SAJCH.2017.v11i4.1414

Faber, M., Van Jaarsveld, P., Kunneke, E., Kruger, H., Schoeman, S., van Stuijvenber, M. (2015). Vitamin A and anthropometric status of South African preschool children from four areas with known distinct eating patterns, *Journal of Nutrition* 31, pp. 64–71. doi: 10.1016/j.nut.2014.04.024.

Farrokhi, F. and Mahmoudi-Hamidabad, A. (2012). Rethinking convenience sampling: Defining quality criteria, *Theory and Practice in Language Studies*, 2(4), pp. 784–792. doi: 10.4304/tpls.2.4.784-792.

Friesen, V. M., Mbuya, M. N. N., Aaron, G. J., Pachón, H., Adegoke, O., Noor, R. A., Swart, R.,Kaaya, A., Wieringa, F. T., & Neufeld, L. M. (2020). Fortified foods are major contributors to apparent intakes of Vitamin A and iodine, but not iron, in diets of women of reproductive age in 4 African countries. *Journal of Nutrition*, *150*(8), 2183–2190. https://doi.org/10.1093/jn/nxaa167

Frison, S. Kerac, M., Checchi, F., Prudhon, C. (2016). Anthropometric indices and measures to assess change in the nutritional status of a population: A systematic literature review, *BMC Nutrition*. BMC Nutrition, 2(1), pp. 1–11. doi: 10.1186/s40795-016-0104-4.

Giese, S., Budlender, D., Berry, L., Motlatla, S. & Zide, H. (2011). Government funding for early childhood development: Can those who need it get it? South Africa: Ilifa Labantwana.

Hartel, T. C., Turawa, E. B., Oelofse, A., & De Smidt, J. J. A. (2022). Effect of maternal cigarette smoking and alcohol consumption during pregnancy on birth weight and cardiometabolic risk factors in infants, children and adolescents: a systematic review protocol. In *BMJ Open* (Vol. 12, Issue 7). BMJ Publishing Group. https://doi.org/10.1136/bmjopen-2022-061811

Hasman, A. et al. (2021). 'COVID-19 caused significant declines in regular vitamin A supplementation for young children in 2020: What is next?', *BMJ Global Health*. BMJ Publishing Group. Available at: https://doi.org/10.1136/bmjgh-2021-007507.

Heale, R. and Twycross, A. (2015). Validity and reliability in quantitative studies, *Evidence-Based Nursing*, 18(3), pp. 66–67. doi: 10.1136/eb-2015-102129.

Hong HA E. (2019). Annual measles, rubella and congenital rubella surveillance review, South Africa, Available from: https:// www. nicd. ac. za/wp- conte nt/ uploa ds/ 2020/ 06/ ANNUAL- MEASL ES- RUBEL LA- AND- CONGENITAL- RUBEL LA- SURVE ILLAN CE- REVIEW- SOUTH- AFRICA- 2019. pdf

Jackson, D. et al. (2019). Changes in rates of early exclusive breast feeding in South Africa from 2010 to 2013: Data from three national surveys before and during implementation of a change in national breastfeeding policy, *BMJ Open*, 9(11). Available at: https://doi.org/10.1136/bmjopen-2018-028095.

Janmohamed, A., Klemm, R. D. W., & Doledec, D. (2017). Determinants of successful Vitamin A supplementation coverage among children aged 6-59 months in thirteen sub-Saharan African countries. *Public Health Nutrition*, *20*(11), 2016–2022. https://doi.org/10.1017/S1368980017000684

Kaushal, V. (2019). Pertinent Association between the Immunization and the Nutritional Status in under 5 Children of Urban Slums Area of Karimnagar Town, India, *Acta Scientific Paediatrics*, 2(8), pp. 61–65. Available at: https://doi.org/10.31080/aspe.2019.02.0115.

Kesmodel, U. S. (2018). Cross-sectional studies – what are they good for?, *Acta Obstetricia et Gynecologica Scandinavica*, 97(4), pp. 388–393. doi: 10.1111/aogs.13331.

Kimani-Murage EW, Kahn K, Pettifor JM. (2010). The prevalence of stunting, overweight and obesity, and metabolic disease risk in rural South African children. BMC Public Health. 2010;10:158. http://dx.doi. org/10.1186/1471-2458-10-158, PMid:20338024, PMCid:2853509

Labadarios, D., Swart, R., Maunder, E.M.W., Kruger, H.S., Gericke, G.J., Kuzwayo, P.M.N.,Ntsie, P.R., Steyn, N.P., Schloss, I., Dhansay, M.A., Jooste, P.L., Dannhauser A. (2008). Executive summary of the National Food Consumption Survey Fortifi cation Baseline (NFCS-FB-I) South Africa, 2005, *Executive summary of the National Food Consumption Survey Fortifi cation Baseline (NFCS-FB-I) South Africa, 2005*, 21(3), pp. 245–300.

Labadarios,D., Steyn, N.P., Maunder, H., MacIntryre, U., Gericke, G., Swart,R., Huskisson, J., Dannhauser, A., Vorster, H.H., Nesmvuni A.E., Nel, J.H., (2005). The National Food Consumption Survey (NFCS): South Africa, 1999, *Public Health Nutrition*, 8(5), pp. 533–543. doi: 10.1079/phn2005816.

Martin-Wiesner, (2018). A Policy- Friendly Environment For Breastfeeding: A review of South Africa's Progress in systematising its international and national responsibilities to protect, promote and support breastfeeding. Johannesburg: DST-NRF Centre of Excellence in Human Development. URL: https://www.wits.ac.za/coe-human/coe-research-grants/coe-research-andadvocacyon-breastfeeding/breastfeeding-policy-review/

Mason, J., Greiner, T., Shrimpton, R., Sanders, D., Yukich, J., (2015). Vitamin A policies need rethinking, *International Journal of Epidemiology*, 44(1), pp. 283–292. doi: 10.1093/ije/dyu194

May, J. and Timæus, I.M. (2014). Inequities in under-five child nutritional status in South Africa: What progress has been made?, *Development Southern Africa*, 31(6), pp. 761–774. Available at: https://doi.org/10.1080/0376835X.2014.952896

May, J., Witten, C., & Lake, L. (2020). *South African Child Gauge 2020.* Available at: www.childrencount.uct.ac.za

Mbarathi., N., Mthembu., M.E. and Diga, K. (2016). 'Early Childhood Development and South Africa : A literature review', *Technical Paper No. 6*, 6(6), p. 35

McCombes, S. (2021). An Introduction to Sampling Methods. Scribbr. [Online]. Available: https://www.scribbr.com/methodology/sampling-methods/ [Downloaded: 29/04/2021]

McLean, E., Klemm, R.., Subramaniam, H., Greig, A.(2020). Refocusing Vitamin A supplementation programmes to reach the most vulnerable, *BMJ Global Health*, 5(7), pp. 1–5. doi: 10.1136/bmjgh-2019-001997.

