

**THE INFLUENCE OF SOCIO-DEMOGRAPHIC FACTORS ON  
THE NUTRITIONAL INTAKE OF OVERWEIGHT AND OBESE  
CHILDREN IN THE STELLENBOSCH AREA, WESTERN  
CAPE**

by  
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## **DECLARATION**

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**A P Kirsten**

**Date: 21 November 2011**

## ABSTRACT

**Introduction:** The worldwide increase in the prevalence of childhood overweight and obesity has been identified as a major threat to children's health and South Africa has not been spared. A child's food environment is constrained and shaped by their parents/carers who provide food based on own food preferences and food selections, which in turn are determined by the larger cultural, social and economic context. Risk factors for childhood obesity are not well established. Existing prevention strategies, focusing on late childhood and adolescence, are largely unsuccessful. There is however an increasing body of evidence that the early life environment is an important determinant of risk of obesity in later life.

**Aim:** To determine prevalence and socio-demographic risk factors associated with childhood overweight and obesity in the Stellenbosch area, Western Cape Province.

**Methods:** Cross-sectional, comparison study. A representative group of 638 children (aged 6-13 years) attending three randomly selected Stellenbosch primary schools were weighed and measured to calculate body mass index (BMI) using international obesity task force (IOTF) guidelines in the screening phase of the project to determine the prevalence of overweight and obesity. The comparison study phase identified 84 overweight and obese children and 84 children of normal weight (comparison group) to comprise a sample population of 168 children. Socio-demographic data were determined with a structured questionnaire and compared between the overweight/obese group and comparison group (normal weight) to identify associated risk factors and investigate the  $H_0$ .

**Results:** The prevalence of overweight and obesity in the sample of primary school children was 13% (n=84) as determined by BMI, of which 9% (n=57) were classified as overweight and 4% (n=27) as obese. Socio-economic factors including maternal employment hours (p=0.0462), family characteristics e.g. number of children in the household (p=0.0231), eating behaviour like consuming brown rice (p=0.0371), pork (p=0.0143), canola/olive-based margarine (p=0.0398) or poly-unsaturated margarine (p=0.0481), doughnuts (p=0.0280) and time spent doing sport (p=0.0450) were significantly associated with overweight or obesity.  $H_0$  were thus rejected.

**Conclusion:** The results suggest that maternal working hours, the number of children in the household, poor eating habits and time spent doing sport are important predictor variables for childhood overweight and obesity. Socio-economic status, infant feeding practices and family characteristics like marital circumstances, household number, and mother's age did not appear to play a role in the development of childhood overweight and obesity in this population. In light of this evidence, preventative initiatives should pro-actively promote healthy eating behaviour and physical activity to children at an early age, in particular girls. Involving families and schools in these initiatives is recommended as well as a national childhood obesity monitoring system to identify children at risk and tracking trends of childhood obesity in guiding evidence-based interventions to tackle this major health problem.

## OPSOMMING

**Inleiding:** Die wêreldwye toename in die prevalensie van kinder-oorgewig en vetsugtigheid is geïdentifiseer as 'n groot bedreiging vir kinders se gesondheid en Suid-Afrika word nie gespaar nie. 'n Kind se voedingsomgewing is beperk en word gevorm deur ouers of versorgers wat voedsel voorsien gebaseer op hul eie kos voorkeure en voedsel keuses, wat op sy beurt deur die groter kulturele, sosiale en ekonomiese konteks bepaal word. Risiko faktore vir kinder-vetsugtigheid is nie goed gevestig nie. Bestaande voorkoming strategieë, wat fokus op die laat kinderjare en vroeë adolessensie, is grootliks onsuksesvol. Daar is egter voortdurende toename in bewyse dat die vroeë lewensomgewing 'n belangrike bepalende risiko faktor is vir vetsugtigheid in latere lewe.

**Doelstellings:** Bepaling van prevalensie en sosio-demografiese risiko faktore wat geassosieer word met kinder-oorgewig en vetsugtigheid in die Stellenbosch area, Wes-Kaap Provinsie.

