The healthiness of processed foods frequently consumed by children in early childhood development centres in the North West Province

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ABSTRACT

Introduction: The prevalence of infant, childhood and adolescent obesity is increasing globally. In South Africa, 20.5% of children aged two to five years are overweight or obese and regional and international comparisons show that South African children at pre-school age have a major problem with overweight and obesity. Obesity is associated with numerous diseases such as stroke and high blood pressure. Little is known about childhood nutritional intakes in the age group of two to five-year olds. Diet, especially the consumption of processed foods, plays an important role in childhood obesity.

Objectives: The aim of this research was to determine the healthiness of frequently consumed processed foods of children aged two to five years. Specific objectives included (i) determining which processed foods were frequently consumed by children in this age group and (ii) determining the healthiness of these frequently consumed processed foods by means of nutrient profiling.

Methods: Twenty-four-hour dietary recall (24HDRs) interviews were conducted to assist with compiling a food frequency questionnaire (FFQ) to determine the consumption of specifically processed food by the study population. Parents and caregivers of children aged two to five years were recruited through early childhood development centres. The children's processed food consumption was captured using the newly developed FFQ. The most frequently consumed processed foods were then identified and assessed for healthiness using the South African nutrient profiling model.

Results: In this study, 51 participants partook in the 24HDRs and 119 participants volunteered to take part in completing the FFQ. Sixteen processed foods were identified as being most frequently consumed by the children aged two to five years. These foods (listed form most to least frequently consumed) were brown bread, crisps, macaroni, Viennas, strawberry yogurt, tub-margarine, soft sweets, chocolate muffins, chocolates, vanilla ice cream, hard sweets, polony, cola carbonated drinks, apricot jam, breakfast cereal (high in fibre) and take aways. Eleven (11) of these 16 processed foods (68.75%) were classified by the South African nutrient profiling model as less healthy.

Conclusions: Most of the processed foods consumed by children aged two to five years in this sample study were less healthy. The foods identified as unhealthy had a high fat and/or salt and/or sugar content. It is recommended that further research should be done to determine the energy contribution of processed foods to children aged two to five years' diet to link childhood obesity with processed food consumption. What is more, priority should be given to the education

of parents and caregivers regarding healthier food choices for their children using the South African Food-Based Dietary Guidelines.

Keywords: processed food, child obesity, healthiness, FFQ, South African nutrient profiling model

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LIST OF ABBREVIATIONS

24HDR	24 - hour dietary recall
BMI	Body Mass Index
CFCTSA	Condensed Food Composition Tables for South Africa
CHO	Carbohydrates
CVDs	Cardiovascular Diseases
ECDs	early childhood development centres
FBDGs	Food Based Dietary Guidelines
FSANZ	Food Standards Australia New Zealand
HFFS	High in fat, sugar and/or salt
HSRC	South African Human Research Council
NCDs	Non-Communicable Diseases
M.Sc.	Master of Science
NPS	Nutrient profiling score
Prot	Protein
SADoH	South African Department of Health
SAJCN	South African Journal of Clinical Nutrition
SANHANES-I	South African National Health and Nutrition Examination Survey
SANPM	South African Nutrient Profiling Model
SFA	Saturated Fatty Acids
FFQ	Food Frequency Questionnaire
UK	United Kingdom

WHO	World Health Organisation

CHAPTER 1: INTRODUCTION

1.1 Background and rationale for the study

The World Health Organisation (WHO) has reported that non-communicable diseases (NCDs) such as cardiovascular diseases (CVDs) are responsible for the deaths of 38 million people globally each year and unhealthy diets have been listed as a risk factor for developing NCDs (WHOa, 2015). Obesity associated NCDs could be the cause of seven out of every ten deaths by 2020 (Boutayeb, 2010) and is associated with increased CVD incidences, morbidity and decreased life expectancy (Chang *et al.,* 2013). Over the past two decades, obesity has become a global epidemic affecting both paediatric and adult populations (Mandviwala *et al.,* 2016). Beaglehole and colleagues (2013) reported that risk factors causing NCDs begin in childhood. Childhood obesity is reported by the WHO as one of the most serious public health challenges that the 21st century has to face with over 42 million overweight children aged two to five years globally (WHO, 2016).

In the South African context overweight and obesity in children and adolescents are also on the increase (Shisana *et al.,* 2013). The South African National Health and Nutrition Examination Survey (SANHANES-I) reported that in 2012 the prevalence of overweight children between the ages of two to five years increased from 10.6% in 2005 (Labadarios *et al.,* 2005) to 18.1% (Shisana *et al.,* 2013). The SANHANES-I also reported that between infants, children and adolescents, children aged two to five years had the highest prevalence of overweight and obesity for both male and female populations (Shisana *et al.,* 2013). Due to the dramatic increase in obesity in South Africa, the South African Department of Health (SADoH) developed the National Strategy for the Prevention and Control of Obesity, singling out childhood obesity as a specific area of focus. One major driver of weight gain identified by this strategy is the excess consumption of sugar sweetened beverages and energy dense foods (SADoH, 2015). The strategy set out numerous goals for tackling obesity with goal four aiming to support obesity prevention in early childhood (DOH, 2015)

If not prevented the consequences of childhood obesity can have both short and long-term health consequences such as CVDs and musculoskeletal disorders (Reilly & Kelly, 2011). There has also been a rapid increase in the development of obesity-associated type II diabetes mellitus (Hannon *et al.,* 2005). Obese and overweight children often have lower mean scores of quality of life combined with social discrimination, depression and low self-esteem (Lobstein *et al.,* 2015). Home environments have, in many ways, a significant role to play in the prevalence of childhood overweight and obesity (Rossouw *et al.,* 2012) as social and cultural messages, values and culture, engagement, beliefs about family and child health and motivation originates from home

environments (Lovell, 2016). Studies have shown that children's food preferences are mostly for less healthy foods and the majority of food choices that children make are less healthy (Monteiro *et al.,* 2013; Waddingham *et al.,* 2015). Marketing of food has also shown to have a direct impact on children's food choices as it changed towards high fat, salt and/or sugar foods in response to food advertising (Cairns *et al.,* 2013).

Research has shown that processed foods are often high in fat, sugar and/or salt and that this is associated with the development of obesity and diet related NCDs (Monteiro*,* 2009; WHO, 2003). Evidence shows that globally and in South Africa, a shift towards a diet consisting of an increased intake of energy dense foods, high in fat, salt and/or sugars and low in vitamins, minerals and other healthy micronutrients has been made (DOH, 2015; Monteiro*,* 2009). Sales and greater accessibility and availability of processed products commonly increase with urbanisation (Feeley *et al.,* 2009) as a result of rapid urbanisation, South African children are now raised in an environment that encourages weight gain, obesity, CVD, metabolic and other disorders in children that continue into adulthood (Rossouw *et al.,* 2012; Swinburn *et al.,* 2011).

Processed food consumption (high in fat, sugar and/or salt) (Ogimoto *et al.,* 2000; WHO, 2003) has proved to be one of the major role players in childhood obesity (Monteiro*,* 2009). The availability and promotion of commercially-branded processed foods has expanded rapidly during the last decade (Lobstein *et al.,* 2015). Sales of processed foods have increased in parallel with the rates of obesity worldwide, particularly in middle-income countries (Monteiro *et al.,* 2013). Addressing processed food consumption as one of the causes of obesity may, over time, decrease childhood obesity and lead to a healthier society as a whole (Monteiro *et al.,* 2013; Sahoo *et al.,* 2015).

There are numerous ways to assess the healthiness of processed foods. Healthiness can easily be determined by the food group that the food is in for example foods that fall into vegetable and fruit groups are typically seen as healthy. Energy density, type of fat and sodium content can also be used to classify a food as healthy or unhealthy (Bucher *et al.,* 2015). An easy but effective way to assess the healthiness of processed foods is by means of nutrient profiling, defined as the science of ranking foods based on their nutrient and energy composition. This serves as a tool to assess the overall healthiness of food products (Scarborough *et al.,* 2007). South Africa has its own validated nutrient profiling model (Wicks, 2012) that will be used to classify the healthiness of foods for the purposes of this study.

Childhood obesity is rapidly increasing in South Africa and can be associated with the development of several NCDs, which will have adverse health effects during adulthood. In this context, research has shown three important things:

1. Children consume large quantities of processed foods high in fat, sugar and/or salt, but information on the type and frequency of processed food consumption of children aged two to five years old is scarce.

2. High sales of processed foods are commonly found in urban areas.

3. Habits of unhealthy food choices can start in childhood and continue into adulthood. This in turn can contribute to the development of CVDs.

This study will therefore identify the type of processed foods frequently consumed by children aged two to five years followed be assessing the overall healthiness of these foods. Frequently consumed foods will be classified as foods consumed more than three times per week (Brekke *et al.,* 2007). Knowing what the overall healthiness is of frequently consumed processed foods by children aged two to five years could give new insight as where to target interventions to get children to choose and eat more healthy foods.

1.2 Aim

The aim of this study was to determine the healthiness of frequently consumed processed foods among children aged two to five years attending early childhood development centres in the Tlokwe municipality area.

1.3 Objectives

I. To develop a Food Frequency Questionnaire (FFQ) from dietary intake data collected by means of 24-hour dietary recalls (24HDRs).

II. To determine what processed foods are frequently consumed by children aged two to five years as identified by the FFQ.

III. To determine the nutrient profiling score and thus the healthiness of the processed foods frequently consumed by the children as identified by the FFQ.

IV. To compare the nutrient content on the packaging of the frequently consumed processed foods with the nutrient content of similar foods in the Condensed Food Composition Tables for South Africa (Wolmarans *et al.,* 2010).

1.4 Ethical approval

The larger study: Processed foods consumed by children in early childhood development centres in the North-West Province was approved by the Health Research Ethical Committee (HREC) of

the North-West University (NWU), Potchefstroom Campus with the following reference number: NWU-00033-17-A1-01 (ANNEXURE IV). This larger study researched the processed food consumed by children aged two to five whilst investigating the sodium content of these foods. This Master of Science in Nutrition (M.Sc.) study's (as a smaller part of the study) approval was obtained from the HREC of NWU, Potchefstroom Campus.

1.5 Structure of this dissertation

This mini-dissertation is presented in an article format according to the NWU postgraduate manual and is divided into five chapters. With exception to Chapter three, all referencing used in this mini-dissertation is in accordance with the NWU Harvard style.

Chapter 1: This chapter serves as an introductory chapter and briefly explains why this study is relevant and of importance to research. This chapter states the aim and objectives, structure of this dissertation and roles of each member in the research team.

Chapter 2: This chapter comprehensively reviews relevant literature on childhood obesity and the contribution processed foods have made to childhood obesity epidemic. Other topics include a global and national perspective on childhood obesity, the consequences of childhood obesity, the drivers of childhood obesity and strategies in South Africa to address this epidemic. Healthiness of food is explained and an in-depth view is given of processed foods and its consumption by children. Literature regarding the South African nutrient profiling model and its use as a tool to determine healthiness of foods will also be presented in this chapter.

Chapter 3: Consists of an article with the title: "The healthiness of processed foods consumed by children in early childhood development centres in the North-West Province". This article is for submission to the South African Journal of Clinical Nutrition. Headings, numbering and referencing were done according to the guidelines as stipulated by South African Journal of Clinical Nutrition (ANNEXURE I).

Chapter 4: Findings are summarised and the study is concluded. In this chapter recommendations and limitations of this study are also identified.

Chapter 5: Gives a reference list of chapters 1, 2 and 4. The references of chapter 3 are included as part of the manuscript for submission.

1.6 Research outputs

An Article titled: The healthiness of processed foods consumed by children in early childhood development centres in the North-West Province will be published in the South African Journal of Clinical Nutrition.

Table 1-1: Research team

Affiliation	Name	Qualification	Relevant Expertise	Role in study
North-West University	Dr. Tertia van Zyl	PhD Dietetics	Experience in dietary assessment methodology, (24HDR, FFQ), nutrient profiling, dietary patterns	Supervisor
North-West University	Dr. Mariaan Wicks	PhD Dietetics	Experience in nutrient profiling	Co-supervisor
North-West University	Dr Bianca Swanepoel	PhD Nutrition	Statistics and data analysis	Statistics and data analysis
North-West University	Ms. Nadia Theron	B.Sc. Nutrition	Full time M.Sc. student	Recruitment of participants, conducting 24HDR; developing the FFQ and conducting the FFQ, compiling a list and analysis of frequently consumed processed food and nutrient profiling
North-West University	Ms. Marlise Korff	BSc Nutrition	Full time M.Sc. student	Recruitment of participants, conducting 24HDR and FFQ

CHAPTER 2: LITERATURE REVIEW

2.1 The global perspective on obesity and non-communicable diseases

Non-communicable diseases (NCDs) such as cardiovascular diseases (CVDs), cancers, chronic respiratory disease and diabetes are responsible for the deaths of 38 million people globally each year, according to the World Health Organisation (WHO) (WHO, 2015a). Most of these deaths occur in low- and middle-income countries and are largely preventable (Mozaffarian *et al.,* 2015). The WHO lists tobacco use, unhealthy diets, physical inactivity and the misuse of alcohol as risk factors for the development of NCDs (WHO, 2015a). The World Health Assembly aims to reduce premature mortality from cardiovascular and chronic respiratory disease, cancer and diabetes by 25% by 2025 (Mathers *et al.,* 2008). The WHO has also put numerous programmes into place to tackle NCDs which has started in 2015. Together with this, the WHO also aims to support the development of guidelines on the clinical management of major NCDs, including screening protocols and management guidelines for major NCDs such as diabetes, hypertension and stroke (WHO, 2015a).

It is now estimated that NCDs that are obesity-associated could be the cause of seven out of every ten deaths by 2020 (Boutayeb, 2010). Obesity is associated with an increase in the incidence of CVDs and morbidity; it also decreases life expectancy in populations (Chang *et al.,* 2013). Globally, 1.9 billion people are overweight and 600 million people are obese, with the prevalence of overweight and obesity increasing in almost all countries (WHO, 2013). Even though mortality and morbidity from NCDs occur mainly during adulthood, exposures to pertinent risk factors that cause NCDs begin in childhood (Beaglehole *et al.,* 2013). The WHO states that childhood obesity and overweight is one of the most serious public health challenges that the world has to face in the 21st century. In 2015, the number of overweight children under the age of five years was estimated to be over 42 million globally. Almost half of all overweight children under five years lived in Asia and one quarter lived in Africa (WHO, 2016).