Mittal, A., Singh, J., & Ahluwalia, S. (2007). Effect of maternal factors on nutritional status of 1-5-year-old children in urban slum population. *Indian Journal of Community Medicine*, *32*(4), 264. https://doi.org/10.4103/0970-0218.37691

Mkhize, M., Sibanda, M. (2020). A Review of Selected Studies on the Factors Associated with the Nutrition Status of Children Under the Age of Five Years in South Africa'. *Int J Environ Res Public Health* 17(21):7973. doi: 10.3390/ijerph17217973. PMID: 33142965; PMCID: PMC7662515.

Momberg, D.J. (2020) Water, sanitation, and hygiene (WASH) factors associated with growth between birth and 1 year of age in children in Soweto, South Africa: Results from the Soweto Baby WASH study, *Journal of Water and Health*, 18(5), pp. 798–819. Available at: https://doi.org/10.2166/wh.2020.085

Moss WJ. Measles. Lancet. (2017);390(10111):2490–502. Available from: http:// www. scien cedir ect. com/ scien ce/ artic le/ pii/ S0140 6736173146 30

Nair, A.B. et al. (2022). Compliance and Barriers of Vitamin A Supplementation for Under Five Children: A Cross Sectional Study, *Acta Scientific Women's Health*, 4(5), pp. 61–65. Available at: https://doi.org/10.31080/aswh.2022.04.0362

Namakin, K. et al. (2014). Comparison of the WHO Child Growth Standards with the NCHS for Estimation of Malnutrition in Birjand-Iran, International Journal of Preventive Medicine. Available at: www.ijpm.inwww.ijpm.ir.

National Department of Health (NDoH). (2015). Vaccinator's Manual "Immunisation That Works", 4Th Edition. South Africa: The National Department of Health. Available at: http://www.health.gov.za/index.php/shortcodes/2015-03-29-10-42-47/2015-04-30-08-29 27/immunization/category/165-immunisation [Accessed 24 January 2022].

National Department of Health (NDoH), Statistics South Africa (STATSSA), South African Medical Research Council (SAMRC), and ICF. (2019). South Africa Demographic and Health Survey 2016. Pretoria, South Africa, and Rockville, Maryland, USA: NDoH, STATSSA, SAMRC, and ICF.

National Institute for Communicable Diseases (NICD). (2015). GERMS-SA Annual Report. Available at: http://www.nicd.ac. za/assets/files/GERMS-SA%20AR%202015.pdf [Accessed 20 March 2023.]

National Institute of Communicable Diseases (NICD). (2017). Hepatitis B infection: Frequently asked questions. Available at: chrome-extension://efaidnbmnnnibpcajpcglclefindmkaj/https://www.nicd.ac.za/assets/files/HepatitisB_20161005_v1.pdf [Accessed 27 October 2022].

National Institute for Communicable Diseases (NCID). (2019). *SOUTH AFRICA CERTIFIED POLIO-FREE*. [online] Available: https://www.nicd.ac.za/south-africa-certified-polio-free/ [Downloaded: 26/10/2022 11:10am].

Oelofse A , Van Raaij JM , Benade AJ , Dhansay MA , Tolboom JJ , Hautvast JG . (2002). Disadvantaged black and coloured infants in two urban communities in the Western Cape, South Africa differ in micronutrient status. Public Health Nutr. 2002 Apr;5(2):289-94.

Page, N. (2006). The Introduction of Rotavirus Vaccines into South Africa, SA Fam Pract. National Center for Communicable Disease, Johannesburg, South Africa.

Penniston, K.L. and Tanumihardjo, S.A. (2006). The acute and chronic toxic effects of vitamin A', *American Journal of Clinical Nutrition*. American Society for Nutrition, pp. 191–201. Available at: https://doi.org/10.1093/ajcn/83.2.191.

Pienaar, A.E. (2019). The association between under-nutrition, school performance and perceptual motor functioning in first-grade South African learners: The north-west child health integrated with learning and development study, *Health SA Gesondheid*, 24. Available at: https://doi.org/10.4102/hsag.v24i0.1046.

Ronaasen, J. E., Steenkamp, L., Wilson, T. M., Venter, D., & Elkonin, D. (2017). ECD indicators and nutritional status of grade r children: An interest to social workers. *Southern*

African Journal of Social Work and Social Development, *29*(2). https://doi.org/10.25159/2415-5829/981

Said-Mohamed, R, Micklesfield, L.K., Pettifor, J.M., Norris, S.A. (2015). Has the prevalence of stunting in South African children changed in 40 years? A systematic review. BMC Public Health, 15:534. doi: 10.1186/s12889-015- 1844-1849.

Saitowitz, R. et al. (2001). A proposed vitamin A supplementation programme for South Africa - Design, coverage and cost, *South African Medical Journal*, 91(9), pp. 755–760.

Samiak, L., Emeto, T.I., (2017). Vaccination and nutritional status of children in Karawari, East Sepik Province, Papua New Guinea. PLoS ONE 12(11): e0187796. https://doi.org/10.1371/journal. pone.0187796.

Sanders, D. et al. (2017). The triple burden of malnutrition in childhood : Causes , policy implementation and recommendations, pp. 145–160.

Sibeko LN, Dhansay MA, Charlton KE et al. (2004). Full-term, peri-urban South African infants under 6 months of age are at risk for early-onset anaemia. Public Health Nutr. 7, 813–820.

Shisana, O., Labadarios, D., Rehle, T., Simbayi, L., Zuma, K., Dhansay, A., Reddy, P., Parker, W., Hoosain, E., Naidoo, P., Hongoro, C., Mchiza, Z., Steyn, N.P., Dwane, N., Makoae, M., Maluleke, T., Ramlagan, S., Zungu, N., Evans, M.G., Jacobs, L., Faber, M. & SANHANES-1 Team, (2014) The South African National Health and Nutrition Examination Survey, 2012: SANHANES-1: the health and nutritional status of the nation. 2014 ed. Cape Town: Online. HSRC Press. http://hdl.handle.net/20.500.11910/2864

Smuts, C.M. et al. (2005). Efficacy of multiple micronutrient supplementation for improving anemia, micronutrient status, and growth in South African infants, *Journal of Nutrition*, 135(3). Available at: https://doi.org/10.1093/jn/135.3.653s.

Social Development and Early Childhood Development Directorate (2015). Investing in early childhood development to build a caring city, p. 56.

Solis-Soto MT, Paudel D & Nicoli, F. (2020). Descriptive Finding Relationship between vaccination and nutritional status in children: Analysis of recent Demographic and Health Surveys *Demographic Research* 42: pp. 1–14. doi: 10.4054/DemRes.2020.42.1.

Statistics South Africa. (2011). City of Cape Town – 2011 Census Suburb Delft. City of Cape Town, Delft. Strategic Development Information & GIS Department.