**Metodes:** Deursnit, vergelykende studie. 'n Verteenwoordigende groep van 638 kinders (ouderdom 6-13 jaar) skoolgaande by drie ewekansig geselekteerde Stellenbosch primêre skole was geweeg en gemeet om Liggaamsmassa Indeks (LMI), volgens die internasionale obesiteit werkgroep (IOTF) riglyne te bereken in die siftingsfase van die projek ter bepaling van prevalensie van oorgewig en vetsugtigheid. Die vergelykende fase het 84 oorgewig en vetsugtige kinders geïdentifiseer en 84 kinders met normale gewig (vergelijkende groep) ter samestelling van 'n steekproef populasie van 168 kinders. Sosio-demografiese data was verkry deur 'n gestruktureerde vraelys en vergelykings was getref tussen oorgewig/vetsugtige groep en vergelykende groep (normale gewig) ter identifisering van geassosieerde risiko faktore en ondersoek van die  $H_0$ .

**Resultate:** Prevalensie van oorgewig en vetsugtigheid in die steekproef van primêre skool kinders was 13% ( $n=84$ ) waarvan 9% ( $n=57$ ) geklassifiseer was as oorgewig en 4% ( $n=27$ ) as vetsugtig. Sosio-ekonomiese faktore soos moeders se werksure ( $p=0.0462$ ), familie kenmerke soos aantal kinders in 'n huishouding ( $p=0.0231$ ), eetgedrag nl. bruin rys ( $p=0.0371$ ), varkvlies ( $p=0.0143$ ), canola/olyf-gebaseerde margarien ( $p=0.0398$ ) of poli-onversadigde margarien ( $p=0.0481$ ), oliebolle ( $p=0.0280$ ) en tyd gespandeer aan sport ( $p=0.0450$ ) was beduidend geassosieer met oorgewig en obesiteit.  $H_0$  was dus verwerp.

**Gevolgtrekking:** Die resultate dui daarop dat moeders se werksure, aantal kinders in 'n huishouding, swak eetgewoontes en tyd gespandeer aan sport, belangrike voorspellers vir kinder-oorgewig en vetsugtigheid is. Sosio-ekonomiese status, baba-voedingspraktyke en familie kenmerke soos huwelikstatus, huishoudelike getal en moeders se ouderdom blyk nie 'n rol te speel in die ontwikkeling van kinder-oorgewig en obesiteit in hierdie populasie nie. Na aanleiding van hierdie bevindinge moet voorkoming inisiatiewe pro-aktief gesonde eetgewoontes en fisiese aktiwiteit in kinders aanmoedig reeds op 'n vroeë ouderdom, veral in meisies. Die betrekking van gesinne en skole in hierdie inisiatiewe word aanbeveel asook 'n nasionale kinder vetsugtigheids-moniteringstelsel om risiko kinders te identifiseer en die tendense van kinder-vetsugtigheid te volg in die begeleiding van navorsings-gebaseerde intervensies om hierdie belangrike gesondheidsprobleem aan te spreek.

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## **CONTRIBUTIONS BY PRINCIPAL RESEARCHER AND FELLOW RESEARCHERS**

The principal researcher, Anna Petronella Kirsten, developed the idea and the protocol. The principal researcher planned the study, undertook data collection without a research assistant, captured the data for analyses, analysed the data with the assistance of a statistician, Prof DG Nel, interpreted the data and drafted the thesis. Dr Debbi Marais and Ms Claudia Schubl provided input at all stages and revised the protocol and thesis.

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## LIST OF ABBREVIATIONS

<b>ADSA</b>	Association for Dietetics in South Africa
<b>VDSA</b>	Vereniging vir Dieetkunde in Suid Afrika
<b>BMI</b>	Body Mass Index
<b>CDC</b>	Centre of Disease Control
<b>DOE</b>	Department of Education
<b>FBDG</b>	Food Based Dietary Guidelines
<b>FFQ</b>	Food Frequency Questionnaire
<b>FISPGHAN</b>	The Federation of International Societies of Pediatric Gastroenterology, Hepatology, and Nutrition
<b>HIV</b>	Human Immunodeficiency Virus
<b>IOE</b>	Institute of Education
<b>IOTF</b>	International Obesity Task Force
<b>LMI</b>	Liggaamsmassa Indeks
<b>M-L</b>	Maximum-Likelihood
<b>NCHS</b>	National Centre for Health Statistics
<b>NFCS</b>	National Food Consumption Survey
<b>O</b>	Obese
<b>OW</b>	Overweight
<b>SA</b>	South Africa
<b>SES</b>	Socio-Economic Status
<b>TV</b>	Television
<b>UK</b>	United Kingdom
<b>USA</b>	United States of America
<b>WHO</b>	World Health Organisation
<b>WCED</b>	Western Cape Education Department