2.2 NCDs and obesity in South Africa

In South Africa, NCDs and injuries account for 49% of mortalities and two out of five deaths in South Africa are attributed to NCDs. Of these deaths, 40% among men and 29% among woman were premature (WHO, 2013). NCDs affect a great number of those considered eligible to work and thus influence the workforce and productivity in South Africa (Bradshaw *et al.,* 2011). There should be a focus on lowering the incidence of NCDs as the health of South Africans will have an effect on the economic development of the country. Diabetes, stroke and coronary heart disease have caused a collected loss of R1 trillion to South Africa's gross domestic product and therefor

decreasing premature deaths from NCDs is part of the Post-2015 Sustainable Development Agenda. (Bates-Eamer *et al*., 2012; Hofman, 2014).

The South African Department of Health (SADoH) states that all available data show that South Africa is facing a double burden of disease: infectious diseases and under-nutrition are highly prevalent while NCD risk factors such as overweight and obesity are rapidly increasing (SADoH, 2015). In South Africa, the prevalence of overweight and obesity has increased since 1998. Looking at body mass index (BMI), 68% of women and 31% of men are overweight or obese with one in five women reported to have a BMI ≥ 35.0, categorizing them as severely obese (NDoH, 2017). A longitudinal study conducted from 2008 to 2012 by Cois and Day (2015) among 10 000 South Africans found that the rate of change in BMI during the period of the study was +1.57 kg/m^2 (95 % CI: 0.93 −2.22) per decade. This change in BMI was found to be higher among women than men and the study concluded that there is still a strong positive trend in the increase of BMI in the South African population and that obesity prevalence is likely to increase. Over the past two decades, obesity has become a global epidemic, affecting both paediatric and adult populations (Mandviwala *et al.,* 2016). The number of overweight and obese children and adolescents is rising in South Africa, there is however a difference in prevalence between age groups, genders and population groups (Shisana *et al.,* 2013).

2.2.1 Obesity in urban settings and urbanisation

In the South African context, where shifts have been made away from a traditional diet to a Western diet (which is commonly high in fat and sugar), a higher prevalence of obesity is seen in urban populations (Bourne *et al.,* 2002; Rossouw *et al.,* 2012). A South African study which analysed the mean BMI of 28247 individuals (with children and adolescents included as participants) found that urban residents and women have a higher risk of becoming overweight or obese and that their risk is on the rise (Sartorius *et al*., 2017). Sales and greater availability and accessibility of processed products, commonly high in fat, sugar and/or salt (Monteiro, 2009), also seem to increase with urbanisation (Feeley *et al.,* 2009). Puoane *et al*. (2002) established that the increasing rate of urbanisation among the African population in South Africa has a great impact on levels of obesity. As a result of rapid acculturation and urbanisation, South African children are now raised in an environment that encourages and predisposes the child to weight gain, obesity, CVD and metabolic and other disorders in adulthood. (Rossouw *et al.,* 2012; Swinburn *et al.,* 2011).

2.3 A wider perspective on childhood obesity

The prevalence of children who are overweight and obese has substantially increased. In 2013, the global estimation stood at over 42 million children under the age of five years, and almost 31

million of these children lived in developing countries (Rossouw *et al.,* 2012). In a globally pooled analysis of 2416 population-based measurement studies (using height and weight) in 128.9 million children, adolescents, and adults, it was found that, from 1975 to 2016, the age standardised prevalence of obesity in children and adolescents was estimated to be the largest in Southern Africa and increased about 400% per decade (Abarca-Gómez *et al.,* 2017). There has been little progress with varying results in addressing childhood obesity (WHO, 2016); what is more, childhood obesity is a strong predictor of adult obesity (Freedman *et al.,* 2004; Puhl & Latner, 2007; WHO, 2013). Obesity is the result of various complex factors such as biological, behavioural, economic, social and environmental interactions that promote a positive energy balance (Hill, 2006). Children who are obese have a significantly lower quality of life due to physical and psychological problems which can affect a child's immediate health, mental state and educational attainment (Bradshaw *et al.,* 2007; WHO, 2016).

2.3.1 Childhood obesity in South Africa

A 2009 study done in the rural districts of the Eastern Cape and KwaZulu-Natal found that 16 – 18% of children between the ages of 0 to 59 months were overweight in these two provinces (Smuts *et al.,* 2008). A systematic review done by Bradshaw and colleagues (2007) found that numerous dietary surveys conducted in South Africa suggest that patterns of unhealthy eating, which can lead to CVDs, are already present in South African youth and children. These findings were reflected five years later when The South African National Health and Nutrition Examination Survey (SANHANES-I) reported that the prevalence of overweight children between the ages of two to five years increased from 10.6% in 2005 to 18.1% in 2012 (Table 2-1) (Shisana *et al.,* 2013). The SADoH confirmed in 2015 that there was an increase in the prevalence of overweight and obesity in South African children (SADoH, 2015).

2.3.2 Children aged two to five years as a target population

The WHO has reported that the prevalence of infant, childhood and adolescent obesity is rising globally (WHO, 2016). Little is known about childhood dietary intakes in the age group of two to five years. The SANHANES-I reported that 20.5% of children aged two to five years were overweight or obese (Shisana *et al*., 2014) and the HSRC concluded that regional and international comparisons show that South African pre-school children have a major problem with overweight and obesity (Shisana *et al.,* 2014). Table 2-1 (adapted from the SANHANES-I) provides evidence that, in 2012, the prevalence of obesity and overweight was the highest for both male and female children in the age group of two to five years.

Table 2-1: Percentage of overweight or obese South African male and female participants aged two to fourteen in 2012, as adapted from the SANHANES-I (Shisana *et al.,* 2014).

Age	Gender	Overweight %	Obese %
2-5 years	Male	17.5	4.4
	Female	18.9	4.9
6-9 years	Male	4.5	2.7
	Female	12.3	4.1
10-14 years	Male	7.5	2.7
	Female	16.7	5.6

2.4 National Strategy for the Prevention and Control of Obesity in South Africa 2015

In acknowledgement of the ever-growing obesity epidemic, the SADoH strategized a control and prevention plan for combating obesity in South Africa; this is known as the National Strategy for the Prevention and Control of Obesity in South Africa (SADoH, 2015). One of the major concerns highlighted the strategy was that South Africans consume diets low in fruits and vegetables and high in fat and/or sugar. The strategy aims to "reform obesogenic environments and enablers for these environments, while enhancing opportunities for healthy food options". Goal four of the strategy aims to support obesity prevention in early childhood (12 years and under). Childhood obesity was also singled out as a specific area of focus with one major driver of weight gain identified by the strategy as the excess consumption of sugar-sweetened beverages and energy-dense foods (SADoH, 2015). Goal two of the strategy is to "create an enabling environment that supports availability of and accessibility to healthy food choices in various settings. Table 2-2 outlines objectives and activities that were identified to help achieve goals two and four (SADoH, 2015).

Another step in the right direction was made in 2017 when a bill was passed in South Africa that enables the South African Revenue Service to collect a levy on sugary sweetened beverages as part of a governmental programme which aims to control and prevent NCDs and obesity (Customs and Excise Amendment Act, 32 of 2014). Figure 2 -1 consists of drivers of overweight and obesity and indicates areas for intervention; for the purpose of this study, focus will be given to processed foods. Interventions aimed at lowering the consumption of processed foods could help realise the main goal of the strategy, which is to decrease obesity by 10% by 2020 (SADoH, 2015). First, it is of vital importance to identify which processed foods are frequently consumed by children aged two to five years.

2.5 The consequences of childhood obesity

Children who are overweight or obese often suffer from both long- and short-term health consequences, including CVDs and musculoskeletal disorders such as osteoarthritis, as well as diabetes and certain types of cancer (Reilly & Kelly, 2011). Over the last couple of decades there has been a large increase in the development of obesity-associated type II diabetes mellitus, even though most cases of childhood diabetes mellitus were once genetically related (Hannon *et al.,* 2005). Not only do children who are overweight and obese experience an extremely lower mean score of life, they also experience social discrimination often with low self-esteem and in some cases depression as reported by studies (Lobstein *et al.,* 2015).

This, in turn, can lower academic achievement and, later on, economic productivity (Magnus *et al.,* 2009). A systematic review by Reilly and Kelly (2011) found that a significant increase in the risk of premature mortality, cardiac morbidity (diabetes, hypertension, ischaemic heart disease, and stroke), asthma and polycystic ovary syndrome symptoms occurred in children and adolescents who were overweight or obese.

Table 2-2: Objectives and actions as set out and adapted from the National Strategy for the Prevention and Control of Obesity in South Africa

Goal	Objectives	Actions	Expected outcomes	What has been done to date
Goal 2: Create an enabling environment that supports availability and accessibility of healthy food choices in various settings.	Promote the development and implementation of a relevant legislative framework.	Influence fiscal policies related to sugar-sweetened beverages.	Sugar and fat reduced in processed foods.	The Customs and Excise Amendment Act (32 of 2014) provides for a levy on sugary beverages (also known as the sugar tax), this may incentivise manufacturers to reduce the amount of sugar in their products. Food labelling regulations regarding nutritional claims on food labels (R.429: May 2014, 2014). Has been implemented in 2014. This regulation helps the consumer to more comprehensively understand what is in the food that they purchase.
	Ensure that food and beverage products sold are aligned with optimal nutritional standards nationally and internationally.	Develop norms and standards for sugar and fat content in ultra-processed foods to guide reformulation of products.	Fat and sugar reduced in processed foods.	
		Engage with retailers to reduce exposure to unhealthy foods at point of purchase.	Decreased exposure to unhealthy foods at point of purchase.	
	Ensure responsible and ethical advertising and marketing of food by the food industry.	Ensure that a code of advertising practice and pledge of advertising is developed and adhered to.	Limit exposure to children and the public of advertising of ultra-processed products.	Restrictions of the advertising of foods regarded as not part of a healthy diet (R.214:July 2007, 2007).
	Promote healthy eating in different settings.	Review and implement nutritional guidelines for all food and beverages sold or provided in schools (including foods sold	Improved nutritional status of learners.	The National School Nutrition Programme has set out guidelines for tuck shop operators in order to promote healthy eating habits in children (Department of Education, 2014)

		by vendors around school premises).		
Goal 4: Support obesity prevention in early childhood (0-12 years).	Promote healthy eating and physical activity in early childhood development (ECD).	Incorporate explicit obesity prevention and control messages in ECD policies and guidelines	Well-nourished and physically active children during ECD stages.	The DOH has set out a guiding document for ECDs called “Nutritional Guidelines for Early Childhood Development”, these guidelines aim to overcome past shortcomings regarding the delivery of nutritional support by providing guidelines regarding nutrition and the planning of nutrition strategies and services in ECDs (SADoH, 2016)

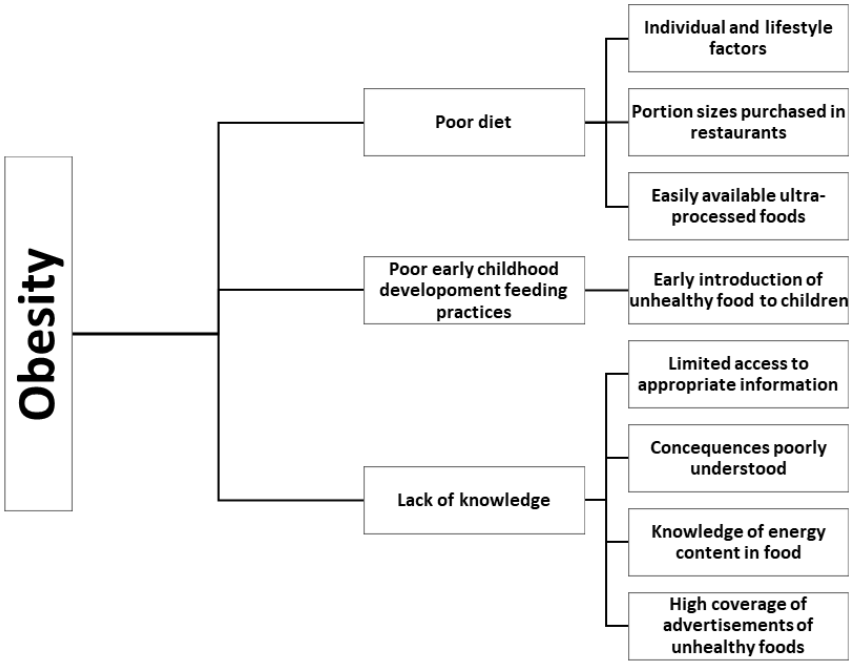


Figure 2-1: Drivers of overweight and obesity (Adapted from the National Strategy for the Prevention and Control of Obesity in South Africa)

2.6 The determinants of childhood obesity

2.6.1 Nutrition transition of children as a cause of childhood obesity

Populations adopt modern lifestyles as result of economic and social development, urbanisation and acculturation, which lead to changes in dietary patterns and nutrient intakes; this can be defined as nutrition transition (Vorster, 2011). As previously mentioned, the main factor contributing to childhood obesity is a shift towards a diet consisting of an increased intake of energy-dense foods high in fat, sugar and/or salt (also known as HSSF foods) and low in vitamins, minerals and other healthy micronutrients (SADoH, 2015; Monteiro, 2009).

A South African study that researched the shift in food consumption of adults from 1994 to 2015 reported that nutrition transitions have been made away from vegetable consumption towards an overall increase in the daily energy consumed. This included increased consumption of sugar-sweetened beverages and an increase in the proportion of processed food in the diet (Ronquest-Ross *et al.,* 2015). Because adults mostly dictate what their children eat, it could be that these shifts have been made in children as well. Feeley and co-workers (2009) stated that South African children and adolescents living in urban areas (townships, settlements, towns and cities) are increasingly exposed to the influences of the Western lifestyle and therefore to foods that are relatively high in fat, carbohydrates and salt

and low in fibre. A large variety of street vendors and tuck shops are available in townships which sells fried foods as well as processed sausages.

2.6.2 Obesogenic environment as a cause of childhood obesity

An obesogenic environment has been defined as "the sum of influences that the surroundings, opportunities, or conditions of life have on promoting obesity in individuals or populations" (Swinburn & Egger, 2002). Obesity and weight gain are easily encouraged in an obesogenic environment in which numerous children are raised (WHO, 2016). Over-nutrition during childhood is an extremely complex disease and has genetic, social and environmental components contributing to it (Mchiza & Maunder, 2013). Swinburn *et al.* (2011) states that "obesity is the result of people responding normally to the obesogenic environments in which they find themselves in". Individuals should be equipped to counteract these environments and policies that counteract obesogenic environments deserve preference.