Statistics South Africa. (2017). Poverty on the rise in South Africa. [Online]. Available: https://www.statssa.gov.za/?p=10334 [Downloaded: 07/08/2022 18:15pm].

Statistics South Africa (2022). Census 2022. [Online]. Available: http://census.statssa.gov.za/ [Downloaded:05/09/2022 07:32pm].

Syiroj, A. T. R., Pardosi, J. F. and Heywood, A. E. (2019). Exploring parents' reasons for incomplete childhood immunisation in Indonesia, *Vaccine*, 37(43), pp. 6486–6493. doi: 10.1016/j.vaccine.2019.08.081.

The Kuyasa Fund. (2005). A new dawn for housing finance*:* 'Delft Area Housing Needs Analysis*'*. Cape Town.

United Nations Children's Fund UNICEF (1998). The State of the World ' S the State of the World's Children, Children. New York: UNICEF. [Online], Available,http://www.unicef.org/sow98/[Downloaded:17/03/2021]

United Nations Children's Fund (UNICEF). (2019). The State of the World's Children 2019. Children, Food and Nutrition: Growing well in a changing world. UNICEF, New York

United Nations Children's Fund UNICEF (2020). METHODS AND PROCESSES FOR THE UNICEF GLOBAL DATABASE Estimates of Vitamin A Supplementation Coverage in Preschool-age Children Methods and processes for the UNICEF global database'.

UNICEF. (2020). UNICEF Conceptual Framework on Maternal and Child Nutrition. [Online].https://www.unicef.org/media/113291/file/UNICEF%20Conceptual%20Framework.pdf [Downloaded: 20/10/2022 18:05pm]

UNICEF. (2020). 'Build to Last: A Framework in Support of Universal Quality Pre-Primary Education', UNICEF Education Section, Programme Division. [Online]. https://www.unicef.org/media/67191/file/Build-to-last-framework-universal-quality-preprimary-education.pdf

United Nations Children's Fund (UNICEF), World Health Organization, International Bank for Reconstruction and Development. (2021). The World Bank. Levels and trends in child malnutrition: key findings of the 2021 edition of the joint child malnutrition estimates. New York: United Nations Children's Fund. Licence: CC BY-NC-SA 3.0 IGO.

USAID. (2016). STAT compiler, the DHS Program. USAID. [online]. Available: https://www.statcompiler.com/en/# [Downloaded:10/03/2021].

Vargas-Barón, E., Book, T. and Pence, A. (2005) Planning policies for early childhood development: guidelines for action*; 2005*. Available at: http://www.unicef.com

Verkerke, H., Sobuz, S., Ma, J. Z., Petri, S. E., Reichman, D., Qadri, F., Rahman, M., Haque, R., & Petri, W. A. (2016). Malnutrition is associated with protection from rotavirus diarrhea:

Evidence from a longitudinal birth cohort study in Bangladesh. *Journal of Clinical Microbiology*, *54*(10), 2568–2574. https://doi.org/10.1128/JCM.00916-16

Victora, C.G. et al. (2016). Breastfeeding in the 21st century: Epidemiology, mechanisms, and lifelong effect, *The Lancet*. Lancet Publishing Group, pp. 475–490. Available at: https://doi.org/10.1016/S0140-6736(15)01024-7

Villamor, E. et al. (2002). Vitamin A supplements ameliorate the adverse effect of HIV-1, malaria, and diarrheal infections on child growth, *Pediatrics*, 109(1). Available at: https://doi.org/10.1542/peds.109.1.e6.

von Gottberg A, de Gouveia L, Tempia S, Quan V, Meiring S, von Mollendorf C. (2014). Effects of vaccination on invasive pneumococcal disease in South Africa. The New England journal of medicine. 2014; 371(20):1889±99. https://doi.org/10.1056/NEJMoa1401914 PMID: 25386897.

Western Cape Government. (2022). UPDATE: Western Cape Government moves forward with ECD Migration. [Online]. Available: https://www.westerncape.gov.za/news/update-western-cape-government-moves-forward-ecd-migration [Downloaded: 08/08/2022 15.12pm]

Western Cape Government. (2022). Delft Community Health Center. [Online]. Available: https://www.westerncape.gov.za/facility/delft-community-health-centre [Downloaded: 23/03/2023 09:30pm]

Wills G, Patel L, Van der Berg S, et al. (2020). Household resource flows and food poverty during South Africa's lockdown: Short term policy implications for three channels of social protection'. NIDS-CRAM Working Paper 12.

Win, T., Cooke, R. and Mlambo, M. (2016). An assessment of the "road-to-health-booklet" based on knowledge/perceptions of the clinic nurses and conduct a record review of the completion of the booklets, (July). Available at: http://wiredspace.wits.ac.za/jspui/bitstream/10539/22555/1/Final Research Report - Thein Win.pdf

World Bank Group. (2021). Mortality rate, under-5 (per 1,000 live births) - South Africa. [Online]. Available: https://data.worldbank.org/indicator/SH.DYN.MORT?locations=ZA [Downloaded: 21/07/2021 13:31 am]

World Bank Group. (Undated). [Online]. Available: https://data.worldbank.org/indicator/SN.ITK.VITA.ZS?locations=ZA [Downloaded: 31/10/2022]

World Health Organization. (1991). Indicators for assessing breast-feeding practices: report of an informal meeting. Geneva, (WHO/CDD/SER/91.14).

World Health Organization. (2002). Global Strategy for Infant and Young Child Feeding. Geneva. (Resolution WHA 55.25 and document A55.15. [Online].Available: http://www.who.int/gb/EB_WHA/PDF/WHA55/ewha5525.pdf and http://www.who.int/gb/EB_WHA/PDF/WHA55/ea5515.pdf.

WHO. (2006). Multicentre Growth Reference Study Group. WHO Child Growth Standards: Length/Height-for-Age,Weight-for-Age, Weight-for-Length, Weight-for-Height and Body Mass Index-for-Age. Geneva: WHO.

WHO. (2011). Guideline : Vitamin A supplementation in infants and children 6 – 59 months of age', World Health Organization. Geneva, Switzerland.

WHO. (2013). 'Immunizations, Vaccines and Biologicals: The Expanded Programme on Immunization'. WHO. [online]. Available: https://www.who.int/immunization/programmes_systems/supply_chain/benefits_of_immunization/en/ [Downloaded: 11/03/2021].

World Health Organization (2014) Global Nutrition Targets 2025: Childhood Overweight Policy Brief. Geneva: WHO.

World Health Organization (WHO). (2013). 'Haemophilus influenza type b (Hib) vaccination position paper – September 2013'. Available at: http://www.who.int/wer/2013/wer8839.pdf?ua=1 [Accessed 28 October 2022].

WHO.(2017). 'Diarrhoeal disease'. [Online]. Available: https://www.who.int/news-room/fact-sheets/detail/diarrhoeal-disease [Downloaded: 07/01/2022 12:05pm].