**CHAPTER 1**  
**INTRODUCTION AND LITERATURE REVIEW**

## 1.1 INTRODUCTION

Obesity is the most common health problem that children face today<sup>1-7</sup> and is rapidly becoming one of the most important medical and public health problems of our times. Its role as a health risk in adults has been well-recognised for some time but in the past little attention has been paid to obesity in childhood.<sup>8</sup>

Over the past 20 years, the prevalence of obesity in children has risen significantly worldwide.<sup>9</sup> An epidemic has occurred in recent years, beginning in the late 1980s in the United Kingdom (UK).<sup>10</sup> Obesity statistics from the British Medical Association showed that 14 million schoolchildren in the European Union were found to be overweight in 1999, of which 3 million were obese.<sup>11</sup>

Childhood obesity is becoming an issue of discussion around the world. Developed and developing countries are not spared from this health concern.<sup>12</sup> Many developing and middle-income countries face a transition from the current burden of poverty-associated infectious diseases to the double burden of both infectious and chronic (non-communicable) diseases,<sup>13-15</sup> thus suffering from similar problems to developed countries relating to over-nutrition and affluence.<sup>13</sup> South Africa (SA) is no different, with an increasing prevalence of overweight and obesity in children and adults. The finding that moderate stunting co-exists with overweight and obesity suggests that patterns of under- and over-nutrition in SA children are changing and might indicate the early stages of a complex nutrition transition.<sup>13</sup>

Few studies have been conducted in SA to determine prevalence rates of childhood obesity. In 1999 the SA National Food Consumption survey (NFCS) found prevalence was 3.7% for obesity and 6.7% for overweight, with the Western Cape Province having a overweight prevalence of 5%.<sup>16</sup> In a secondary analysis of anthropometric data from the NFCS (1999) using WHO growth standards<sup>17</sup> higher figures for stunting (>20%) and overweight/obesity combined (>30%) were shown, compared to the figures previously calculated with NCHS references. The International Paediatric Association has officially endorsed the use of the WHO standards describing them as an effective tool for detecting both undernutrition and obesity, thus addressing the double burden of malnutrition affecting populations on a global level.<sup>18</sup> The SA Department of Health has subsequently replaced the Road to Health Chart with the Road to Health booklet, which includes the WHO growth standards for weight-for-age, height-for-age and weight-for-height. This is a step in the right direction to address both stunting and overweight.

A study in SA primary school children aged 6-13 years, in 2001-2004, showed a higher prevalence of 7.2% for obesity and 28.4% for overweight. This study concluded that SA children are showing trends of obesity and overweight, similar to values in developed countries about 10 years ago.<sup>19</sup> Findings from studies indicate trends of overweight being higher in girls,<sup>13,19,20</sup> urban areas,<sup>19,20</sup> among children of well-educated mothers<sup>19,20</sup> and smaller households.<sup>20</sup>

With the rise in obesity prevalence in so many countries, it is clear that the environmental conditions for obesity expression are being created in large parts of the world,<sup>21</sup> but the evidence on risk factors for childhood obesity is limited at present<sup>10,22-23</sup> although awareness is increasing for the importance of the environment in early life.<sup>10</sup>

## 1.2 DEFINITION AND DIAGNOSIS OF OVERWEIGHT AND OBESITY IN CHILDREN

Controversy exists regarding the measurement and classification of obesity, especially in children. An ideal tool to assess obesity in children would simply and rapidly identify those with excess body fat who are at risk of morbidity.<sup>24</sup> These are the children who are most likely to experience co-morbidity, such as persistence of obesity<sup>24</sup> presence and clustering of cardiovascular risk factors<sup>24</sup> and psychological problems.<sup>10</sup>