Evidence shows that children's food preferences are influenced by the eating behaviour of their parents, caregivers, peers and role models (Hawkes *et al.,* 2015). This is of vital importance as it has been shown that people who have previously developed notions regarding unhealthy food preferences often struggle to make healthier choices later on in life (Reyes *et al.,* 2013). According to this evidence, it would be of great value to target interventions at the early stages of the child's development. If policies can be implemented that direct food choices of children towards healthier choices, it could address long-term obesity outcomes as these children grow up to be adults that teach their children healthy eating/dietary habits.

2.6.3 Household and school environment as a cause of childhood obesity

Home environments have, in many ways, a significant role to play in the prevalence of childhood overweight and obesity (Rossouw *et al.,* 2012) as social and cultural messages, values and culture, beliefs about family and child health, motivation and engagement originate from home environments (Lovell, 2016). Other factors that influence what a child consumes are the foods that are available in and outside the home and cultural-social norms (Hawkes *et al.,* 2015). Healthy foods are commonly more expensive than unhealthy alternatives. Healthy and culturally appropriate diets are also typically too expensive for low-income families (Rao *et al.,* 2013). Barriers to accessing nutritious foods are also widespread in rural areas (Sedibe *et al.,* 2014). In addition, Faber *et al*. (2014) found that the school food environment also has large scope for improvement in the promotion of healthy eating. This included increasing access to vegetables and fruit, encouraging learners to carry healthy lunch boxes and

regulating foods that are sold in tuck shops and by food vendors. It is known that ECDs provide meals to the attending children and can thus also create an environment for developing positive nutritional behaviour in children.

2.6.4 Parental influence as a cause of childhood obesity

The process of food preference learning begins in the early stages of life (Hawkes *et al.,* 2015). What children are taught at home about eating healthily, exercising and making the right nutritional choices, contributes to other aspects of their adult life. The behaviours, attitudes and feeding patterns of parents play a large contributing role in the eating behaviour of their children (Patrick & Nicklas, 2005). Parents' influence on the child's diet is said to be strongest in early childhood, which is why parents of young children are often the focus of public health interventions (Clark *et al.,* 2007). Many overweight and obesity problems that occur in children can be avoided if parents enforce a healthier lifestyle. As previously mentioned, interventions in early life often offer the best chance for primary prevention (WHO, 2016). The aim is to address childhood obesity but before this can be done, the processed foods frequently consumed by children must be identified in order to target the correct drivers of childhood obesity.

2.6.5 Lack of physical activity as a cause of childhood obesity

In a study by Mchiza and Maunder (2013), it was found that children who did not spend at least one hour a day doing sport-like activities were mostly found to be overweight or obese. This was confirmed by the WHO when it reported that a less healthy diet in combination with an absence of physical activity are the largest contributing factor to health risks (WHO, 2015a). The SADoH (2015) also states that a decrease in childhood activity plays its part in childhood overweight and obesity.

2.6.6 Food choices of children as a cause of childhood obesity

There are numerous factors that influence the food choices that children make, including fussiness, neophobia, enjoyment of food, responsiveness to food and frequency of exposure to certain types of foods (Russell & Worsley, 2016). In an Australian study aimed at identifying the reasons why children make certain choices regarding food, it was reported that children's food preferences were mostly for unhealthy foods and that the majority of food choices made were unhealthy. The study also reported that the taste of the food, whether it was sugary, quick to eat, inexpensive and/or available, the relationship between food, the weather and peer dominance were reasons for making these unhealthy food choices (Waddingham *et al.,* 2015).

A systematic review of 99 studies aimed at identifying the impact of food marketing on children concluded that food promotions have a direct effect on children's food preferences. Branded packaging (fast-food chains) influenced the food preferences of pre-school children and there was also overwhelming evidence that the food preferences of children shifted towards high fat, sugar and/or salt foods in response to food advertising (Cairns *et al.,* 2013). Changing the food choices and influencing the factors that contribute to these preferences of children would be the first level of targeted interventions to address childhood obesity, especially after research has shown that children prefer unhealthy foods. Nutrient profiling (discussed in section 2.7) is a unique and validated tool for assessing the healthiness of foods.

2.6.7 Increased intake of high fat, sugar and/or salt as a cause of childhood obesity

Mayosi *et al*. (2009) reported that, from 1994 to 2008, dietary fat intake increased from 16.4% to 26.6% of total energy among the black population living in urban settings in South Africa. It was observed that the largest consumption was of sugar-sweetened beverages, sauces, dressings, meats, sweet and savoury snacks, condiments and the foods from the fats and oil food groups. Convenience and indulgence were two of the main drivers of the increase in the consumption of processed foods and beverages; these changes in food consumption are disturbing as they relate to the intake of fat, sugar and/or salt, which is a public health concern (Ronquest-Ross *et al.,* 2015).

The increased consumption of processed foods as an important cause of the obesity epidemic has been identified in the past (Ogimoto *et al.,* 2000; WHO, 2003) but Monteiro (2009) described this issue as "largely ignored or minimised in education and information about food, nutrition and health, and also in public health policies". A study by Longo-Silva *et al*. (2017), investigating the age of introduction of ultra-processed foods among Brazilian pre-school children attending day-care centres, reported that the median age at which ultra-processed foods were introduced to children was six months. He also reported that between the third and sixth month there was a "significant increase in the probability that ultra-processed food would be introduced into the child's diet".

2.7 Processed foods

Sales of processed, convenience and pre-prepared foods have in parallel increased with those of obesity rates globally, especially in middle-income countries (Monteiro *et al.,* 2013). The amount that households spend on ultra-processed foods has also been associated with a greater prevalence of obesity (Canella *et al.,* 2014; Da Costa Louzada *et al.,* 2015). Household dietary patterns based on meals and dishes prepared from unprocessed or minimally

processed foods are now displaced by those that are increasingly based on highly processed foods. Unfortunately, the result is food choices that are high in energy, unhealthy fats, sugars and/or salt, and low in dietary fibre (Canella *et al.,* 2014; Da Costa Louzada *et al.,* 2015). The WHO also reports that consumption of processed food is associated with the development of NCDs (WHO, 2003). Consumption of fast food may also play its role in childhood obesity (Sahoo *et al.,* 2015) but data regarding its influence, especially on children between the ages of two to five years, are scarce. Processed foods are foods that are "manufactured by adding salt or sugar, oil or vinegar and other culinary ingredients to foods to make them more durable or to enhance their palatability "(O'Halloran *et al.,* 2017).

Ultra-processed foods are foods made from "processed substances refined or extracted from whole foods; these include oils, hydrogenated oils and fats, starches and flours, variants of sugar, and inexpensive parts of animal foods with little or no whole foods" (Monteiro *et al.,* 2013). Ultra-processed foods are further described by O'Halloran et al. (2017) as foods of which the "majority of ingredients are preservatives and other additives such as stabilisers, emulsifiers, solvents, binders, bulkers, sweeteners, sensory enhancers, colours and flavours, and processing aids". For the purpose of this study, the term "processed foods" will refer to both processed and ultra-processed foods as defined by O'Halloran *et al*. (2017) and Monteiro *et al*. (2013). Therefore, the levels of processing, as described in Table 2-3, that are of interest for this study include substances extracted from whole foods (group 2) and ultra-processed foods (group 3). Focusing on reducing the intake of processed food may, over time, decrease childhood obesity and lead to a healthier society as a whole (Monteiro *et al.,* 2013; Sahoo *et al.,* 2015). Nutrition policies that aim to tackle childhood obesity, such as those identified in the National Strategy for prevention and Control of Obesity in South Africa, 2015, need to promote household nutrition security and healthy growth. These policies should also protect children against over-consumption of foods of poor nutritional quality and encourage them to be physically active (Lobstein *et al.,* 2015).

2.8 The healthiness of foods

The healthiness of foods can mostly be determined by the food group that the food belongs to, for example, foods that are part of the fruit and vegetable group are typically seen as healthier. Other factors, such as energy density, the type of fat and sodium content, can also be used to classify a food as healthy or less healthy (Bucher *et al.,* 2015). The WHO describes a healthy diet as one that protects against malnutrition and NCDs and where energy intake does not exceed energy expenditure. The WHO further describes a healthy diet as a diet where a shift is made away from consuming saturated fats and industrial trans fats towards the consumption of unsaturated fats. Sugar and salt intake is limited in a healthy diet (WHO,

2015b). Looking at the WHO's description of a healthy diet, it is clear why foods high in saturated fat, salt and sugar are classified as less healthy (Monteiro, 2009). To help classify the healthiness of foods, nutrient profiling models have been created which consider several product attributes and aim to categorise foods according to their nutritional composition (Lobstein & Davies, 2009). Nutrient profiling scores used to assess the healthiness of foods have also been shown to correlate highly with the opinions of nutrition experts (Bucher *et al.,* 2015; Lobstein & Davies, 2009; Wicks *et al.,* 2016).

Table 2-3: Levels of processed foods adapted from Da Costa Louzada *et al.,* (2015)

	Group 1: Minimally processed foods	**Group 2: Substances extracted from whole foods**	**Group 3: Ultra-processed foods**
Explanation	Whole foods submitted to some process, but the nutritional properties are unaltered	Ingredients used in the domestic preparation and cooking and mainly made up of fresh and minimally processed foods	Made up of group 2 substances to which either no or small amounts of foods from group 1 are added
Method of processing	Cleaning, removal of inedible fractions, portioning, refrigeration, freezing, pasteurisation, fermenting, pre-cooking, drying, skimming, bottling and packaging	Extraction	The addition of salt, preservatives and cosmetic additives, such as flavourings and colourants
Examples of foods	Fresh meat and milk, grains, legumes, nuts and fruits, vegetables, roots and tubers	Oils, fats, flours, pastas, starches and sugars	Breads, cookies, ice creams, chocolates, confectionery, breakfast cereals, cereal bars, chips, savoury and sweet snack products in general, and sugared and other soft drinks. Meat products such as nuggets, meat patties and sausages made from processed or extruded remnants of meat

2.9 Nutrient profiling

2.9.1 Background of nutrient profiling

Nutrient profiling is defined as the science of ranking foods based on their nutrient and energy composition and is a tool that assesses the overall "healthiness" of food products (Scarborough *et al*., 2007). There are numerous nutrient profiling models worldwide that can be useful tools and are used in translating nutritional information related to the whole diet to the point of singular foods (WHO, 2011). The WHO (2017) states that nutrient profiling can be used in implementing a set of recommendations regarding the marketing of foods and non-alcoholic beverages to children as well as by national authorities to promote public health dietary goals. Nutrient profiling has also been used in the regulation of the labelling of products regarding nutrition and health claims to set qualifying criteria for these specific claims (WHO, 2011).

2.9.2 Purpose of nutrient profiling

The WHO has identified two general purposes for nutrient profiling models:

1. To generate descriptions that refer to the nutrient levels in foods (e.g. high, low and reduced fat, high in sugar or salt/sodium, source of fibre, energy dense and nutrient poor);

2. To generate descriptions that refer directly to the effects on a person's health of consuming the specific food (e.g. healthier option, healthy or less healthy) (WHO, 2011).

2.9.3 The South African nutrient profiling model

The South African nutrient profiling model (SANPM) is based on the work of Mike Rayner and colleagues of the United Kingdom (UK). The UK model was adapted by Food Standards Australia New Zealand (FSANZ) and in 2012 was adopted by the SADoH, Directorate: Food Control with the aim of supporting the regulation of nutrient and/or health claims in South Africa. This model was validated by Wicks and colleagues (2012) for use in the South African context and led to the development of SANPM. The SANPM demonstrated suitable content validity by classifying food items in a manner that supports the South African Food-Based Dietary Guidelines (FBDGs). The SANPM also classified food items in accordance with the views of South African nutrition experts. The SANPM is recommended for the use of screening food products to determine their eligibility to carry nutrient and/or health claims (Wicks *et al*., 2012).

2.9.4 How does the SANPM work?

The SANPM classifies foods based on the nutritional value per 100g portion and assigns points based on negative nutrients, which include energy, saturated fat, sodium and the total sugar content of foods. After this, points are deducted based on positive nutrients, which include protein and dietary fibre, as well as the content of fruit, vegetables, nuts and legumes. The lower the nutrient profiling score, the healthier the product (Table 2-4) (Hughes *et al*., 2013).

The South African nutrient profile calculator (SADoH, 2014) can be used to determine these profiling scores and is freely available on the SADoH's website (http://www.health.gov.za/phocadownload/FoodInfor/NPC_NWU.html).

Table 2-4: Determining the healthiness of a food using the SANPM

Food Items	**Category 1**	**Category 2**	**Category 3**
Final score	Beverages (excluding milk)	Any foods other than those included in Category 1 or 3	Cheese and processed cheese with a calcium content >320mg/100g, edible oil, edible oil spreads, margarine and butter
Calculations	1. Baseline points are calculated based on the cut-points provided for energy, saturated fat, total sugar and sodium. 2. Modifying points are calculated taking into consideration certain conditions, such as the fruit, vegetable, nut and legume content of the food item, and the content of fibre and protein. 3. Certain conditions are also built into the model; for example, if a food or drink scores 11 or more baseline points, then it cannot score points for protein, unless it also scores the maximum number of points for fruit, vegetables and nuts.		
Final score is calculated by subtracting baseline points from modifying points	< 1 for food items to be eligible for a health claim and to be classified as healthy	< 4 for food items to be eligible for a health claim and to be classified as healthy	< 28 for food items to be eligible for a health claim and to be classified as healthy

In conclusion, evidence has shown that there is a global obesity epidemic. Because obesity contributes to the development of CVDs, the prevention of obesity is a high priority worldwide. The South African population falls in with global obesity trends. Unhealthy eating habits start in childhood and overweight or obese children are likely to become overweight or obese adults. The SANHANES-I showed that among infants, children and adolescents, children aged two to five years had the highest prevalence of obesity and overweight for male and female populations. The National Strategy for the Prevention and Control of Obesity in South Africa 2015 has claimed addressing childhood obesity as a top priority in South Africa. It has also identified achievable actions, goals and recommendations regarding childhood obesity.

There are numerous drivers of childhood overweight and obesity, one being overconsumption of high fat and sugar and/or salt foods which is commonly the case with processed foods. The healthiness of these foods can be determined through nutrient profiling. The SANPM has been validated and reported to be effective in assessing the healthiness of foods in the South African context. Knowing the healthiness of processed foods frequently consumed by children aged two to five years could give new insight as to where interventions should be targeted to encourage children and their care givers to make healthier food choices.