World Health Organization. (2019). 'Immunization and vaccine preventable communicable diseases'. [online]. Available: https://www.who.int/data/gho/data/themes/immunization [Downloaded: 26/10/2022 11:06am]

WHO. (2019). 'Experts caution against stagnation of immunization coverage in Africa'. Available from: https:// www. afro. who. int/ news/ exper ts- caution- again st- stagn ation- immun izati on- cover age- africa.

World Health Organization. (2019). 'Measles'. [online]. Available: ho.int/news-room/fact-sheets/detail/measles?gclid=Cj0KCQjwteOaBhDuARIsADBqRegh-sf_XWQ0noGswTBo6j-bt4b9k2iIpdL-mUUrOVcIRGvfjWXTqMoaAklOEALw_wcB [Downloaded:26/10/2022]

WHO (2019). 'Vitamin A supplementation in children 6–59 months of age with severe acute malnutrition'. WHO. [Online]. Avalilable: https://www.who.int/elena/titles/vitamina_sam/en/ [Downloaded: 11/03/2021]

World Health Organisation (WHO). (2018). 'Implementation guidance: protecting, promoting and supporting breastfeeding in facilities providing maternity and newborn services – the revised Baby-friendly Hospital Initiative'. Geneva: World Health Organization

WHO (2020). Children: improving survival and well-being. [Online]. Available: https://www.who.int/news-room/fact-sheets/detail/children-reducing-mortality. [Downloaded: 21/07/2021 10:04 am]

World Health Organization. (2020). Malnutrition. [Online]. Available: https://www.who.int/news-room/fact-sheets/detail/malnutrition#:~:text=Key%20facts,while%20462%20million%20are%20underweight. [Downloaded: 01/08/2020 12:08 pm].

World Health Organization and the United Nations Children's Fund (UNICEF). (2021). Indicators for assessing infant and young child feeding practices: definitions and measurement methods. Geneva:. Licence: CC BYNC-SA 3.0 IGO; https://creativecommons.org/licenses/by-nc-sa/3.0/igo.

WHO. (2022). 'Stunting, wasting, overweight and underweight'. Nutrition Landscape Information System (NLiS). [Online]. Available:

https://apps.who.int/nutrition/landscape/help.aspx?menu=0&helpid=391&lang=EN.

Zegeye, B. (2022). Trends in inequality in the coverage of vitamin A supplementation among children 6–59 months of age over two decades in Ethiopia: Evidence from demographic and health surveys, *SAGE Open Medicine*, 10, p. 205031212210946. Available at: https://doi.org/10.1177/20503121221094688

Zembe-Mkabile, W.(2018) To be a woman is to make a plan: A qualitative study exploring mothers' experiences of the Child Support Grant in supporting children's diets and nutrition in South Africa', *BMJ Open*, 8(4), pp. 1–11. Available at: https://doi.org/10.1136/bmjopen-2017-019376

APPENDICIES

Appendix 1: Information sheet

UNIVERSITY OF THE WESTERN CAPE

Private Bag X 17, Bellville 7535, South Africa

Tel: +27 21-959 2760 Fax: +27 21-959 3686

E-mail: soph-comm@uwc.ac.za/3353909@myuwc.ac.za

INFORMATION SHEET

Project Title: The relationship between the nutritional status of children within Early Development Centres of Delft and their compliance to the Expanded Programme of Immunization and routine Vitamin A supplementation

What is this study about?

This is a research project being conducted by Monique Jansen and Team at the University of the Western Cape. We are inviting your child to participate in this research project as he/she is between the ages of 6 months and 5 years old and attends an ECD/Creche centre within the Delft community. The purpose of this research project is to evaluate the nutritional status of children in Early Childhood Development (ECD) centres as well as their coverage of EPI and vitamin A supplementation in Delft in an effort to indirectly improve the rates of undernutrition in the community.

What will I be asked to do if I agree to participate?

You will be asked to provide the ECD/Creche principle and teachers with your child's Road to Health Booklet on the day that your child will be weighed and measured. The date will be discussed with the principle and the teachers at the ECD where your child attends. Measurements will take place at the ECD. Your child will be screened for their nutritional status to see if they are undernourished (underweight) or over nourished (overweight or obese). Their Road to Health booklets will also be looked at and screened and will be given vitamin A supplementation and deworming if they are in need. The duration of this procedure will be nothing more than 20 minutes for your child.

Would my participation in this study be kept confidential?

The researchers undertake to protect your child's identity and the nature of his/her contribution. To ensure your child's anonymity his/her name will not be included on the data collection sheet, a code will be placed on the data collection sheet, through the use of an

identification key, the researcher will be able to link the code on the data sheet to your identity, only the researcher will have access to the identification key.

To ensure your child's confidentiality, data and information will be stored in cabinets which consist of locks as well as password-protected computer files that will only be in the possession of the researcher. In the case where some children have skipped immunization dates as well as dates for vitamin A supplementation and deworming I will need to communicate and stay in close contact with the health facilities, Delft CHC, Symphony Way CDC and Delft South clinic, depending on which facility the child usually attends to refer the child to receive the immunization as soon as they can. This may lead me to reveal the child's identity to the health care worker in charge of the children services at the various facilities.

If we write a report or article about this research project, your identity will be protected.

In accordance with legal requirements and/or professional standards, we will disclose to the appropriate individuals and/or authorities information that comes to our attention concerning child abuse or neglect. In this event, we will inform you that we have to break confidentiality to fulfil our legal responsibility to report to the designated authorities.

What are the risks of this research?

There may be some risks from participating in this research study. If your child has skipped certain immunizations or vitamin A and deworming supplementation dates it would be made known during this time. If your child is classified as malnourished (under or over nourished) throughout this time, it will also be made known to you. This may present as an emotional or

uncomfortable risk for you as the parent. Keep in mind it is done in effort to help your child nonetheless. As deworming and Vitamin A droplets will be administered (through your consent) to your child in the event that your child has not received it within 6 months before the collection of data, there is a risk that your child might gag (vomit) or not chew and swallow the deworming tablet properly due to the taste. Other risks may be involved that are currently unforeseeable

All human interactions and talking about self or others carry some amount of risks. We will nevertheless minimise such risks and act promptly to assist your child if he/she experience any discomfort, psychological or otherwise during the process of his/her participation in this study. Where necessary, an appropriate referral will be made to a suitable professional for further assistance or intervention.

What are the benefits of this research?

The benefits for you and your child include the knowledge regarding your child's nutritional status and if it is healthy or not so that appropriate action can be taken place through your consent. Other benefits for you and your child is that in the event that your child has not received vitamin A supplementation and deworming within the 6 months prior to the data collection date, she/he can receive it for free at the ECD/Creche centre. In the event that your child has missed immunizations a referral will be made out to receive it which will help you gain quicker and easier access to the clinic and their services.