The value of body mass index (BMI) as a measurement of childhood obesity has been evaluated in many clinical and anthropometric studies<sup>24</sup> and its effectiveness as a screening tool has been assessed by comparisons against reference measures of body fatness, such as Dual energy X-ray absorptiometry<sup>21</sup>, hydrodensitometry and dilution of the isotopes deuterium and oxygen-18.<sup>24</sup> Although skinfold thickness seems to be the ideal measurement in clinical settings, BMI (weight/height<sup>2</sup>) has been indicated as the measure of choice for public health purposes because of its reasonable reliability and validity and also its ease and comfort.<sup>8,25-27</sup>

The WHO, the Centre of Disease Control (CDC), the International Obesity Task force (IOTF) and many local health authorities recommend the use of BMI for classification of overweight in children, adolescents and adults.<sup>21</sup> It is a reliable index of relative body weight that – given its simplicity – is reasonably well correlated with adiposity. Although direct evidence relating BMI to health risks is scarce, it tracks well into adulthood, where consequences of overweight and obesity are well established.<sup>21</sup>

In the case of children and young people, BMI is not a static measure, but varies from birth to adulthood, and is different between boys and girls. BMI decreases from 1 to 6 years of age and then increases up until the teenage years and start of adulthood. Interpretation of BMI values in children therefore depends on comparisons with population reference data, using cut-off points in the BMI distribution (BMI percentiles). Despite this limitation, there is widespread international support for the use of BMI to define obesity in children as expressed in non-systemic reviews and consensus statements.<sup>24</sup>

Although there seems to be consensus developing around the use of BMI as the measurement tool of choice, there is not consensus about the cut off value to define obesity.<sup>8</sup> BMI by age reference charts have been available since the early eighties<sup>28</sup> and many countries have since constructed their own BMI charts, in some cases from existing data on height and weight.<sup>21</sup>

In the majority of published epidemiological work, overweight and obesity are defined as a BMI  $\geq 85^{\text{th}}$  percentile and  $\geq 95^{\text{th}}$  percentile for age and sex respectively<sup>24,29</sup> equivalent to a

standard deviation score of 1.64 or more.<sup>10,30,31</sup> A certain similarity exists between the National Centre for Health Statistics (NCHS), CDC and IOTF cut-off values<sup>32</sup> but the choice of the 85<sup>th</sup> and 95<sup>th</sup> percentile cannot be extrapolated to their reference charts, unless prevalence of overweight and obesity is 15% and 5% respectively in the reference population as well.<sup>21</sup> The WHO BMI chart uses the 85<sup>th</sup> and 97<sup>th</sup> percentile as cut-off points for overweight and obesity.<sup>33</sup> Other studies have used cut-offs between the 75<sup>th</sup> to 98<sup>th</sup> percentile without any convincing scientific basis.<sup>8,34</sup> A study by Kinra (2000) opted for the 98<sup>th</sup> percentile primarily for reasons of consistency and this is the suggested cut-off for obesity in the UK growth charts, which they have used to calculate their centiles.<sup>8,34</sup> These cut-off points conflict with the majority of international literature and it is important to maintain epidemiological definitions, which are consistent with current literature.<sup>24</sup>

An important disadvantage when making international comparisons or when evaluating historical trends is the plethora of criteria and techniques used to define overweight and obesity. Different criteria are often not compatible and could mask true differences between or within populations.<sup>21</sup> A more convenient and objective way to define overweight and obesity cut-off limits, in children, is to extrapolate WHO adult criteria on a growth chart. This approach was proposed by the IOTF working group and therefore adopted the 'international reference' by Cole *et al* (2000) for international use. Cole calculated cut-off limits from data resulting from six large national representative growth studies worldwide (Europe, the America's and Asia), and averaged the country specific cut-off limits to obtain a single list of reference values. These limits are the primary choice for comparison of different data sources on the prevalence of overweight and obesity, especially between countries and in cases also within countries (Table 1.1).<sup>21</sup>

**Table 1.1: International cut-off points for body mass index for overweight and obesity by sex between 2 and 18 years (adapted from Cole *et al.*, 2000)**