CHAPTER 3: ARTICLE 1

Journal	South African Journal of Clinical Nutrition
Title of the article	The healthiness of processed foods consumed by children in early childhood development centres in the North-West province
Impact factor	0.40
Author guidelines	http://www.sajcn.co.za/index.php/SAJCN/about/submissions

3.1 Abstract

The main objective of this study was to determine the healthiness of frequently consumed processed foods eaten by children aged two to five years attending early childhood development centres in the Tlokwe municipality area.

Setting: ECDs in the Tlokwe municipality.

Subjects: Parents and caregivers on behalf of children aged two to five years attending ECDs.

Outcome measures: A food frequency questionnaire (FFQ) was developed to collect data, with specific focus on the consumption of processed foods. Parents and caregivers of children aged two to five years were recruited through early childhood development centres (ECDs). The children's processed food consumption was captured using the newly developed FFQ. The most frequently consumed processed foods were assessed for healthiness using the South African nutrient profiling model (SANPM).

Results: In this study, 119 participants (parents and caregivers) volunteered to take part in completing the FFQ on behalf of their children. Sixteen processed foods were identified with brown bread identified as most frequently consumed by the children aged two to five years. Eleven of these 16 processed foods (68.75%) were classified by the SANPM as less healthy.

Conclusions: Most processed foods consumed by children aged two to five years were less healthy. The 11 foods identified as less healthy and frequently consumed by children aged two to five years had a high fat and/or salt and/or sugar content.

3.2 Introduction

Childhood obesity and overweight has been identified as an area of great concern by the World Health Organization (WHO) with the number of overweight children under the age of five years estimated to be over 42 million globally in 2015.[1] In the South African context, childhood overweight and obesity has increased from 10.6%[2] to 18.1%[3] in children aged two to five years in the last decade. Progress in addressing childhood obesity has been slow and inconsistent[4] moreover, childhood obesity is a strong predictor of adult obesity which can contribute to the development of cardiovascular diseases (CVDs).[5] International studies have found that focusing on reducing processed food intake may, over time, decrease childhood obesity.[4,5] [6] and barriers such as the cost of healthier food lead to less healthy food choices.[7] Weight gain and obesity are increasing among children as numerous children are raised in obesogenic environments and barriers such as the cost of healthier food lead to less healthy food choices.

South African children and adolescents living in urban areas are increasingly influenced by a Western lifestyle, and therefore they are now consuming foods that are high in fat, refined carbohydrates and salt.[8] Research has identified the increased consumption of processed foods as an important cause for the obesity epidemic.[9] Processed food as a cause however, has largely been ignored or minimised in education and information about food, nutrition and health and in public health policies.[10] Processed foods are typically "energy dense, have a high glycaemic load, are low in dietary fibre, micronutrients, and phytochemicals, and are high in unhealthy fat, sugars and/or salt".[10] In addition sales of these foods increase with urbanisation.[8] Focusing on reducing processed food intake, may over time, decrease childhood obesity and lead to a healthier society.[5]

In 2015 the South African Department of Health (SADoH) released the National Strategy for the Prevention and Control of Obesity in South Africa with the aim of controlling and combatting obesity.[11] One of the major focus areas of the strategy is the prevention of obesity in early childhood by reforming obesogenic environments and enablers of weight gain, while enhancing opportunities for healthy food options. The strategy also aims to create opportunities to make healthier food choices easier.[11] Thus, it is important for the population to be able to easily classify foods as healthy or less healthy in order to assist them in making healthier choices. There are various ways to classify food as healthy or less healthy and nutrient profiling is an effective way to do this. Different nutrient profiling models are used globally and in some countries are incorporated into legislation concerning food marketing restrictions and food labelling.[12] These models consider several food product attributes and aim to categorize foods according to their nutritional composition. A score is then allocated to

a food which classifies it as healthy or less healthy.[13] Nutrient profiling scores used to assess the healthiness of foods have also been shown to highly correlate with the opinions of nutrition experts.[14] The South African nutrient profiling model (SANPM) demonstrates suitable content validity by classifying food items in a manner that supports the South African Food Based Dietary Guidelines (SAFBDG)[14, 15] and is recommended for the use of screening food products to determine their eligibility to carry nutrient and/or health claims.[14] In South Africa, data regarding the healthiness of processed foods are scarce. Therefore, this study was designed to firstly determine which processed foods are frequently consumed by the children aged two to five years and secondly to determine the healthiness of these processed foods.

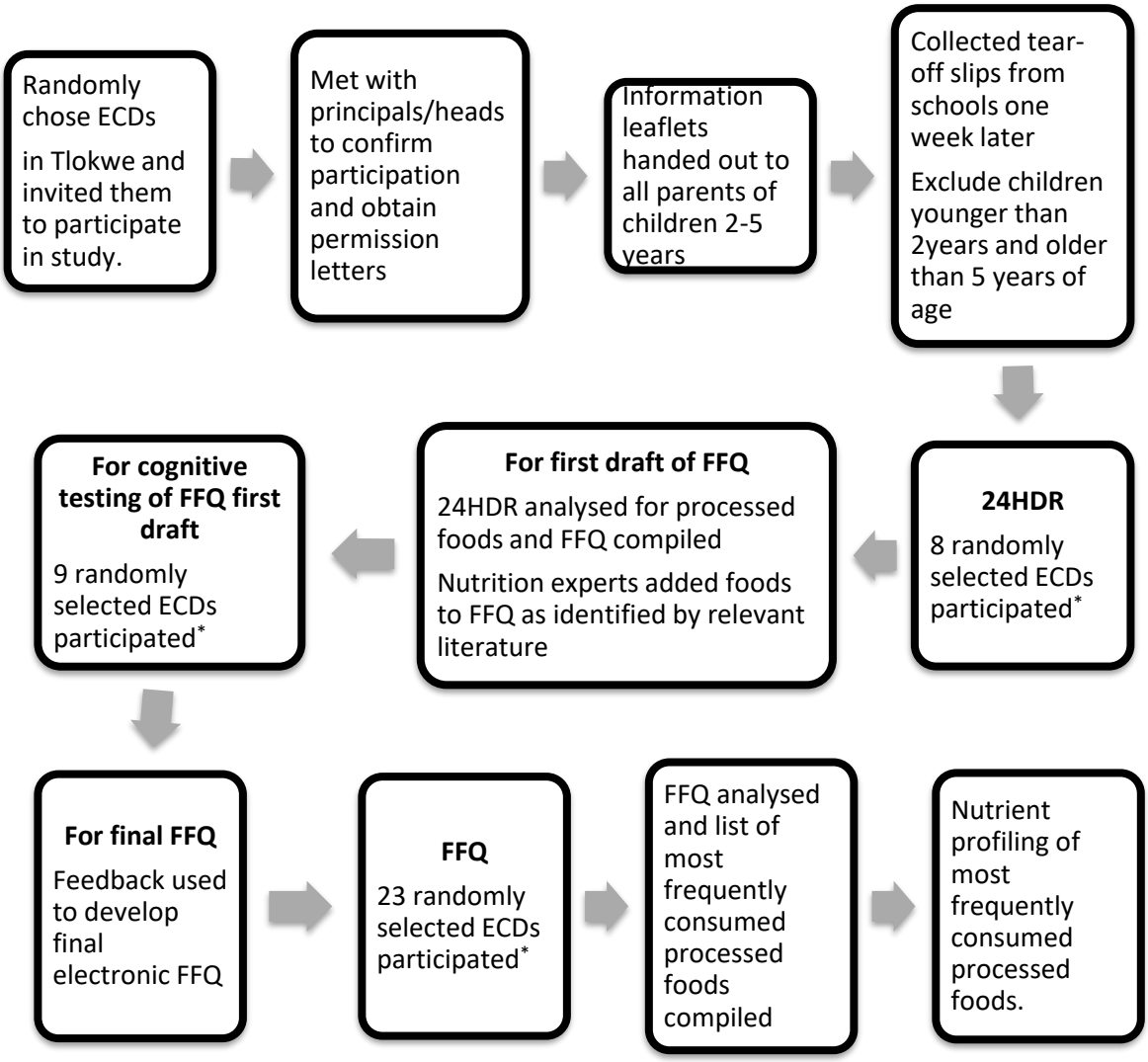
3.3 Subjects and Methods

Ethics

The Health Research Ethics Committee (HREC) of the North-West University (NWU) approved this study (NWU-00033-17-A1-01). The study was conducted according to the guidelines of the Medical Research Council for research on humans and the Helsinki Declaration of 1975 (revised in 2008). Informed consent was obtained from all participants (parents and caregivers) before interviews and data collection commenced.

Study population and sampling

This study was conducted in the North West province in the Tlokwe municipality area. Tlokwe has an average population of 162 762 people and an unemployment rate of 21,6%. Afrikaans is spoken by 27,5% of its population and 11,9% of Tlokwe's population speaks Sotho.[16] Permission to conduct research in the early childhood development centres (ECDs) was obtained from Tlokwe's Department of Social Development. Goodwill permission was also obtained from the principals of each ECD participating in the study. The municipal area of Tlokwe was subdivided into eight suburbs in order to give the study adequate demographic representation. ECDs were identified in each suburb using electronic resources and information from the Department of Education and randomly chosen to include in the study sample. Not all ECDs are registered which means that some ECDs could have been excluded. Interviews were conducted with parents and caregivers of children aged two to five years attending ECDs. The research procedures and data collection are described in figure 3-1.



*Different ECDs were randomly selected for 24HDR, Cognitive testing and FFQ, as far as possible from each of the 8 suburbs.

Figure 3-1: The research procedure and data collection

Data collection and analysis

Fieldworkers

Six trained postgraduate Nutrition and Dietetics students from the North-West University assisted in data collection. Data capturing and analysis, nutrient profiling and comparison to the South African Food Composition tables was done by the primary researcher.

Questionnaire

A Food frequency questionnaire (FFQ) was developed to determine which processed foods where frequently consumed by children aged two to five years. The following procedures were followed in developing the questionnaire*:*

24 Hour Dietary Recall interviews

Twenty-four-hour dietary recall (24HDR) interviews were conducted at eight randomly selected ECDs with the aim of developing an FFQ with specific focus on processed foods. These eight ECDs represented the eight suburbs in which the area was divided. The 24HDRs captured specific foods consumed by children aged two to five years. Parents and caregivers were asked to recall what their children consumed the previous day from the time they woke up to the time that they went to bed (weekends were included). Specific brands of the food products that were consumed were also recorded. In the case where a child was attending an ECD on the day recalled by the parent/caregiver (meaning the parent does not necessarily know what the child ate), the head cook of the school was interviewed to recall what was served. The interviewer recorded the portions sizes served to the children and this data was used for the 24HDR, the actual amounts eaten by the children were not recorded as this was very difficult to determine. The amounts that were served to the children (not eaten) was used for this study. The food, amounts eaten and brands (if the participant could recall) was captured onto a Microsoft Excel (2016) spread sheet. The total amounts (in gram and millilitre) of food that was consumed was calculated. The brands mostly consumed were also identified by choosing the brands that were mostly eaten. It was necessary to record the amounts of food eaten to determine which foods to include in the FFQ which was compiled using the foods with the highest amounts of g/ml eaten. From this, a list of processed foods consumed by the children were identified. This information was then used to compile an electronic FFQ and additional processed foods that was not captured by the 24HDR but that was found to be relevant in South African literature were added by nutrition experts. These additional foods were added by nutrition experts to make sure that no processed foods were omitted when compiling the FFQ.

Cognitive testing of the draft FFQ

After the FFQ was compiled, it was translated into Afrikaans and SeTswana. The content validity and the practicality of completing the FFQ was tested by having 15 participants from the randomly selected ECDs, complete the FFQ through interviews or by self-administration. After the participants finished the FFQ, an in-depth, semi-structured interview with the

participants was done regarding the FFQ that they had just completed. The aim of these interviews was to evaluate the effectiveness and ability of the FFQ to identify frequently consumed processed foods. The fieldworkers were also interviewed to identify any issues they encountered with the administration of the FFQ. This information was then used to adapt and refine the FFQ to be more user-friendly.

The final FFQ and data collection

After cognitive testing was completed, the FFQ was administered (recalling over a period of one week) in two different manners. The first manner was self-administration where the participant, on behalf of the child completed the FFQ electronically. The electronic FFQ was administered using laptops and tablets brought to the ECDs. The electronic FFQ was also emailed to participants and they completed the FFQ at home or work. The second manner of administration was through interviews as some participants had difficulty using the electronic version of the FFQ. Fieldworkers assisted the parents or caretakers if they had any difficulties completing the FFQ. The questionnaire consisted of nine food categories, based on the food categories of the Condensed Food Composition Tables for South Africa (CFCTSA)[17] . For each of the most frequently consumed processed foods in the 75th percentile that was identified by the FFQ as frequently consumed, the same or similar food was identified in the CFCTSA (for example if the FFQ identified crisps as frequently consumed, the nutritional values of three brands of crisps was used for nutrient profiling and the nutritional values recorded in the CFCTSA for crisps was then also used for nutrient profiling). This was done to compare the accuracy with which the CFCTSA can be used when assessing the healthiness of processed food. In doing this, it can determine if the CFCTSA is still a comparable source when it comes to nutrient information of different processed foods especially looking at different brands of the same foods.

Determining the healthiness of the processed foods

A list of frequently consumed (defined as consumption of more than 3 times a week[18]) processed foods was compiled as identified by the FFQ. The SANPM was used to classify these foods as healthy or less healthy. This was done based on the food's nutritional value per 100g/ml portion. The SANPM assigned points to these foods based on negative nutrients, which included energy, saturated fat, sodium and total sugar. After this, points were deducted based on positive nutrients which included protein and dietary fibre as well as the content of fruit, vegetables, nuts and legumes. The lower the nutrient profiling score, the healthier the food.[19] The SANPM calculator was used to determine the profiling scores (http://www.health.gov.za/phocadownload/FoodInfor/NPC_NWU.html). The nutritional

information of each of the food products was obtained from the Discovery Foodswitch database which is an application that captures data regarding nutrient information of different food products using the back of pack label of the product. This was used to classify a food product as healthy or less healthy.

3.4 Statistical Analysis

The 24HDR data were entered into an Excel (Microsoft) spread sheet. This was done by capturing the amount of each food that was eaten by each participant onto the spreadsheet as captured by fieldworkers on the 24HDRs. Excel was then used to calculate the sum total of each food eaten in g/ml. The researcher then identified the processed foods with the highest sum total (indicating that these foods were mostly consumed). These foods (consumed in the greatest amounts) were then included in the FFQ. The data was captured from the FFQ using Google forms (an electronic form tool that creates surveys) and was automatically transferred onto an Excel spread sheet. The categories of processed food that were frequently consumed for the period of one week, were allocated a value of one (1); this included the categories of "once a day", "twice a day", "three times or more a day" and "four to six times a week".