Participation in this research is completely voluntary. You may choose not to agree for your child to take part at all. If you decide to participate in this research, you may stop

participating at any time. If you decide not to participate in this study or if you stop participating at any time, you will not be penalized or lose any benefits to which you otherwise qualify. Participation in the research is not a course requirement. The crèche/ECD centre will not force you or your child to be part of the study.

What about COVID-19

As we are still within the midst of the COVID-19 pandemic, regulations to protect participants involved in the study will be put in place. Hand sanitizers will be available at each station (i.e weighing, measuring and screening the RtHB of the children). Each data collector and researcher will sanitize their hands as well as the equipment after weighing and measuring a child and before the next child will be weighed and measured. Surgical masks will be required to be worn by each person involved in the weighing and measuring process of the child as well as each of the teachers that will be present on the day of data collection. Social distancing will also be practiced as much as possible.

What if I have questions?

This research is being conducted by *Monique Jansen, Masters student of the Department of Dietetics and Nutrition* at the University of the Western Cape. If you have any questions about the research study itself, please contact Monique Jansen at: 0787857164 or 3353909@myuwc.ac.za or my supervisor Prof Rina Swart rswart@uwc.ac.za.

If you wish to report your concerns about the project, please contact:

Prof Ernesta Kunneke

Head of Department: Dietetics and Nutrition

University of the Western Cape

Private Bag X17

Bellville 7535

ekunneke@uwc.ac.za

Prof Anthea Rhoda

Dean: Faculty of Community and Health Sciences

University of the Western Cape

Private Bag X17

Bellville 7535

chs-deansoffice@uwc.ac.za

Biomedical Research Ethics Committee

University of the Western Cape

Private Bag X17

Bellville

7535

Tel: 021 959 4111

E-mail: research-ethics@uwc.ac.za

[RESEARCH ETHICS REFERENCE NUMBER: BM 21/8/13]

UNIVERSITY OF THE WESTERN CAPE

Private Bag X 17, Bellville 7535, South Africa

Tel: +27 21-959 2760 Fax: +27 21-959 3686

E-mail: soph-comm@uwc.ac.za/3353909@myuwc.ac.za

INLIGTINGSBLAD

Title van Navorsingsprojek: Die verhouding tussen die voedingsstatus van kinders in Vroee Kinderontwikkelings Sentrums in Delft en hul nakoming aan die Uitgebreide Program van Immunisasie en roetine Vitamien A supplementasie

Tema van die studie?

Hierdie navorsingsprojek word uitgevoer deur Monique Jansen en span van UWK. Kinders tuessen die ouderdom van 6 maande en 5 jaar wat die Vroee Kinderontwikkelings Sentrums in Delft gemeenskap bywoon, word uitgenooi. Die doel van hierdie navorsing is om die voedingstatus van kinders in Vroee Kinderontwikkelings Sentrums evalueer sowel as hulle nakom aan Uitgebreinde Program van Immunisasie en Routine Vitamien A aanvuling in n poging om indirek die standard van voeding in die gemeenskap te help.

Watter vrae sal gestel word as ek instem to deelname?

U moet U kind se ‘Road to Health Booklet’ aan die prinsipaal en onderwyser by u kind se ECD/Creche inhandig aan die dag as die kind geweeg en gemeet word. Die datum van die bogenoemde sal met die prinsipaal van die creche gereel word. Alles sal gebeur by die creche. Die kind sal nagegaan word om hy/sy se voedigstatus te bepaal, om te sien of hulle ondergewig, normale gewig of oorgewig is. Hul Road to Health booklets sal ook nagegaan word en hulle sal Vitamien A aanvulling kry of ontwurm word indien nodig. Hierdie prosedure sal ongeveer 20 minute neem.

Is my deelname aan projek vertroulik?

Die navorser onderneem om u kind se indentiteit en status vertroulik te hou. Die kind se naam sal nie op data lys verskyn nie, slegs ‘n kode Die navorser sal n identifikasie sleutel gebruik om op identiteit in te gaan wat net deur die navorser gesien sal word.

Om u vertroulikheid van u kind se inligting te verseker word, data en inligting in kabinette toegesluit sowel as rekenaa lêers met veiligsheid password wat net die narvorser besit. Indien sommige kinders hul inentings datums sowel as ontwurming en datums vir vitamien A aanvulings nie na gekom het nie sal die navorser met die gesonheidsfasilitete moet kommunikeer in Delft CHC, Symphony Way CDC end Delft South Kliniek. Dit hang dus af watter fasiliteite die kind gewoonlik bywoon sodat die kind verwys kan word om hul inentings so gou as moontlik te kry. Die kind se indentiteit sal dan aan die gesondheidswerkers van die aangewese fasiliteit bekend gemaak moet word.

Indien n verslag of artikel oor die navorsingsprojek geskryf word sal die kind se indentiteit beskerm word.

Ingevolge die wetlikke vereistes en/of professionele standaarde, sal mishandeling of nalatigheid aan die toepaslike individue en outoriteite openbaar word. In so n geval sal ons u in kennis stel dat vertroue vebreek moet word om wettige verantwoordelikheid teenoor die toepaslike owerhede te rapporteur.

Risikos verbande aan die navorsing?

Daat mag risikos verbande wees aand die projek. Indien jou kind inenting, Vitamien A aanvuling en ontwurming oorgeslaan het sal dit nou bekend wees. Indien jou kind oor of ondergewig is, sal dit ook bekend maak word aan u. Dit mag U as ouer emosioneel onstel of ongemaklik laat voel. Onthou dit word gedoen om u kind te help. Ontwurming en Vit A druppels sal met u toestemming aan u Kind gegee word indien die kind dit nie die afgelope 6 maande ontvang het nie. U kind mag vomeer indien die tablet nie behoorlik gekou word nie as gevolg van smaak. Ander onvoorsiene risikos mag ook plaasvind.

Alle menslike interaksies en gesprekke oor jouself en andere dra risikos. Ons sal probeer om risikos so min as mootlik te hou en vining op te tree om u kind te help indien hy/sy enige fisiese ongemak ondervind tydens deelname aan projek. Waar nodig sal professionele hulp uitgeroep word ter ondersteuning. Geen kind sal gedwing word om deel te neem indien hulle bang is of weier of teel te neem..

Voordele verbonde aan die projek ?

Voordele vir jou en jou kind beteken jy ken nou jou kind se voedingstatus en of hy/sy gesond is en hoe jy met toestemming jou kind kan help. Indien jou kind nie die afgelope 6 maande inenting gemis of oorgeslaan het, sal u n verwysingsbrief kry sodat u gou by die kliniek gehelp sal word. U deelname aan die projek is geheel en al vrywilliglik. Jy kan weier om deel te neem. Indien u besluit om deel te neem, mag u enige tyd ophou indien u so voel. U sal glad nie gepenaliseer word of voordele waarvoor u kwalifiseer verloor nie. Die ECD sentrum sal nie u of u kind forseer om deel te neem aan die projek nie.