Age (years)	Body mass index 25 kg/m <sup>2</sup>		Body mass index 30 kg/m <sup>2</sup>	
	boys	girls	boys	girls
2	18.41	18.02	20.09	19.81
2.5	18.13	17.76	19.80	19.55
3	17.89	17.56	19.57	19.36
3.5	17.69	17.40	19.39	19.23
4	17.55	17.28	19.29	19.15
4.5	17.47	17.19	19.26	19.12
5	17.42	17.15	19.30	19.17
5.5	17.45	17.20	19.47	19.34
6	17.55	17.34	19.78	19.65
6.5	17.71	17.53	20.23	20.08
7	17.92	17.75	20.63	20.51
7.5	18.16	18.03	21.09	21.01
8	18.44	18.35	21.60	21.57
8.5	18.76	18.69	22.17	22.18
9	19.10	19.07	22.77	22.81
9.5	19.46	19.45	23.39	23.46
10	19.84	19.86	24.00	24.11
10.5	20.20	20.29	24.57	24.77
11	20.55	20.74	25.10	25.42
11.5	20.89	21.20	25.58	26.05
12	21.22	21.68	26.02	26.67
12.5	21.56	22.14	26.43	27.24
13	21.91	22.58	26.84	27.76
13.5	22.27	22.98	27.25	28.20
14	22.62	23.34	27.63	28.57
14.5	22.96	23.66	27.98	28.87
15	23.29	23.94	28.30	29.11
15.5	23.60	24.17	28.60	29.29
16	23.90	24.37	28.88	29.43
16.5	24.19	24.54	29.14	29.56
17	24.46	24.70	29.41	29.69
17.5	24.73	24.85	29.70	29.84
18	25	25	30	30

### 1.3 DETERMINANTS OF CHILDHOOD OVERWEIGHT AND OBESITY

The aetiology of overweight and obesity is complex and multi-factorial. Various social, biological and environmental determinants of obesity have been investigated previously.<sup>8</sup> Intrauterine life, infancy, and the preschool period (around the time of the adiposity or BMI rebound) have all been considered as possible critical periods during which the long-term regulation of energy balance may be programmed and could be related to later risk of obesity.<sup>10,21,35</sup>

The epidemiology of overweight and obesity strongly suggests that environmental determinants, particularly those found within families, are significant in both the aetiology and treatment of childhood obesity.<sup>20,36</sup> The family is the primary source of environmental factors that determine energy balance in young children. Several studies showed that risk factors for



weight gain in school-aged children are linked strongly to low physical activity and family environmental factors.<sup>36</sup> Thus the family and other social environment influences interact with genetic predispositions to childhood obesity.

### 1.3.1 Socio-economic Factors

The importance of socio-economic factors in the development of childhood obesity remains controversial. However, a comprehensive review of the relationship between childhood obesity and socio-economic status (SES) reports that about a third of studies show no relationship, a third of studies demonstrate increased obesity associated with low SES, and a third of studies demonstrate increased obesity associated with high SES.<sup>7</sup> Several authors have reported a significant inverse relationship between the development of obesity and markers of SES such as family income level, occupation status, maternal education as well as family size.<sup>7,36</sup>

Being born into a particular SES (based on parental occupation, parental education, a composite of the two or family income) cannot itself cause obesity. However, characteristics of socio-economic groups that are related to marital circumstances, health-related behaviours or lower cognitive stimulation that influence energy balance directly or indirectly may exacerbate a predisposition to obesity in populations already at high risk.<sup>36</sup> Adults of lower SES and those with lower education qualifications have less healthy diets.<sup>36</sup> Previous studies have suggested that the nutritional status of children is directly related to the educational status of the caregiver.<sup>20,37,38</sup>

The employment status of the parents determines whether adequate economic resources are available at household level, including cash to buy food. The level of income will determine the quantity and quality of the food purchased.<sup>16</sup> This is likely to be prominent in lower socio-economic groups where limited finances force the poor to buy more efficiently. These efficiencies often lead to the purchase of foods higher in energy (high in fat and sugar) to satisfy hunger; which are much cheaper per unit of energy than less nutrient-dense foods (like fruit and vegetables).<sup>8</sup> Other studies also indicate that adolescents and children of lower SES are less likely to eat fruit and vegetables<sup>7</sup>, and more likely to eat foods higher in total fat and saturated fat.<sup>7</sup> There is some evidence for decreased physical activity in poorer people<sup>8</sup> and that they are therefore less likely to participate in sport activities.<sup>36</sup> Hence, their children, if predisposed to adiposity, are likely to live in environments that promote obesity.<sup>36</sup>