The processed food categories that were not frequently consumed were allocated a value of zero (0); this included the categories of "never" and "one to three times a week". Excel was then used to calculate the sum total by adding all the allocated ones (1) for each processed food. For example, bread had a total of 95. This number was then divided by the total of participants (119) times 100 (x/119*100) to give a percentage value of consumers who frequently consumed the specific processed food. This was done for each of the processed foods. Excel was then used to rank these percentages from highest percentage to lowest percentage. The 75th quartile (highest sum total of consumers) was then identified by the researcher and these processed foods were then profiled using the SANPM.

3.5 Results

Eight ECDs were used as sites for data collection by means of the 24HDRs where 51 interviews were conducted for the 24HDRs and 124 FFQs were completed. These 24HDRs identified 242 different foods. From this list of foods, 43 were classified as processed foods and were used for the FFQ. Nutrition experts added 13 foods known to be consumed by the specific age group shown to be relevant by South African literature and studies and personal experience. These Nutrition experts were selected based on their areas of expertise and study field. Three nutrition experts were consulted. A total of 66 processed foods were included in the first draft of the FFQ. During the cognitive testing, the time it took to complete

the FFQ was identified as a major issue due to the format of the draft questionnaire. The format of the FFQ was therefore changed and the final FFQ was compiled. One thousand, four hundred and eighty (1480) information leaflets were handed out throughout 23 ECDs in the Tlokwe municipality area, 237 leaflets were returned indicating a positive response to participate in the study which gives a response rate of 16.01%. The electronic FFQ was then sent to these 237 participants and 71 participants responded. Fifty-three (53) interviews were conducted in informal settlements and were electronically captured giving a total of 124 completed FFQs and a total response rate of only 8.38%. All eight suburbs were represented but with different amounts of participants. Five (5) participants did not meet the inclusion criterion (their children were younger than two or older than five) and their FFQs were not included in the study.

Sixteen (16) processed foods were identified as being most frequently consumed (the 75th percentile) by the children aged two to five years. The top three brands and flavours of each of these 16 foods were also identified, as shown in Table 3-1 (See Annexure II for detailed information). This Table also indicates the healthiness of these processed foods (as indicated by “yes” or “no”) as classified by the SANPM. In the cases where the data on the brand or flavour were not captured by the FFQ or 24HDR for the specific food, the webpages of four top retailers were visited and all brands/flavours was identified from the websites and listed. A brand/flavour was then randomly selected from this list and allocated to the specific food.

For each of the 16 processed foods the same or similar food in the CFCTSA was also identified and added to the list. The 16 processed foods (three brands each and one of the same food from the CFCTSA) were then profiled using the SANPM. This was done to compare the healthiness of processed foods according to the information on the back of label with that of the healthiness of processed foods captured in the CFCTSA. In total 64 processed foods were classified according to the SANPM. This was done to research the comparability of the healthiness of processed food (using the back of pack label) with the healthiness of the processed food according to the nutrient data in the CFCTSA. The most frequently consumed processed food was brown bread (78.83%). From these 16 foods, four foods (25%) were consistently identified through nutrient profiling as healthy foods (brown bread, plain macaroni, strawberry yogurt, breakfast cereal (these breakfast cereals included cereal with no added sugar and that are high in fibre), nine foods (56.25%) were identified as less healthy (crisps, Viennas, soft sweets, hard sweets, polony, cola carbonated drinks, chocolates and take away) and three processed foods (18.75%) had contradicting results (tub-margarine, chocolate muffins and vanilla ice-cream). From these three processed foods that delivered contradicting results, two processed foods were still predominantly classified by the SANPM as less healthy.

These foods had contradicting results as some brands were classified by the SANPM as healthy and other brands were classified as less healthy. Taking this into account, 68.75% of frequently consumed processed was classified as less healthy.

Table 3-1: The healthiness classifications of the frequently consumed processed foods by the SANPM and percentage of the population consuming the product

Ranking *	Processed Food	% Population	Healthy food product			
			Brand 1	Brand 2	Brand 3	CFCT SA**
1	Brown bread	79.83	Yes	Yes	Yes	Yes
2	Crisps	78.99	No	No	No	No
3	Macaroni	77.31	Yes	Yes	Yes	Yes
4	Vienna	73.95	No	No	No	No
5	Strawberry yogurt	72.27	Yes	Yes	Yes	Yes
6	Tub Margarine	72.27	No	Yes	Yes	No
7	Soft sweets	70.59	No	No	No	No
8	Chocolate muffins	68.91	No	No	No	Yes
9	Chocolates	68.07	No	No	No	No
10	Vanilla ice Cream	67.23	No	Yes	No	No
11	Hard sweets	67.23	No	No	No	No
12	Polony	67.23	No	No	No	No
13	Cola carbonated drinks	66.93	No	No	No	No
14	Apricot jam	66.39	No	No	No	No
15	Breakfast cereal high in fiber	65.55	Yes	Yes	Yes	Yes
16	Take away	64.73	No	No	No	No

* According to frequency of consumption

**Condensed Food Composition Tables of South Africa

3.7 Discussion

Firstly, this study aimed to identify the processed foods which were most frequently consumed by children aged two to five years attending ECDs in the Tlokwe municipality area using a FFQ consisting of processed foods that was firstly developed for this particular study population. The healthiness of these processed foods was then evaluated by means of the

SANPM. This study found that South African children in the Tlokwe municipality aged two to five years frequently consumed 16 different processed foods. Brown bread was most frequently consumed by 79.93% of the study population. This finding was consistent with that of other South African studies where maize and bread was mostly eaten by children aged 12 to 108 months.[20] Bread was also one of the staple foods identified as frequently eaten by the National Food Consumption Survey and recommended as a food for mandatory fortification with micronutrients: vitamin A, thiamine, riboflavin, niacin, pyridoxine, folic acid, iron and zinc.[20] In the case of brown bread which is classified as a processed food, this is not a finding of concern because of the fortified vitamins and minerals that are present in bread. The South African Food Based Dietary Guidelines (SAFBDGs)[21] advises to make starchy foods the basis of most meals. The SANPM also classified brown bread as a healthy food.

Secondly this study aimed to assess the healthiness of these processed foods using the SANPM. Brown bread with three other processed food were classified as healthy. Not all processed foods are less healthy and some processed foods have a place in a balanced diet. The frequent consumption of brown bread, macaroni, strawberry yogurt and plain breakfast cereal is supported by the SAFBDGs[21] as this forms part of the guidelines encouraging frequent consumption of starchy foods[22] and dairy[23]. Nine of the sixteen foods (56.63%) were unanimously classified by the SANPM as less healthy, these foods were classified as less healthy because they are high in saturated fat and/or salt and/or sugar and low in protein and fibre. The scores given by the SANPM corresponded with that of processed foods found the CFCTSA and consistently correlated with the healthiness scores of the branded processed food in 87.5% in all examples.

Three of the processed foods (chocolate muffins, vanilla ice cream and tub-margarine) delivered contradicting results when their healthiness was classified by the SANPM. Thus, some brands were classified as healthy and others as less healthy. Two of these foods that were classified as both healthy and less healthy (chocolate muffins and vanilla ice cream) were still predominantly classified as less healthy by 75% of the scores given by the SANPM. Taking this into consideration, eleven processed foods were classified as unhealthy. Tub margarine was classified as less healthy when using the nutrient information in the CFCTSA. This may be due to the tub margarine in the CFCTSA having a higher fat content than that of the modern-day branded margarines, as the reference values in the CFCTSA are from 1991. The same may be true for muffins where the nutrient information is from 1988 may not be able to accurately reflect the nutrient composition of commercial muffins found today.

According to the SAFBDGs, aimed at guiding South Africans to make healthier food choices, saturated fat, salt and sugar is recommended to be eaten sparingly.[21] Results from this study

shows that children aged two to five years frequently consumed saturated fat, salt and sugar through less healthy processed foods. These findings correspond with another South African study that found that patterns of unhealthy eating were prevalent in the South African youth and children.[24] This may be due to the increased exposure of South African adolescents and children to a Western lifestyle typically high in fat, refined carbohydrates and salt and low in fibre.[8] This study confirmed these findings as take away, crisps (high in fat), soft sweets (high in sugar), hard sweets (high in sugar), chocolates (high in sugar), vanilla ice cream (high in sugar), cola carbonated drinks (high in sugar), apricot jam (high in sugar), viennas and polony (high in sodium) was frequently eaten by children aged two to five years.

A study done by the researcher in 2015[25] also found that a nutrition transition has been made away from vegetable consumption towards an overall increase in daily energy consumed. This included a diet high in sugar-sweetened beverages and an increase in the proportion of processed food. The 2015 study found that carbonated drinks were frequently consumed by 66.39% of children aged two to five years[25] where this study found that carbonated drinks were frequently consumed by 66.93% by a similar study population. The increased consumption of processed foods could be due to the high availability of processed foods that are often cheaper;[5] these foods include take away and processed meat like viennas and polony which were found to be frequently eaten by the children in this study. Working parents may also not always have the capacity or time to pack healthier lunches. One of the major concerns highlighted in the National Strategy for the Prevention and Control of Obesity in South Africa was childhood obesity driven by sugar sweetened beverages and energy dense foods.[11] This study found that 68.7% of processed foods consumed by children aged two to five years were classified as unhealthy.

Even though 1480 information leaflets were distributed throughout 23 ECDs in the Tlokwe municipality area, the response rate of the parents with children attending ECDs was only 8.38%. This is a limitation in the study. Using another mode of data collection such as personal interviews combined with electronic questionnaires over a longer period of time could have increased this response rate. This could be done by engaging other platforms of recruitment such as church communities and public health clinics. This study confirmed some findings of previous research and shone light onto the processed food consumption of children aged two to five years attending ECDs in the Tlokwe municipality. Further research is recommended where the energy contribution of processed foods to a child's diet is reported which could then more successfully link processed food intake to childhood obesity.

3.8 Conclusion

This study concludes that most of the processed foods (68.7%) consumed by children aged two to five years attending ECDs in the Tlokwe municipality area are less healthy. Although the results cannot be generalised because of the small number of participants, this study can be used as a platform on which larger studies can be based. Processed food has been found to contribute to childhood overweight and obesity and further research is needed on the contribution of processed food to the daily energy intake of children. Targeted interventions aimed at enhancing the knowledge of parents and caregivers regarding healthy foods for children, should be established in order to prevent overweight and obesity in children that may lead to detrimental effects in adulthood. More attention should also be given to the administration of school feeding programmes in ECDs. In this manner ECDs can be helped to provide the healthiest options when it comes to meals provided to children.

3.6 Conflict of interest

The researchers have no conflict of interest to declare. The post graduate student was financially supported by Discovery Vitality.

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CHAPTER 4: CONCLUSION AND RECOMMENDATION

4.1 Introduction

This research was undertaken after identifying a gap in the literature regarding the processed food consumption of South African children aged two to five years. The rate of obesity is high in this age group and the consumption of processed foods may be a contributory factor. The main aim of this study was to determine the healthiness of frequently consumed processed foods by children aged two to five years attending early childhood development centres (ECDs) in the Tlokwe municipality area. This was done, firstly, by determining which processed foods were frequently consumed by children aged two to five years, and secondly, by using the South African nutrient profiling model (SANPM) to assess the overall healthiness of these foods.

This concluding chapter summarises the findings and conclusions drawn from the research done according to the objectives of the study.

4.2 To develop a Food Frequency Questionnaire from data collected by a 24-hour dietary recall

A food frequency questionnaire (FFQ), developed for this study from 24HDR conducted for the specific study population, was adequately able to identify the processed foods most frequently consumed by children aged two to five years. The processed foods that were identified reflected past research while also identifying new processed foods as being frequently consumed by children aged two to five. The FFQ was developed form 51, 24HDRs. The sample population used for the 24HDRs was drawn from different socio-economic groups, which provided a comprehensive list of processed foods consumed by children aged two to five years. Repetition of the same foods consumed was seen in the 24HDRs regardless of the socio-economic background of the children.

The information captured by the 24HDRs regarding processed food consumption of children aged two to five years was then used to compile the FFQ. Processed foods that were found to be relevant but missed in the 24HDRs were also included in the FFQ to narrow the margin for any processed foods that might have been missed by the 24HDRs such as sugary beverages and sweat treats. From the 24HDRs, 43 processed foods were identified and added to the FFQ. Thirteen other processed foods were also added to the FFQ as identified

by relevant South African literature and added by nutrition experts. Thus, in total, 66 processed foods were used and included in the first draft of the FFQ. After the FFQ was compiled, cognitive testing was done regarding the user-friendliness of the FFQ. The cognitive testing was a simple and successful way to refine the FFQ, especially after feedback from parents and fieldworkers was taken into consideration and gaps/problems with the administration and understanding of the FFQ were identified and addressed. After this, the final FFQ was compiled that covered an intake period of one week.

4.3 To determine which processed foods are frequently consumed by children aged two to five years as identified by FFQ

The FFQ was able to successfully identify 16 different processed foods that were frequently consumed (more than three times a week) by children aged two to five years. These foods (listed from eaten by the highest to lowest number of consumers) were brown bread, crisps, macaroni, viennas, strawberry yogurt, tub margarine, soft sweets, chocolate muffins, chocolates, vanilla ice cream, hard sweets, polony, cola carbonated drinks, apricot jam, breakfast cereal (plain and high in fibre) and take-away foods.

4.4 To determine the healthiness of the processed foods frequently consumed by children aged two to five as identified by the FFQ using the South African nutrient profiling model

To determine the healthiness classification for each of the 16 processed foods, the SANPM was used. The SANPM is a validated method to test the healthiness of foods and it scores foods according to their nutrient composition. Of these 16 processed foods, four foods were classified as healthier; nine were classified as less healthy. Brown bread was most frequently consumed by children aged two to five years. Although brown bread is classified as a processed food, brown bread was classified by the SANPM as healthy. Brown bread is also fortified with numerous vitamins and minerals. Three of the identified processed foods delivered contradictory results, where the processed food was profiled as both healthy and less healthy; this was due to the varying nutrient content of different brands of the same processed food. Chocolate muffins were found to be frequently consumed and all the brands were classified as less healthy due to high sugar and fat content. From the CFCTSA, the nutrient values for plain muffins were used as these were the closest values found to correspond to chocolate muffins and were classified as healthy because of the lower sugar and kilojoule content. The CFCTSA needs to be updated regularly to ensure that new food items are included for nutrient analyses. For tub margarine, the SANPM classification for brand one and the CFCTSA analysis thereof were both less healthy. This was due to the high fat

content of brand one and the high kilojoule content of the margarine in the CFCTSA. For vanilla ice cream one brand classified as healthy; this brand was low in sugar, fat and energy whereas the other brands and the vanilla ice cream found in the CFCTSA were not.