Wat van COVID-19

Omdat ons nog baie in die pandemic is sal alle veiligheidsmaatreels in plek gestel word. Handereinigers sal by alle plekke teenwoordig wees (waar geweeg word, gemeet word en toetsing van RTHB van kinders). Elke data opnemer en navorser sal hul hande sowel as die voorraard reining na elke kind getoets is. Elke person betrokke sal n masker dra. Ook onderwysers moet maskers dra. Sosiale afstand sal so veel as mootlik toegepas word.

Indien u vrae het?

Kontak *Monique Jansen op*: 0787857164 or

3353909@myuwc.ac.za of my toesighouer Prof Rina Swart rswart@uwc.ac.za.

Indien U enige besware ten opsigte van die projek will opper, kontak:

Prof Ernesta Kunneke

Head of Department: Dietetics and Nutrition

University of the Western Cape

Private Bag X17

Bellville 7535

ekunneke@uwc.ac.za

Prof Anthea Rhoda

Dean: Faculty of Community and Health Sciences

University of the Western Cape

Private Bag X17

Bellville 7535

chs-deansoffice@uwc.ac.za

Biomedical Research Ethics Committee

University of the Western Cape

Private Bag X17

Bellville

7535

Tel: 021 959 4111

E-mail: research-ethics@uwc.ac.za

[RESEARCH ETHICS REFERENCE NUMBER: BM 21/8/13]

UNIVERSITY OF THE WESTERN CAPE

Private Bag X 17, Bellville 7535, South Africa

Tel: +27 21-959 2760 Fax: +27 21-959 3686

E-mail: soph-comm@uwc.ac.za/3353909@myuwc.ac.za

IPHEPHA ELICHAZA UKUBA OLUPHANDO LUNGANTONI NA

Isihloko sophando: Ubudlelwane Phakathi kwemeko yesondlo yabantwana ngaphakathi kumaZiko oPhuhliso lwaBantwana abasaqalayo ase Delft kunye nokuthobela kwabo inkqubo eyandisiweyo yogonyo kunye nesiqhelo esongezelelweyo lwesakhamzimba u vithamini A.

Ingaba oluphando lungantoni na?

Oluphando liqhutywa ngu Monique Jansen kunye negqiza lwe Duniversity yase Ntshona koloni. Simema umntwana wakho ukuba athathe inxaxheba koluphando kuba eneminyaka ephakathi kwe nyanga ezi yi 6 ukuya kwiminyaka eyi 5 kwaye ngoba uhamba indiwo yabantwana abasaqalayo/ kritshi yendawo yase Delft. Injongo zoluphando kukuhlola imeko yesondlo sabantwana abahamba kwindawo zokukhulisa abantwana abasaqalayo kunye

nokujongana kwabo ne EPI kunye nongezelelo luka vithamini A ngenjongo yokuphuhlisa inqanaba lokungondleki ekuhlaleni.

Ingaba kuzocelwa ndenze ntoni na ukuba ndiyavuma ukuba yinxalenye yoluphando?

Uzakucelwa ukuba unike umphathi kunye nomfundisi ntsapho wase kristhi incwadi yomntwana yendlela eya empilweni kwaye ngalomini umntwana uzakukalwa futhi ajongwe nobude. Umhla nosuku luzakuxoxwa nomphathi kunye nomfundisi ntsapho wase kritshi apho umntwana wakho ahamba khona. Umntwana wakho uzakuhlolwa isondlo ukujonga ukuba akondlekanga (akanamzimba) okanye wondliwe ngokugqithiseleyo (utyibile kakhulu). Incwadi yomntwana izakujongwa anikwe uvithamini A kunye nokhupho ntshulube ukuba uthe kanti uyazidinga. Ixesha lwalenqubo aluzothatha ixesha elingaphezulu kwemizuzu eyi 20.

Ukuba ndithabathe inxaxheba koluphando kuzakugcinwa kuyimfihlo?

Abaphandi bathembisa ngokukhusela ukwaziwa komntwana wakho kunye nencombolo yakhe. Ukuqinisekisa ukungaziwa komntwana, igama lake alizokufakwa kumaphepha, kuzosetyenziswa amanani kwaye ngumphandi wophando yedwa ozakuyazi ukuba inombolo ethile yeyomphi umntwana. Ukuqinisekisa imfihlo ngomntwana wakho incukhacha nolwazi lizogcinwa kwi khabhathi etixekayo futhi ezo zizoba kwikhuputha zizokhuselwa nge phasiwedi kwaye ngumphandi wodwa ozakufikele kuzo. Xa kukho abantwana abaphose ugonyo, ungezelelo luka vithamini A kunye nokunqanyulwa kwentshulube. Kuzakudingeka ukuba ndithethe futhi ndigcine unxibelelwano olufutshane nomthalampilo, Delft CHC, Symphony Way CDC and Delft South clinic, kuzoxhomekeka ukuba umntwana uqhele

ukuhamba kweyiphi indawo yempilo ukuze asiwe afumane ugonyo. Kunganyanyeleka ukuba umntwana aziwe ngumsebenzi wezempilo ojongene nempilo yabantwana kwindawo ngendawo ezahlukeneyo. Ukuba sibhala ingxelo okanye inqaku ngoluphando isazisi somntwana wakho sizakukhuselwa. Ngokomthetho kunye/okanye umgangatho wobugcali sizakuyichaza kwabantu bomthetho ukuba sive ulwazi oluphathene nokuphathwa gadalala kwabantwana okanye ukungahoywa. Xa kukho isehlo isinjena sizakuxelela ukuba kuzakufuneka saphule isithembiso sethu semfihlo ukuze sixelele abomthetho

Yinton ubungozi boluphando?

Kunga bakhona ubungozi koluphando ukuba umntana wakho uphose intsuku zo ugonyo oluthile okanye uvithamini A okanye unqamlo wentshulube lonto iyakuxelwa kwa nge thuba. Ukuba umntana wakho uchazwe ukuba akondlekanga (ngaphantsi okanye ngaphezulu ukondliwa)lonto uyokwaziswa ngayo.Oku kunoku bonakalisa njengomngcipheko wemvakalelo okanye ungonwabi njenga mzali.Khumbula ukuba kwenziwa oku ngenzame zokunceda umntana wakho.njengoko amathontsi wokunqamla intshulube kunye no vithamini A ezokunikezwa (ngemvume yakho) umntana wakho xa kufumaniseke ukuba akazange azifumane kwi xesha lenyanga ezi 6 ngaphambi kolu phando luqale ,kukho umngcipheko okuba umntwana wakho angagabha okanye angahlafuni aginye iyeza loku nqamla intshulube ngenxa yobubi bayo xa engcamla .eminye imingcipheko ingakhona engabonakaliyo okwangoku.