In SA, groups of children (aged 1-3 years) have been found to be especially vulnerable to sub-optimal nutrition through socio-economic factors such as poverty or parents' lack of nutritional knowledge.<sup>19</sup> There is also a strong association between maternal education (as a proxy for SES) and childhood obesity.<sup>10</sup> It has been well-recognized that the educational status (level of schooling) of the mother has a direct relationship with the nutritional status of the child. Within the SA context, the 1999 NFCS found that improved maternal education was

associated with an increased prevalence of a child being overweight, especially for children living in formal urban areas.<sup>16</sup>

### **1.3.2 Home Environmental Factors on Food Consumption and Eating Patterns**

Home environments may affect children's energy balance in multiple ways. These environments affect diet composition via food availability, influence food preferences, help determine child-feeding practices, set behaviour social learning environment and alter other patterns of behaviour.<sup>36</sup>

#### **1.3.2.1 Food availability**

Parents and older siblings control young children's access to food. The type of food that is stored at home by parents and siblings influence the younger child's food consumption. Despite increased autonomy as the child ages, the family environment remains a major influence on diet and activity. It is the parents' responsibility to offer a variety of healthy food to children and minimize the availability of food that may promote the over consumption of energy. Meeting these responsibilities is especially important if there is susceptibility to obesity.<sup>36</sup>

#### **1.3.2.2 Food preference and child-feeding practices**

Parents should be in charge of what food is offered and when children are offered food. Children should be allowed to choose from food that they are offered and control the amounts they choose to eat.<sup>39</sup> Moreover, parental efforts to control the quality of food children consume or to encourage children to eat certain food generally produces the opposite choices. Imposition of stringent parental controls can potentiate preferences for high fat, energy-dense foods, limit a child's acceptance of a variety of food, and disrupt energy intake regulation by altering responsiveness to internal hunger and satiety cues.<sup>39</sup>

It is also known that children's preferences for the majority of food are shaped by repeated experiences with food. The predisposition for associative conditioning affects food acceptance patterns during the period of most intense development. This results in preference for food offered in positive contexts, while foods presented in negative contexts will become increasingly disliked via the learning of associations with the social and environmental contexts under which they are experienced. This suggests that parental and child-feeding practices play a causal role in the development of individual food preferences, food intake control, and perhaps in the aetiology of energy balance problems.<sup>36</sup>

#### **1.3.2.3 Social learning environment**

The family provides a major social learning environment for the child.<sup>36</sup> The family environment is where children first experience the social world: the place and time where they develop a sense of self and explore their prospects for the future.<sup>12</sup> Parents and other family members arrange a common, shared environment that may be conducive to overeating or a sedentary lifestyle. Certain behaviours, meal patterns and leisure activities that are

associated with the development and persistence of obesity are modeled and reinforced by parents and siblings.<sup>36</sup>

#### **1.3.2.4 Family structure and functioning**

Family structures, parenting styles, as well as intra-familial relationships and support may have a strong impact on eating, food preferences and the ability to regulate intake and exercise patterns in children. Lissau and Sorensen, in a study conducted from 1974-1984, found that the family structure (biological and non-biological parents and the number of siblings) did not significantly affect the risk of adult obesity. However, parental neglect during childhood greatly increased the risk of obesity in young children in comparison with those who enjoyed harmonious parental support. Neglected children will experience a greater risk of adult obesity than those who were cared for more responsibly. However, being an only child receiving overprotective parental support, or being well-groomed had no effect on this risk. This is independent of age, BMI in childhood, sex and social background.<sup>40</sup> Christoffel and Forsyth (1988) observed that families of children aged 1 to 10 years with severe obesity in very early childhood had the following features: family disorganization, mother and child separation, displacement of child care to others, maternal depression, denial of the growth abnormality, hostility towards health care providers and inconsistent medical follow-up.<sup>41</sup>

#### **1.3.2.5 Marital status**

Increased risk of obesity was also observed in single mother families.<sup>7</sup> In a UK prospective cohort study, children who lived with single mothers were significantly more likely to become obese after a 6-year follow-up, as well as children with non-working parents, children with non-professional parents, and children whose mothers did not complete high school.<sup>7</sup> The increased risk of childhood obesity associated with lower cognitive stimulation was demonstrated consistently among single mothers and minorities as well as those with the lowest income and education. Findings also supported a 2.2-fold increased incidence of childhood obesity in children residing in dilapidated living conditions, independent of parental education and occupation.<sup>7</sup>