Two of these three processed foods that delivered conflicting results were nevertheless predominantly classified as unhealthy, with an unhealthy score given by the SANPM to 75% of these processed foods that delivered contradicting results. Taking this into consideration, 11 processed foods of the 16 identified as frequently consumed were classified as less healthy. According to the results, the SANPM was able to classify processed foods as either healthy or less healthy, regardless of the brand or similar processed food in the CFCTSA in most instances. This means that it would be possible to assign a blanket score to each processed food, which can be used by consumers to make healthier food choices. In the case where certain brands are classified as healthy and other brands as less healthy, the SANPM can help the consumer to choose the healthier brand option.

4.5 To compare the nutrient content on the packaging of the frequently consumed processed foods with the nutrient content of a similar processed food in the Condensed Food Composition Tables for South Africa (Wolmarans *et al.,* 2010)

The CFCTSA is a reliable resource compiled and used by South African researchers. This objective was included to determine how the nutrient information of the CFCTSA compares with that on processed food labels. In 87.5% of all instances, the healthiness score given by the SANPM compared well with that of the processed foods found in the CFCTSA. This indicates that the CFCTSA is still a dependable source for providing information on the energy and nutrition composition of foods consumed in South Africa. Researchers should, nevertheless, compare the nutrient information on the back of food labels with that of similar food items in the CFCTSA to make the correct assumptions when substituting items not available in the CFCTSA.

4.6 Limitations

Because this study was concerned only with the healthiness of processed foods consumed by children aged two to five years in the Tlokwe district, the findings cannot be generalised in the rest of South Africa. Secondly, this study gives insight into the processed food consumption of children aged two to five years but cannot successfully link processed food consumption to childhood obesity as the contribution to energy intake was not measured; this was, however, not an objective of the study. To increase the response rate, participants could be recruited through different channels such as church groups and public health centres. Even

though precautions were taken to include a representative sample of the study area, some processed foods could have been omitted from the FFQ, which could lead to biased results. This bias could be lessened with a larger study sample.

4.7 Recommendations

- This study gave new insight regarding the processed food consumption of children aged two to five years. The Nutritional Guidelines for ECDs advises that numerous processed foods should not be recommended for children, these include processed meats, sugary drinks and snack foods (SADoH, 2016). To further expand on this study and to support the Nutritional Guidelines for ECDs, it is recommended that an investigation should be launched into the caloric contribution of processed foods to a child's diet and the child's body composition. This can be done at district level as each part of South Africa can uniquely differ from another to ensure more targeted interventions.

- Parents and caregivers play a major role in the food choices that children make when they are young (Hawkes *et al*., 2015; DOH, 2016). It is therefore recommended that the interventions should be targeted at parents and caregivers on a national level and should focus on educating them on making healthier food choices for their children. This can be done using the South African Food-Based Dietary Guidelines (FBDGs) (which promotes healthy food choices) as the foundation for every food choice.

4.8 Main findings and conclusion

The tools used in this study were able to adequately identify and classify the processed foods frequently consumed by children aged two to five years. Other recruitment methods that may have yielded a larger sample, may have led to a better response rate. The CFCTSA, used together with other resources, is a reliable source of nutrient data for South African researchers.

This study found that 68.7% of processed food frequently consumed by children aged two to five years was classified by the SANPM as less healthy. This is of concern because of the high fat and or salt and/or sugar content of these foods, which is of vital importance when addressing healthier food choices in children. More research is needed to investigate the caloric contribution of processed foods to a child's diet and to the body composition of these children to successfully link processed food consumption and childhood obesity. Interventions should be targeted at parents and caregivers while more attention should be given to the administration of school feeding programmes in ECDs. Preventing childhood obesity will benefit South Africa in future by contributing to a healthier population and a lower prevalence

of cardiovascular diseases. This is an area of research, therefore, that warrants more urgent attention.

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ANNEXURES

ANNEXURE I: CONTENT AND STYLE GUIDELINES FOR THE SOUTH AFRICAN JOURNAL OF CLINICAL NUTRITION

INSTRUCTIONS FOR CONTRIBUTORS

As part of the submission process, authors are required to check off their submission's compliance with all of the following items, and submissions may be returned to authors that do not adhere to these guidelines.

- The submission has not been previously published, nor is it before another journal for consideration (or an explanation has been provided in Comments to the Editor).
- The submission file is in Microsoft Word, or RTF file format
- When available, the URLs to access references online are provided, including those for open access versions of the reference. The URLs are ready to click.
- The text is single-spaced; uses a 12-point font; employs italics, rather than underlining (except with URL addresses); and all illustrations, figures, and tables are placed within the text at the appropriate points, rather than at the end.
- The text adheres to the stylistic and bibliographic requirements outlined in the Author Guidelines, which is found in About the Journal.
- If submitting to a peer-reviewed section of the journal, the instructions in Ensuring a Blind Review have been followed.
- The manuscript has an abstract.

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Ethnic classification: Work that is based on or contains reference to ethnic classification must indicate the rationale for this.

Manuscripts: Short items are more likely to appeal to our readers and therefore to be accepted for publication. Manuscript should not exceed 4000 words in total all contents inclusive.

Original articles: of 4 000 words or less, with up to 6 tables or illustrations, should normally report observations or research of relevance to the field of nutrition. References should preferably be limited to no more than 25.

Short reports or scientific letters, which include case reports, side effects of nutrient supplements/drugs and brief or negative research findings should be 1000 words or less, with 1 table or illustration and no more than 6 references.

Editorials, Opinions, Issues in the field of nutrition, should be about 1000 words and are welcome, but unless invited, will be subjected to the SAJCN peer review process. Review articles are rarely accepted unless invited.

Letters to the editor, if intended for the correspondence column, should be marked 'for publication', signed by all authors and presented in triple spacing. Letters should be no longer than 400 words with only one illustration or table.

Obituaries should not exceed 400 words and may be accompanied by a photograph.

MANUSCRIPT PREPARATION

1. Please submit your manuscript electronically at www.sajcn.co.za
2. Research articles should have a structured abstract not exceeding 250 words (50 for short reports) comprising: Objectives, Design, Setting, Subjects, Outcome measures, Results and Conclusions.
3. A second abstract should be written in simple and clear spoken language highlighting the reason(s) that the research work was undertaken, the key findings and the key recommendations without, overtly or covertly implying or containing any claims of whatsoever nature, but rather explaining how the work will help scientists (and/or lay persons) better understand and address the topic of investigation. The abstract should not exceed an absolute maximum of 75 words. In addition, please also include a < 140 character, “strong” message that can be used for social media.

4. Refer to articles in recent issues for guidance on the presentation of headings and subheadings.
5. Abbreviations should be spelt out when first used in the text and thereafter used consistently.
6. Scientific measurements should be expressed in SI units except: blood pressure should be given in mmHg and haemoglobin values in g/dl.
7. Figures consist of all material that cannot be set in type, such as photographs and line drawings.
8. Tables and legends for illustrations should appear on separate sheets and should be clearly identified.
9. Line drawings should be arranged to conserve vertical space. Note that reduction to 80 mm for a single column or 170 mm for double columns should not render lettering illegible. Explanations should be included in the legend and not on the figure itself.
10. Figure numbers should be clearly marked on the back of prints and the top of illustrations should be indicated.
11. If any tables or illustrations submitted have been published elsewhere, written consent to republication should be obtained by the author from the copyright holder and the author(s).
12. A limited number of illustrations are free at the discretion of the editor. Colour illustrations are encouraged but are charged to the author.

A quote will be provided on request. Consider sponsorship.

REFERENCES

References should be inserted in the text as superior numbers and should be listed at the end of the article in numerical and not in alphabetical order. Authors are responsible for verification of references from the original sources. References should be set out in the Vancouver style and approved abbreviations of journal titles used; consult the List of Journals in Index Medicus for these details. Names and initials of all authors should be given unless there are more than six, in which case the first three names should be given followed by *et al*. First and last page numbers should be given.

Journal references should appear thus:

1. Price NC . Importance of asking about glaucoma. BMJ 1983; 286: 349-350.

Book references

Book references should be set out as follows: 1. Jeffcoate N. Principles of Gynaecology. 4th ed. London: Butterworth, 1975: 96-101. 2. Weinstein L, Swartz MN. Pathogenic properties of

invading microorganisms. In: Sodeman WA jun, Sodeman WA, eds. Pathologic Physiology: Mechanisms of Disease. Philadelphia: WB Saunders, 1974: 457-472

ANNEXURE II: NUTRIENT INFORMATION AND HEALTHINESS SCORE OF PROCESSED FOOD

Processed Food			Nutritional Information/100g									
Processed food and % of population consumed	**Brand**	**Flavour/type**	**Energy (kJ)**	**Prot[1] (g)**	**Total fat (g)**	**SFA[2] (g)**	**CHO[3] (g)**	**Sugar (g)**	**Fiber (g)**	**Sodium (mg)**	**NPS[4]**	**Healthy food product**
Bread 79.83%	Brand 1	Brown	901.00	8.00	1.60	0.60	38.00	3.50	6.90	596.00	-1	Yes
	Brand 2		910.00	8.00	1.80	0.60	45.00	3.60	3.50	464.00	0	Yes
	Brand 3		998.00	7.70	2.10	0.50	44.00	4.00	5.60	472.00	-2	Yes
	CFCTSA[5]		1036	9.00	0.24	0.24	45.90	0.00	3.20	653.00	3	Yes
Crisps 78.15%	Brand 1	Salt and Vinegar	2203.00	7.40	35.00	13.60	46.00	0.70	4.80	1440.00	21	No
	Brand 2	Cheese	2335.00	6.20	35.90	15.00	53.00	1.30	1.00	839.00	24	No
	Brand 3	Barbeque	2177.00	6.60	31.00	14.00	54.00	1.70	3.90	935.00	22	No
	CFCTSA	Potato crisps	2328.00	6.40	34.70	14.03	53.30	0.00	1.70	1067.00	25	No
Macaroni 77.31%	Brand 1	Plain	1456.00	12.00	1.60	0.40	66.00	3.50	5.70	12.00	-6	Yes
	Brand 2		720.00	5.70	0.50	0.20	34.00	0.50	1.40	0.00	-2	Yes
	Brand 3		656.00	5.00	0.70	0.10	32.00	4.40	1.30	6.00	-3	Yes
	CFCTSA	Cooked, plain	595.00	4.80	0.70	0.10	26.70	0.00	1.60	1.00	-3	Yes
Vienna 73.95%	Brand 1	Pork	570.00	13.90	8.00	3.20	2.40	1.10	0.80	1149.00	18	No
	Brand 2	Pork	489.00	14.40	2.40	0.40	4.80	0.00	0.00	1152.00	6	No
	Brand 3	Chicken	980.00	13.50	19.60	6.60	0.90	0.00	3.50	908.00	19	No
	CFCTSA	Pork	1142.00	10.20	25.20	9.28	2.00	0.00	0.00	953.00	22	No
Yogurt 72.27%	Brand 1	Strawberry, smooth	370.00	3.70	2.10	1.60	13.40	10.70	0.50	44.00	2	Yes
	Brand 2		406.00	2.50	2.00	1.30	17.00	12.20	0.00	37.00	3	Yes
	Brand 3		354.00	2.10	2.20	1.60	14.00	10.00	1.00	31.00	2	Yes
	CFCTSA	Fruit, sweetened	375.00	3.80	1.50	0.94	15.00	0.00	0.00	74.00	-1	Yes
Soft tub Margarine 72.27%	Brand 1	Original	2987.00	0.40	80.00	29.40	1.00	0.60	1.00	703.00	44	No
	Brand 2		1858	0.30	50.00	16.40	1.00	0.30	1.00	597.00	27	Yes
	Brand 3		2230	0.10	60.00	14.60	1.00	0.30	1.00	240.00	22	Yes
	CFCTSA	Polyunsaturated	3063	0.20	82.50	16.66	0.40	0.00	0.00	400.00	29	No

Processed Food			Nutritional Information/100g									
Processed food and % of population consumed	**Brand**	**Flavour/type**	**Energy (kJ)**	**Prot[1] (g)**	**Total fat (g)**	**SFA[2] (g)**	**CHO[3] (g)**	**Sugar (g)**	**Fiber (g)**	**Sodium (mg)**	**NPS[4]**	**Healthy food product**
Jelly/ soft sweets 70.59%	Brand 1	Jelly sweet	1200.00	5.10	0.20	0.20	66.00	47.00	0.00	24.00	13	No
	Brand 2	Jelly sweet	1470.00	0.00	0.00	0.00	88.00	77.90	1.00	73.00	13	No
	Brand 3	Marshmallow	1385.00	3.60	0.00	0.00	78.00	61.50	0.00	50.00	15	No
	CFCTSA	Soft jelly type	1602.00	0.00	0.80	0.70	92.50	92.10	0.00	23.00	14	No
Muffins 68.91%	Brand 1	Chocolate	1692.00	7.50	14.30	4.20	56.00	36.90	2.00	480.00	20	No
	Brand 2	Chocolate chip	1550.00	5.20	14.40	2.50	54.00	32.70	1.40	339.00	13	No
	Brand 3	Chocolate	2811.00	8.00	30.40	4.80	90.00	52.80	3.00	736.00	27	No
	CFCTSA	Plain	1294.00	10.10	6.30	0.00	49.60	0.20	2.70	130.00	- 3	Yes
Chocolates 68.07%	Brand 1	Milk chocolate	2205.00	7.60	29.00	17.50	57.00	17.50	2.50	81.00	24	No
	Brand 2	White chocolate	2324.00	5.00	32.90	19.30	60.10	51.00	0.18	118.00	26	No
	Brand 3	Milk, dark and white mix	2194.00	6.10	31.20	18.90	54.00	46.40	2.90	85.00	23	No
	CFCTSA	Chocolate, milk	2303.00	8.60	30.60	17.98	60.20	54.20	0.00	120.00	27	No
Ice cream 67.23%	Brand 1	Vanilla	728.41	2.00	9.00	4.00	25.00	16.00	0.00	95.00	8	No
	Brand 2		351.00	1.00	3.800	2.00	11.00	7.50	0.00	0.00	3	Yes
	Brand 3		689.00	1.00	7.00	3.20	24.00	14.40	0.30	79.00	8	No
	CFCTSA	Regular	868.00	35.00	11.00	6.79	23.60	13.40	0.00	80.00	8	No
Hard Sweets 67.23%	Brand 1	Hard sweet	1498.00	0.00	0.00	0.00	95.00	85.60	0.00	79.00	14	No
	Brand 2		1361.00	0.00	0.00	0.00	81.00	66.10	0.00	13.00	14	No
	Brand 3		141.00	1.20	1.40	1.20	79.00	77.20	0.30	114.00	16	No
	CFCTSA	Hard boiled type	1602.00	0.00	0.80	0.70	92.50	92.10	0.00	23.00	14	No
Polony 67.23%	Brand 1	French	638.00	12.70	9.50	3.20	3.10	0.20	2.90	1020.00	17	No
	Brand 2		594.00	13.30	6.60	2.00	4.00	1.300	1.00	1100.00	20	No
	Brand 3		892.00	9.00	18.40	5.40	4.00	0.30	0.00	998.00	17	No
	CFCTSA	Bolonga	1294.00	11.70	28.30	10.70	2.80	0.00	0.00	1019.00	23	No
Carbonated drinks 66.39%	Brand 1	Cola	234.00	0.00	0.00	0.00	13.00	12.20	0.00	10.00	2	No
	Brand 2		180.00	0.00	0.00	0.00	11.00	10.6	0.00	7.00	3	No
	Brand 3		187.00	0.50	0.50	0.10	10.70	10.70	0.50	0.005	2	No
	CFCTSA	Cold drink carbonated	175.00	0.00	0.00	0.00	10.30	10.30	0.00	7.00	2	No