Konke ukudibana kwabantu nokuthetha nge siqu okanye abanye abantu kubakhona umngcipheko, kodwa ke sizakubunciphisa obungozi kwaye sithathe amanyathelo kwangoko ukunceda umntwana wakho xa efumana ukungaphatheki kakuhle,ngokwe ngqondo okanye ngenye indlela ngexesha lokuthatha inxaxheba kwakhe kolu phando. Apho kuyi mfuneko, ukuthunyelwa ngokufanelekileyo kuya kwenziwa kwiingcali efanekileyo ngo ncedo olungaphezulu okanye ungenelelo.

Zithini izibonelelo zolu phando?

Izibonelelo zakho kunye nomntwana wakho zibandakanya ulwazi malunga nenqanaba lesondlo somntwana wakho kwaye ukuba usempilweni okanye akunjalo ukuze kuthathwe amanyathelo afanekileyo nge mvume yakho. Ezinye izibonelelo zakho kunye nomntwana wakho kukuba kwimeko apho umntwana wakho engakhange afumane ukongezwa kwe vithamini A kunye nokususa intshulube kwinyanga ezi 6 phambi komhla wokuqokelelwa kwedatha ,angayifumana engabhatelanga kwi iko lwabantwana abasaqalayo. Kwimeko apho umntwana wakho ephosakeleyo kugonyo,uyakuthenyelwa ukuze ufumane uncedo lula na ngoku khawulezileyo emthola Mpilo uthatho nxaxheba lwakho kolu phando lingokuzithandela.Unokukhetha ukungathathi nxaxheba kwaphela. Ukuba uthatha isigqibo sokuthatha inxaxheba kolu phando ,unokuyeka uthatha inxaxheba nanini na . ukuba uthatha isigqibo sokungathathi nxaxheba kolu phononongo okanye uyeke awuyi kohlwaywa okanye uphulukane naziphi na izibonelelo oya kuthi ulunge ngazo.ukuthatha inxaxheba kuphando akuyomfuneko yekhosi. Iziko labantwana abasaqalayo ayizukunyanzela wena okanye umntwana wakho ukuba abe yinxalenye yesifundo.

Uthini nge COVID -19

Njengokuba sisephakathi kobhubhane wesifo se COVID-19,imigaqo yokhusela abathathi-nxaxheba ababandakanyekayo kuphononongo iya kwenziwa. Isicoci sesandla siya kufumaneka kwisikhululo ngasinye (umzekelo, ukukalwa ubunzima, ubude kunye nokuhlola I RTHB yabantwana). Umqokeleli zincukacha ngamnye kunye nomphandi baya kuzicoca izandla zabo kunye nezixhobo emva kokulinganisa kunye nokulinganisa umntwana nangaphambi kokuba umntwana olandelayo abekwe umlinganiso. Imaski zotyando ziya kucelwa ukuba zinxitywe ngumntu ngamnye obandakanyekayo kwinqubo yokulinganisa komntwana kunye notitshala ngamnyeoya kuba ngomhla wokuqokelelwa kwe datha. Ukunga sondelelani kuya kuqhutywa kangangoko kunokwenzeka.

Ukuba ndinemibuzo?

Oluphando luyaqhutywa ngu *Monique Jansen,umfundi we Masters I-Dietetics kunye nesondlo kwi Dyunivesithi ye ntshona koloni*. Ukuba unayo nayiphi na imibuzo malunga nophando ngokwalon,nceda unxibelelane no Monique Jansen at: 0787857164 or

3353909@myuwc.ac.za or umphathi wam Prof Rina Swart rswart@uwc.ac.za.

Ukuba unqwenela ukunika inkxalabo malunga neprojekthi, nceda unxibelelane:

Prof Ernesta Kunneke

Head of Department: Dietetics and Nutrition

University of the Western Cape

Private Bag X17

Bellville 7535

ekunneke@uwc.ac.za

Prof Anthea Rhoda

Dean: Faculty of Community and Health Sciences

University of the Western Cape

Private Bag X17

Bellville 7535

chs-deansoffice@uwc.ac.za

Biomedical Research Ethics Committee

University of the Western Cape

Private Bag X17

Bellville

7535

Tel: 021 959 4111

E-mail: research-ethics@uwc.ac.za

[RESEARCH ETHICS REFERENCE NUMBER: BM 21/8/13]

Appendix 2: Consent Forms

UNIVERSITY OF THE WESTERN CAPE

Private Bag X 17, Bellville 7535, South Africa

Tel: +27 21-959 2760 Fax: +27 21-959 3686

E-mail: soph-comm@uwc.ac.za/3353909@myuwc.ac.z

CONSENT FORM

Title of Research Project: : The relationship between the nutritional status of children within Early Childhood Development Centres of Delft and their compliance to the Expanded Programme of Immunization and routine Vitamin A supplementation

The study has been described to me in language that I understand. My questions about the study have been answered. I understand what my child's participation will involve and I agree to participate of my own choice and free will. I understand that my child's identity will not be disclosed to anyone. I understand that my child may withdraw from the study at any time without giving a reason and without fear of negative consequences or loss of benefits.

Parent's name……..

Child's name…….

Parent's signature…….

Date……

Biomedical Research Ethics Committee

University of the Western Cape

Private Bag X17

Bellville

7535

Tel: 021 959 4111

E-mail: research-ethics@uwc.ac.za

[RESEARCH ETHICS REFERENCE NUMBER: BM 21/8/13]

Private Bag X 17, Bellville 7535, South Africa

Tel: +27 21-959 2760 Fax: +27 21-959 3686

E-mail: soph-comm@uwc.ac.za/3353909@myuwc.ac.z

TOESTEMMINGS FORM

Title van Navorsingsprojek: Die verwantskap tussen die voedingsstatus van kinders in Vroee Kinderontwikkelings Sentrums in Delft en hul nakoming aan die Uitgebreide Program van Immunisasie en roetine Vitamien A supplementasie

Die studie is aan my verduidelik in verstaanbare taal. My vrae ten opsigte van die studie is beantwoord. Ek verstaan my kind se deelname in hierdie projek en ek is gewillig om uit vrye keuse deel te neem. Ek verstaan dat my kind se indentiteit nie bekend gemaak sal word nie. Ek verstaan dat my kind enige tyd van die studie kan onttrek sonder om rede te verstrek en sonder vrees vir negatiewe gevolge of verlies van voordele.

Ouer se naam……..

Kind se naam…….

Ouer se handtekening…….

Datum……

Biomedical Research Ethics Committee

University of the Western Cape

Private Bag X17

Bellville

7535

Tel: 021 959 4111

E-mail: research-ethics@uwc.ac.za

[RESEARCH ETHICS REFERENCE NUMBER: BM 21/8/13]

UNIVERSITY OF THE WESTERN CAPE

Private Bag X 17, Bellville 7535, South Africa

Tel: +27 21-959 2760 Fax: +27 21-959 3686

E-mail: soph-comm@uwc.ac.za/3353909@myuwc.ac.z

INCWADI YESIVUMELWANO

Isihloko sophando: Ubudlelwane Phakathi kwemeko yesondlo yabantwana ngaphakathi kumaZiko oPhuhliso lwaBantwana abasaqalayo ase Delft kunye nokuthobela kwabo inkqubo eyandisiweyo yogonyo kunye nesiqhelo esongezelelweyo lwesakhamzimba u vithamini A.