Processed Food			Nutritional Information/100g									
Processed food and % of population consumed	**Brand**	**Flavour/type**	**Energy (kJ)**	**Prot[1] (g)**	**Total fat (g)**	**SFA[2] (g)**	**CHO[3] (g)**	**Sugar (g)**	**Fiber (g)**	**Sodium (mg)**	**NPS[4]**	**Healthy food product**
Jam 66.39%	Brand 1	Apricot, smooth	1104.00	0.80	2.00	0.00	64.00	52.10	0.00	6.00	13	No
	Brand 2		1090.00	0.10	0.10	0.10	61.00	58.10	1.00	19.00	12	No
	Brand 3		1020.00	0.40	0.20	0.20	58.00	51.10	0.30	24.00	13	No
	CFCTSA	Jam	1198.00	0.40	0.00	0.00	69.30	64.10	0.80	15.00	13	No
Breakfast cereals 65.55%	Brand 1	High in fibre	1323.00	10.70	11.60	0.30	5.90	1.80	10.70	332.00	- 4	Yes
	Brand 2		1523.00	14.40	7.90	1.40	57.00	1.00	12.30	19.00	1	Yes
	Brand 3		1054.00	12.00	2.20	0.50	51.10	12.90	22.50	534.00	2	Yes
	CFCTSA		1555.00	11.60	2.10	0.27	63.10	6.20	12.11	165.00	- 4	Yes
Take away 64.71%	Brand 1	Fried chicken drumstick[6]	1186.00	22.50	17.40	4.61	9.10	0.00	0.30	292.00	5	No
	Brand 2	Pizza, margarita, thin base	1149.00	13.90	13.30	6.60	24.90	2.30	0.40	359.20	7	No
	Brand 3	Cheese Burger	1277.00	16.50	13.00	7.50	29.50	4.50	2.70	775.00	16	No
	CFCTSA	Pizza, tomato and olives	1042.00	9.00	11.80	5.19	24.80	0.90	1.80	570.00	13	No

1. Protein
2. Saturated Fatty Acids
3. Carbohydrates
4. Nutrient profiling score
5. Condensed Food Composition Tables for South Africa
6. Taken from the CFCTSA

ANNEXURE III: ELECTRONIC FFQ

Thank you for your willingness to complete this questionnaire. Please answer all questions as completely as possible. It will take you 20-30 minutes to complete.

Please fill in your information. All information will be kept confidential.

* Required

1. **Email address** *

Participant Information

Please fill in your information. All information will be kept confidential.

2. **Name and Surname** *

3. **In which school is your child?** *

4. **What is the gender of your child?** *
Mark only one oval.
- ◯ Male
- ◯ Female

5. **What age is your child turning this year?** *
Mark only one oval.
- ◯ 2 years
- ◯ 3 years
- ◯ 4 years
- ◯ 5 years
- ◯ None of the options

Processed foods consumed by children in early childhood development centres.

ETHICS REFERENCE NUMBERS: NWU-00033-17-S1

PRINCIPAL INVESTIGATOR: Dr Tertia van Zyl

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social development
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Discovery Vitality

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Study information

Good day

You are invited to take part in a research study that investigates the eating behaviour of children aged two to five years with specific focus on processed foods. Please take some time to read the information presented in this informed consent form which will explain the details of this study. Please ask the researcher or person explaining the research to you any questions about any part of this study that you do not fully understand. It is very important that you are fully satisfied and that you clearly understand what this research is about and how you might be involved. Also, your participation is entirely voluntary and you are free to say no and decide to not participate. If you say no, this will not affect you negatively in any way whatsoever. You are also free to withdraw from the study at any point, even if you do agree to take part now.

This study has been approved by the Health Research Ethics Committee of the Faculty of Health Sciences of the North-West University (NWU-00033-17-S1) and will be conducted according to the ethical guidelines and principles of Ethics in Health Research: Principles, Processes and Structures (DoH, 2015) and other international ethical guidelines applicable to this study. It might be necessary for the research ethics committee members or other relevant people to inspect the research records.

What is this research study all about?
-The prevalence of infant, childhood and adolescent obesity is increasing around the world according to a World Health Organization report. Little is known about childhood nutritional intakes in the age group of two to five years. In South Africa 20.5% of children aged two to five are overweight or obese and regional and international comparisons show that South African children at pre-school age have a major problem with overweight and obesity.

-Obesity is associated with numerous diseases such as stroke and high blood pressure. Diet plays an important role in the development of these heart diseases. Many studies have shown that dietary habits form early in childhood, and continues into adulthood. Thus it is important to understand what children aged two to five years eat. This information can help bring new insight regarding the epidemic of childhood obesity.

-This study will be conducted at pre-schools and day-care centres in the Tlokwe municipality area. Parents/caregivers will be interviewed by experienced nutrition researchers (Nutritionist/Dietitians) to determine what their children eat. A minimum of 200 to 250 participants is required for this phase of data collection.

-Processed foods identified by this questionnaire will be listed. The processed food from this list will then be analysed to determine their healthiness and how these foods contribute to the sodium content of the children's diets.

Study information continued...

Why have you been invited to participate?
-You have been invited to be part of this study because you are a parent/caregiver of a child aged two to five years, and you have the best knowledge of what your child eats.
-You have also been chosen because your child attends a pre-school or day-care centre in the Tlokwe municipality area.
-You will not be able to take part in this research if your child is younger than two years or older than five years.
-You must also communicate effectively in Afrikaans, English or Tswana to participate in the study.

What will be expected of you?
-Be willing to complete this electronic questionnaire. The link has been sent to you via email. You should complete the questionnaire within a months' time and submit it electronically via the link. The questionnaire will include questions on the foods that your child eats. You are required to complete the questionnaire only once and it will take 30 minutes of your time.

Will you gain anything from taking part in this research?
-You and your child will not personally benefit from taking part in this study.
-There are indirect benefits for the community if you take part in the study such as helping to understand what young children eat. This will help put together guidelines to teach parents, children and teacher on what should be given to the young children to eat for them to develop and grow well. Information will be given to the school and the researchers will come back to give feedback on the results

Are there risks involved in you taking part in this research and what will be done to prevent them?
-There are minimal risks involved in partaking in this study

How will we protect your confidentiality and who will see your findings?
-Only the researchers and trained fieldworkers, who are part of the study, will be able to look at the answers given in your questionnaire.
-All data and information will be kept anonymous as only your participant number will be written on the questionnaire.
-Electronic questionnaire are automatically anonymised and the research team will not know who completed the questionnaire.
-The hard copies will be converted into electronic copies. The electronic data will be kept safe, it will be on a password protected computer, and all back-up data will be locked in the primary investigators office. Data will be stored for 7 years.

What will happen with the findings or samples?
-The findings of this study will only be used for reaching the aims and objectives of this study. The results from this questionnaire will identify the top processed foods mostly consumed by children aged two to five years. These foods will be assessed for healthiness and salt content. The data will be stored for 7 years.

How will you know about the results of this research?
-We will give you feedback of the results of this study as soon as the data analysis is completed which is aimed to be finished by the 10th of October 2017.

Will you be paid to take part in this study and are there any costs for you?
-No, you will not be paid to take part in the study because the fieldworkers will visit you at a convenient place of your choice and no travelling expenses will be incurred by you. There will thus be no costs involved for you, if you do take part in this study.

IF you have any other questions:
-You can contact Tertia Van Zyl at 018 299 2467 or email her at tertia.vanzyl@nwu.ac.za .
-You can also contact the Health Research Ethics Committee via Mrs Carolien van Zyl at 018 299 1206 or carolien.vanzyl@nwu.ac.za if you have any concerns that were not answered about the research or if you have complaints about the research.

6. **I here by give informed consent to take part in the research study and I understand what is expected of me. (Clicking "Yes" is required to continue with the questionnaire)** *
Check all that apply.

- [ ] YES

1.Milk and milk products (1/9)

Please indicate whether your child has eaten any of the foods mentioned below as well as the number of times he/she has eaten the food in the last week (last 7 days).

7. **1.Milk and milk products** *
Check all that apply.

	Never	1-3 per week	4-6 per week	Once a day	Twice a day	Three times or more per day
Flavoured Milk (Super M)	☐	☐	☐	☐	☐	☐
Drinking yogurt (Yogisip)	☐	☐	☐	☐	☐	☐
Maas (Amasi)	☐	☐	☐	☐	☐	☐
Yogurt	☐	☐	☐	☐	☐	☐
Block Cheeses (Cheddar)	☐	☐	☐	☐	☐	☐
Soft cheese spreads/dips/ triangles (Melrose)	☐	☐	☐	☐	☐	☐
Ice cream	☐	☐	☐	☐	☐	☐

8. **1.1 Please select the brands of milk products used most often (you may select more than 1)** *
Check all that apply.

- [ ] Not Applicable
- [ ] House brand
- [ ] Future life
- [ ] Parmalat
- [ ] Bonnita
- [ ] Clover
- [ ] Fair Cape
- [ ] Inkomazi
- [ ] Amasi Egoli
- [ ] Danone
- [ ] Dairybelle
- [ ] Lancewood
- [ ] Mellrose
- [ ] Fairview
- [ ] Kiri
- [ ] Laughing cow
- [ ] Simonsberg
- [ ] Nestle

9. **1.2 Please list any other milk product brands not mentioned.**

2.Beverages (2/9)

Please indicate whether your child has eaten any of the foods mentioned below as well as the number of times he/she has eaten the food in the last week (last 7 days).

10. **Beverages** *

Check all that apply.

	Never	1-3 per week	4-6 per week	Once a day	Twice a day	Three times or more per day
Carbonated drinks (Coke)	☐	☐	☐	☐	☐	☐
Sports Drinks (Energade)	☐	☐	☐	☐	☐	☐
Ice Teas (Lipton)	☐	☐	☐	☐	☐	☐
Fruit juice and dairy blends (Tropica)	☐	☐	☐	☐	☐	☐
Fruit Juices (Liquifruit)	☐	☐	☐	☐	☐	☐
Concentrates/Drink powders	☐	☐	☐	☐	☐	☐
Flavourings for milk (Nesquick, Ensure)	☐	☐	☐	☐	☐	☐

11. **2.1 Please select the brands of beverages used most often (you may select more than 1)** *

Check all that apply.

- [ ] House brand
- [ ] Not Applicable
- [ ] Kingsley
- [ ] Twizza
- [ ] Coca Cola
- [ ] Pepsi
- [ ] BOS
- [ ] Lipton
- [ ] Energade
- [ ] Powerade
- [ ] Tropica
- [ ] Clover
- [ ] Krush
- [ ] Liqui-Fruit
- [ ] Ceres
- [ ] Hall's
- [ ] Oros
- [ ] Purity
- [ ] Wild Island
- [ ] Tang
- [ ] Game
- [ ] Milo
- [ ] Nesquick
- [ ] Ensure
- [ ] Nestle
- [ ] Cadburry

12. **2.2 Please list other beverage brands not mentioned**

3. Fruit, vegetables, nuts and seeds (3/9)

Please indicate whether your child has eaten any of the foods mentioned below as well as the number of times he/she has eaten the food in the last week (last 7 days).

13. **Fruit, vegetables, nuts and seeds** *

Check all that apply.

	Never	1-3 times per week	4-6 times per week	Once a day	Twice a day	Three times or more per day
Dried fruit (fruit lollies)	☐	☐	☐	☐	☐	☐
Canned fruit (Peaches in syrup)	☐	☐	☐	☐	☐	☐
Canned vegetables (beans in tomato sauce)	☐	☐	☐	☐	☐	☐
Salted nuts	☐	☐	☐	☐	☐	☐

14. **3.1 Please select the brands of fruit, vegetables, nuts and seeds used most often (you may select more than 1)** *

Check all that apply.

- ☐ Not Applicable
- ☐ House brand
- ☐ Safari
- ☐ Montagu
- ☐ Jungle Bites
- ☐ KOO
- ☐ Rhodes
- ☐ Goldcrest
- ☐ Farmgirl
- ☐ All Gold
- ☐ Miami
- ☐ Heinz
- ☐ Roastwell

15. **3.2 Please list other fruit, vegetables, nut and seed brands not mentioned**

4. Meat, chicken and fish (4/9)

Please indicate whether your child has eaten any of the foods mentioned below as well as the number of times he/she has eaten the food in the last week (last 7 days).

16. **Meat, chicken and fish** *

Check all that apply.

	Never	1-3 per week	4-6 per week	Once a day	Twice a day	Three times or more per day
Chicken patties/schnitzel/nuggets and bites	☐	☐	☐	☐	☐	☐
Meatpatties	☐	☐	☐	☐	☐	☐
Canned meat products (e.g. bully beef)	☐	☐	☐	☐	☐	☐
Biltong and dry sausage	☐	☐	☐	☐	☐	☐
Viennas, sausages and russians (all types)	☐	☐	☐	☐	☐	☐
Polony, salami, bacon, ham	☐	☐	☐	☐	☐	☐
Canned fish (e.g. pilchards, tuna)	☐	☐	☐	☐	☐	☐
Fish fingers/bites/crumbed fish	☐	☐	☐	☐	☐	☐

17. **4.1.Please select the meat, chicken and fish used most often (you may select more than 1)** *

Check all that apply.

- ☐ Not applicable
- ☐ House brand
- ☐ County Fair
- ☐ Rainbow chicken
- ☐ Banquet
- ☐ Farmer brown
- ☐ Escort
- ☐ I&J
- ☐ Bull Brand
- ☐ Prima
- ☐ Top One
- ☐ Bokkie
- ☐ Mighty Meats
- ☐ John West
- ☐ Lucky Star
- ☐ Sea queen

18. **4.2 Please list other meat, chicken and fish brands not mentioned**

5.Cereals and cereal products (5/9)

Please indicate whether your child has eaten any of the foods mentioned below as well as the number of times he/she has eaten the food in the last week (last 7 days).

19. **Cereals, Bread and baked products** *

Check all that apply.

	Never	1-3 per week	4-6 per week	Once a day	Twice a day	Three or more times per day
Breakfast cereals (Weetbix, Frosties)	☐	☐	☐	☐	☐	☐
Breakfast porridge (Oats, matabella)	☐	☐	☐	☐	☐	☐
Maize porridge (Pap)	☐	☐	☐	☐	☐	☐
Cereal bars (Special K)	☐	☐	☐	☐	☐	☐
Bread/bread rolls/bread buns	☐	☐	☐	☐	☐	☐
Crackers,savoury (Salty cracks)	☐	☐	☐	☐	☐	☐
Cookies,sweet (Romany creams)	☐	☐	☐	☐	☐	☐
Muffins, cakes, cup cakes	☐	☐	☐	☐	☐	☐
Doughnuts or vetkoek	☐	☐	☐	☐	☐	☐
Instant noodles (2-minute noodles)	☐	☐	☐	☐	☐	☐
Pasta (macaroni,spaghetti)	☐	☐	☐	☐	☐	☐

20. **5.1 Please select the cereal and cereal products used most often (you may select more than 1)** *

Check all that apply.

- [ ] Not applicable
- [ ] House Brand
- [ ] Pronutro
- [ ] Futurelife
- [ ] Jungle
- [ ] Nature's Choice
- [ ] Nestle (Bar one, Milo)
- [ ] Kellog's All bran
- [ ] Coco-pops
- [ ] Rice Crispies
- [ ] Froot Loops
- [ ] Morvite
- [ ] Purity
- [ ] Bokomo
- [ ] Ace
- [ ] Papa
- [ ] Wabona
- [ ] Impala
- [ ] Iwisa
- [ ] White Star
- [ ] Albany
- [ ] Sasco
- [ ] Blue Ribbon
- [ ] Sunbake
- [ ] Provita
- [ ] Kips
- [ ] Bakers
- [ ] Ouma-Rusks
- [ ] Cape cookies
- [ ] Oreo
- [ ] Romany Creams
- [ ] Fatti's & Moni's
- [ ] Maggi
- [ ] Cup a snack
- [ ] Knorr mince mate/tuna mate

21. **5.2 Please list other cereal and cereal product brands not mentioned**

6. Sweets and snacks (6/9)

Please indicate whether your child has eaten any of the foods mentioned below as well as the number of times he/she has eaten the food in the last week (last 7 days).

22. **Sweets and snacks** *

Check all that apply.

	Never	1-3 timer per week	4-6 times per week	Once a day	Twice a day	Three or more times a day
Jelly sweets/soft sweets (wine gums)	☐	☐	☐	☐	☐	☐
Hard sweets (lollipops)	☐	☐	☐	☐	☐	☐
Chocolates (bars, slab)	☐	☐	☐	☐	☐	☐
Crisps (Simba chips, NikNaks)	☐	☐	☐	☐	☐	☐
Pop corn (Jumping Jack)	☐	☐	☐	☐	☐	☐
Salt and vinegar snacks	☐	☐	☐	☐	☐	☐

23. **6.1 Please select the sweet and snack brands used most often (you may select more than 1)** *

Check all that apply.

- [ ] Not Applicable
- [ ] House brand
- [ ] Spaza shop sweets/chips
- [ ] All sorts
- [ ] Jelly Tots
- [ ] Beacon Marshmallows
- [ ] Fizzers
- [ ] Energellies
- [ ] Fruitella
- [ ] Manhattan
- [ ] Maynards
- [ ] Mentos
- [ ] Rascals
- [ ] Amajoya
- [ ] Sparkels
- [ ] Super C
- [ ] Yogette
- [ ] Fizz pop
- [ ] Beacon
- [ ] Beyers
- [ ] Cadburry
- [ ] Nestle
- [ ] Kinder Joy
- [ ] Simba
- [ ] Lay's
- [ ] Willard's
- [ ] Flanigans
- [ ] Fritos
- [ ] Pringles
- [ ] NikNaks
- [ ] Act I I Microwave Popcorn
- [ ] Popz Microwave Popcorn
- [ ] Hoppity Poppity Popcorn
- [ ] Diddle Daddle Caramel Cluster Popcorn
- [ ] Jumpin Jack

24. **6.2 Please list other snack and sweets brands not mentioned**

7. Fats, oils and spreads (7/9)

Please indicate whether your child has eaten any of the foods mentioned below as well as the number of times he/she has eaten the food in the last week (last 7 days).

25. **Fats, oils and spreads** *

Check all that apply.

	Never	1-3 times per week	4-6 times per week	Once a day	Twice a day	Three times or more per day
Soft Tub Margarine (Rama, stork)	☐	☐	☐	☐	☐	☐
Hard Brick Margarine in foil	☐	☐	☐	☐	☐	☐
Butter (Kerry gold)	☐	☐	☐	☐	☐	☐
Peanut butter	☐	☐	☐	☐	☐	☐
Beef spread (Bovril, Marmite)	☐	☐	☐	☐	☐	☐
Savory spreads (fish paste/liver spread)	☐	☐	☐	☐	☐	☐
Sweet chocolate Spreads (Nutella)	☐	☐	☐	☐	☐	☐
Jam, syrup, honey	☐	☐	☐	☐	☐	☐

26. **7.1 Please select the fat, oil and spread brands used most often (you may select more than 1)** *

Check all that apply.

- [ ] Not Applicable
- [ ] Blossom
- [ ] Housebrand
- [ ] Flora
- [ ] Rama
- [ ] Stork
- [ ] Helios
- [ ] Sunshine
- [ ] Clover
- [ ] Kerrygold
- [ ] Ladismith
- [ ] Yum Yum peanut butter
- [ ] Black cat
- [ ] Thokoman
- [ ] Marmite
- [ ] Bovril
- [ ] Redro fish spread
- [ ] Pecks Anchovette
- [ ] Enterprise liver spread
- [ ] Eskort liver spread
- [ ] Miami piccalilli
- [ ] Nutella
- [ ] Buttanut
- [ ] KOO jam
- [ ] All Gold
- [ ] Lion golden suryp
- [ ] Rhodes
- [ ] Little bee honey

27. **7.2 Please list other fats, oils and spread brands not mentioned**

8.Soups, sauces seasoning and flavourings (8/9)

Please indicate whether your child has eaten any of the foods mentioned below as well as the number of times he/she has eaten the food in the last week (last 7 days).

28. **Soups, sauces seasoning and flavourings** *

Check all that apply.

	Never	1-3 times per week	4-6 times per week	Once a day	Twice a day	Three times or more per day
Sauce powders (white sauce)	☐	☐	☐	☐	☐	☐
Soup powders (Knorr)	☐	☐	☐	☐	☐	☐
Stock cubes/powders	☐	☐	☐	☐	☐	☐
Tomato sauce	☐	☐	☐	☐	☐	☐
Mayonnaise/Salad dressing	☐	☐	☐	☐	☐	☐
Ready made sauces	☐	☐	☐	☐	☐	☐
Sweet chilly sauce , soy sauce, worcester sauce	☐	☐	☐	☐	☐	☐
Aromat	☐	☐	☐	☐	☐	☐
Atchar	☐	☐	☐	☐	☐	☐

29. **8.1 Please select the soup, sauces, seasoning and flavouring brands used most often (you may select more than 1)** *

Check all that apply.

- ☐ Not Applicable
- ☐ House brand
- ☐ Imana
- ☐ Knorr
- ☐ Royco
- ☐ Ina Paarman
- ☐ Knorrox
- ☐ Oxo
- ☐ Maggi
- ☐ All Gold
- ☐ Heinz
- ☐ Wellington
- ☐ Crosse & Blackwell
- ☐ Hellmann's
- ☐ Nola
- ☐ Steers sauces
- ☐ Spur Sauces
- ☐ Hollbrooks
- ☐ Mango Man
- ☐ Miamii
- ☐ Packo
- ☐ Aromat

30. **8.2 Please list other sauces, soups, seasoning and flavouring brands not mentioned**

9. Miscellaneous (9/9)

Please indicate whether your child has eaten any of the foods mentioned below as well as the number of times he/she has eaten the food in the last week (last 7 days).

31. **Miscellaneous** *

Check all that apply.

	Never	1-3 times per week	4-6 times per week	Once a day	Twice a day	Three times or more per day
Ready made meals (mac and cheese)	☐	☐	☐	☐	☐	☐
Pies	☐	☐	☐	☐	☐	☐
Samosas	☐	☐	☐	☐	☐	☐
Pureed baby foods	☐	☐	☐	☐	☐	☐
Take away (Mac Donalds, KFC)	☐	☐	☐	☐	☐	☐
Restaurant food (Mikes Kitchen)	☐	☐	☐	☐	☐	☐

32. **9.1 Please select the brands of the above mentioned foods used most often (you may select more than 1)** *

Check all that apply.

- ☐ Not Applicable
- ☐ Housebrand
- ☐ I&J
- ☐ Oh my Goodness
- ☐ Dr Oetker
- ☐ Nice and Easy
- ☐ Today
- ☐ Mama's pies
- ☐ Big Jack pies
- ☐ Fatima's frozen samosas
- ☐ Purity baby food
- ☐ Nestle baby food
- ☐ Hipp Organic baby food
- ☐ Squish baby food

33. **9.2 Please specify which take away store you and restaurants you frequently visit with your child (you may select more than 1).** *

Check all that apply.

- [ ] Not Applicable
- [ ] Mac Donalds
- [ ] KFC
- [ ] Romans Pizza
- [ ] Dominoes pizza
- [ ] Steers
- [ ] Burger King
- [ ] Wimpy
- [ ] Mug and Bean
- [ ] Spur
- [ ] Ocean Basket
- [ ] Mikes Kitchen
- [ ] Roco Mamas
- [ ] John Dory's
- [ ] Panarottis

34. **9.3 Please list other restaurants/take away shops that you visit frequently with your child.**

35. **9.4 What does your child eat when eating take aways or at restaurants?**

Thank you for your time

This information will be used to assess the overall healthiness of foods and to test these foods for their salt content. Feedback will be given to you via the school your child is in.

ANNEXURE IV: CERTIFICATE OF LANGUAGE EDITING

Mary Hoffman
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1939
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2 May 2018

To Whom It May Concern

This certifies that the following Master's dissertation has been edited for English language correctness and fluency. I trust that the corrections made have been applied after due consideration by the author of the document:

The healthiness of processed foods consumed by children in early childhood development centres in the North-West Province

by

Nadia Theron

Dissertation submitted in fulfilment of the requirements for the Master's degree in Nutrition in the faculty of Health Sciences, Centre of Excellence for Nutrition, North-West University

Mary Hoffman

(SATI Registration: 1001632)

ANNEXURE IV: ETHICS APPROVAL CERTIFICATE OF STUDY

NORTH-WEST UNIVERSITY
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Research Ethics Regulatory Committee
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ETHICS APPROVAL CERTIFICATE OF STUDY

Based on approval by **Health Research Ethics Committee (HREC)** on **08/11/2017**, the North-West University Research Ethics Regulatory Committee (NWU-RERC) hereby **approves** your study as indicated below. This implies that the NWU-RERC grants its permission that provided the special conditions specified below are met and pending any other authorisation that may be necessary, the study may be initiated, using the ethics number below.

Study title: **The healthiness of processed foods consumed by children in early childhood development centres in the North West Province**

Study Leader/Supervisor: Dr T van Zyl

Student: N Theron-22692096

Ethics number: N W U - 0 0 0 3 3 - 1 7 - A 1 - 0 1
(Institution / Study Number / Year / Status)

Status: S = Submission; R = Re-Submission; P = Provisional Authorisation; A = Authorisation

Application Type: Sub-study

Commencement date: 08/11/2017 **Risk:** Minimal

Approval of the study is initially provided for a year, after which continuation of the study is dependent on receipt of the annual (or as otherwise stipulated) monitoring report and the concomitant issuing of a letter of continuation.

Special conditions of the approval (if applicable):

- Provide the HREC with the final version of the unstructured food frequency questionnaire, which must be approved before implementing it in the study

General conditions:

While this ethics approval is subject to all declarations, undertakings and agreements incorporated and signed in the application form, please note the following:

- *The study leader (principle investigator) must report in the prescribed format to the NWU-RERC via HREC:*
  - *annually (or as otherwise requested) on the monitoring of the study, and upon completion of the study*
  - *without any delay in case of any adverse event or incident (or any matter that interrupts sound ethical principles) during the course of the study.*
- *Annually a number of studies may be randomly selected for an external audit.*
- *The approval applies strictly to the proposal as stipulated in the application form. Should any changes to the proposal be deemed necessary during the course of the study, the study leader must apply for approval of these amendments at the HREC, prior to implementation. Should there be any deviations from the study proposal without the necessary approval of such amendments, the ethics approval is immediately and automatically forfeited.*
- *The date of approval indicates the first date that the study may be started.*
- *In the interest of ethical responsibility the NWU-RERC and HREC retains the right to:*
  - *request access to any information or data at any time during the course or after completion of the study;*
  - *to ask further questions, seek additional information, require further modification or monitor the conduct of your research or the informed consent process.*
  - *withdraw or postpone approval if:*
    - *any unethical principles or practices of the study are revealed or suspected,*
    - *it becomes apparent that any relevant information was withheld from the HREC or that information has been false or misrepresented,*
    - *the required amendments, annual (or otherwise stipulated) report and reporting of adverse events or incidents was not done in a timely manner and accurately,*
    - *new institutional rules, national legislation or international conventions deem it necessary.*
- *HREC can be contacted for further information or any report templates via Ethics-HRECApply@nwu.ac.za or 018 299 1206.*

The RERC would like to remain at your service as scientist and researcher, and wishes you well with your study. Please do not hesitate to contact the RERC or HREC for any further enquiries or requests for assistance.

Yours sincerely,

Prof. Refilwe Phaswana-Mafuya
Chair NWU Research Ethics Regulatory Committee (RERC)