Isifundo sichazwe kum ngolwimi endiluvayo.imibuzo yam malunga nesifundo iphendulwe.Ndiyakuqonda okuza kuthatha inxaxheba komntwana wam kwaye ndiyavuma ukuthatha inxaxheba kukhetholwam nokuzikhethela. Ndiyaqonda ukuba umntwana wam akazuxelwa nakubani na. Ndiyaqonda ukuba umntwana wam angarhoxa esifundweni naninina ngaphandle kokunika isizathu kwaye engoyiki iziphumo ezibi okanye ukulahleka kwezibonelo.

Igama lo mzali……..

Utyikityo lo mzali…….

Umhla……

Biomedical Research Ethics Committee

University of the Western Cape

Private Bag X17

Bellville

7535

Tel: 021 959 4111

E-mail: research-ethics@uwc.ac.za

[RESEARCH ETHICS REFERENCE NUMBER: BM 21/8/13]

Appendix 3: Data Extraction sheet

Date:_____ ECD Number:_____ Participant number:_____

		Anthropometry		
	Measurement type	Unit	Recorded measurements	
1	Weight (all participants)	kg	1 , 2	
	Any comment:			
	Unable to obtain measurement – reason:			
2	Height Length (Indicate) ☐	cm	1 , 2	

	(all participants)		
	Any comment:		
	Unable to obtain measurement – reason:		
3	Mid upper arm circumf. (all participants)	cm	1 , 2 ,
	Any comment:		
	Unable to obtain measurement – reason:		
	[redacted]	Road To Health Booklet Information	
4	Immunization schedule	All ☐ missed any	☐ vaccination
	Any comment (which immunization missed):		
	Unable to obtain information – reason:		
5	Vitamin A schedule	All ☐ missed any	☐ date
	Any comment:	Total number of VAS dosages recorded to date	☐

	Unable to obtain information – reason:					
6	Growth Pattern	DOB		Birth		weight Birth Length :
	Any comment (Describe the weight pattern up until the last date weighed)	☐	follow trajectory upwards	☐ deviate downwards	☐ deviate	
	Unable to obtain information – reason:					

Appendix 4: BMREC Ethics Clearance letter

UNIVERSITY of the WESTERN CAPE

60 YEARS of hope, action & knowledge

27 October 2021

Ms M Jansen
Dietetics and Nutrition
Faculty of Community and Health Sciences

Ethics Reference Number: BM21/8/13

Project Title: The relationship between the nutritional status of children within Early Development Centres of Delft and their compliance to the Expanded Programme of Immunization and routine Vitamin A supplementation

Approval Period: 4 October 2021 – 4 October 2024

I hereby certify that the Biomedical Science Research Ethics Committee of the University of the Western Cape approved the scientific methodology and ethics of the above mentioned research project and the requested amendment to the project.

Any further amendments, extension or other modifications to the protocol must be submitted to the Ethics Committee for approval.

Please remember to submit a progress report annually by 30 November for the duration of the project.

For permission to conduct research using student and/or staff data or to distribute research surveys/questionnaires please apply via:
https://sites.google.com/uwc.ac.za/permissionresearch/home

The permission letter must then be submitted to BMREC for record keeping purposes.

The Committee must be informed of any serious adverse event and/or termination of the study.

Ms Patricia Josias
Research Ethics Committee Officer
University of the Western Cape

NHREC Registration Number: BMREC-130416-050

FROM HOPE TO ACTION THROUGH KNOWLEDGE.

Appendix 5: DSD Rec Approval

Western Cape Government

Social Development
Directorate: Research and Information Management
DSD REC Ethics Secretariat - DSD.REC-Ethics@westerncape.gov.za

Reference: 12/1/2/4

Enquiries: Clinton Daniels/Petro Brink

Ms M. Jansen

10 Lesperance Street

Highbury

Kuils River

7580

Dear Ms Jansen

RE: APPROVAL TO UNDERTAKE RESEARCH IN THE WESTERN CAPE DEPARTMENT OF SOCIAL DEVELOPMENT

1. Your request for ethical and access approval to undertake research in respect of '***The relationship between the nutritional status of children*** *within* ***Early Development Centres of Delft and their compliance to the Expanded Programme of Immunization*** *and routine Vitamin A supplementation*' refers.
2. Kindly note that your request was found to meet the ethical requirements of the Department's Research Ethics Policy, subject to the conditions stipulated below:
   - That the Secretariat of the Research Ethics Committee be informed in writing of any changes made to your research design after approval has been granted and be given the opportunity to respond to these changes.
   - That ethical standards and practices as contained in the Department's Research Ethics Policy be maintained throughout the research study, in particular that informed consent (written or recorded) be obtained from participants.
   - The confidentiality and anonymity of participants should be maintained throughout the research process and should not be named in your research dissertation or any other publications that may emanate from your research.
   - Informed consent for participation in the study must be obtained from participants. Assent should be negotiated with participants under the age of 18 years while consent should be obtained from relevant caregivers/guardians.
   - Access to Early Childhood Development Centres must be obtained from the management structures of these entities.

- The requirements of the Children's Act 38 of 2005 in respect of the reporting of children in need of care and protection must be adhered to. This limitation to confidentiality should be explained to participating ECD's as well as participants during the obtaining of informed consent.
- The Department should receive a copy of the final research dissertation or products and any subsequent publications resulting from the research.
- The Department should be acknowledged in all research reports and products that result from the data collected in the Department.
- Please note that the Department cannot guarantee that the intended sample size as described in your proposal will be realised.
- Access to Departmental officials must be negotiated with relevant Senior Managers subject to service delivery priorities and operational demands.
- The requirements of the Protection of Personal Information Act, no 4 of 2013 must be adhered to during your data collection process.

3. **This approval is valid for a period of 12 months from the date of final approval as indicated on this letter.**
   A progress report regarding the status of your research must be submitted to the REC Secretariat one month prior to the date on which the REC approval expires. If data collection has not been completed within this period, it is your responsibility to timeously submit a request for an extension of this approval.

4. **The Secretariat must be notified once you have completed data collection in the Department.**
   - Failure to comply with these conditions can result in this approval being revoked.
   - Please provide written acceptance of these conditions and recommendations within 5 working days of the receipt of this letter.

Yours sincerely

Gavin D Miller

Digitally signed by Gavin D Miller
Date: 2021.12.08 13:19:07 +02'00'

pp Ms M. Johnson
Chairperson: Research Ethics Committee
Date:

I hereby acknowledge receipt and accept the conditions set out in this letter of approval.

Name: Monique Jansen

Signature: MJansen

Date: 19/07/2021

Place: Kuils River