#### **1.3.3 Effects of Modern Lifestyles**

As a result of complex social and economic influences, the eating patterns of toddlers and preschool children have changed significantly. Current-day adult eating patterns are greatly influenced by the pressures of modern lifestyle, and these in turn affect the way young children are fed,<sup>39</sup> with trends towards eating out and greater access to high energy dense foods. Data from the the UK National Food Survey (2000)<sup>24,42</sup> show that although household energy intakes have fallen since 1970 there has been a concomitant change in the type of food consumed.<sup>24</sup> In particular there has been an increased intake of high fat foods. These are readily available, very palatable and energy-dense, but may not satisfy the appetite as quickly as high carbohydrate foods.<sup>31</sup>

Family life has also changed a lot over the past two decades, with trends towards eating out and greater access to entertainment media than previously. Television, computers, video games, cell phones and movies encourage a sedentary lifestyle. Children consume more energy when meals are eaten at restaurants than at home. Eating dinner together as a family seems to decrease television viewing and improve diet quality e.g. less saturated and trans fat, less fried food, lower glycaemia load, more fibre, fewer soft drinks, more fruit and vegetables. Moreover social support from parents and others correlate strongly with participation in physical activity. In view of these results relating psychosocial factors to dietary and physical activity behaviours that affect energy balance - it is not surprising that children who suffer from neglect, depression or other related problems are at substantially increased risk for obesity during childhood and later in life.<sup>9,43</sup>

There may be a wider societal and political context to these changes. These include the loss of school playing fields; the lack of a safe environment in which to walk or cycle to school or for physical play at home; transport policies that favour driving above cycling or walking; a food industry that targets children with advertisements for high energy foods, and health promotion policies that fail to target appropriate dietary change or address issues of health inequality.<sup>24</sup>

#### **1.3.3.1 Mothers Working**

Across the population groups, a high proportion of mothers of young children return to work soon after childbirth for economic reasons. This has an impact on the initiation and duration of breastfeeding and previous research has indicated that early infant feeding practices may be contributing to the problem of childhood obesity.<sup>44</sup> Grandparents and other family members who in the past might have provided childcare and support often no longer live close by. This and parents, in particular mothers, working longer hours has resulted in young children eating many meals away from home and a greater reliance on child-minders and nurseries to provide meals.<sup>45</sup> Thus modern lifestyles mean that many toddlers eat in day-care settings away from the family and often eat commercially pre-prepared foods.<sup>39</sup>

There are also a larger percentage of single-parent families these days of which woman usually head most and women are therefore the main caregivers. In these female-headed households and where women are employed outside the home there is generally a large workload if their workload is not shared, resulting in less time for food preparation and feeding of young children.<sup>19</sup> At home, mealtimes are nowadays less likely to be family occasions and often rely on fast food, eating out or commercially pre-prepared easy meals designed for microwave cooking. This in some cases could translate into, lower income, with less money available for food or use of cheap and easy meals. Mothers' employment however, has not been associated with poorer dietary intakes for their children.<sup>46,47</sup>

### 1.3.3.2 Breastfeeding

One of the factors known to be associated with not breastfeeding and with early breastfeeding cessation is circumstances that make breastfeeding difficult such as going back to work<sup>45</sup>, insufficient maternity leave as well as mother and child unfriendly working environment. This then means that mothers resort to bottle feeding of infant formula. The initiation and the duration of breastfeeding may reduce the risk of later life overweight and obesity, in addition to the other benefits of breastfeeding. Since 2000, 16 studies regarding this issue have been published – some have found a protective effect, while others have not.<sup>48</sup> The conclusions drawn from these data regarding the potential protective effect of breastfeeding on childhood obesity diverge.<sup>48</sup> A series of meta-analyses of observational studies consistently found that breastfeeding reduces the odds ratio for obesity at school age by about 20%, relative to formula feeding, after adjustment for biological and socio-demographic confounding variables.<sup>49-52</sup> Consistent with a possible causal relationship, some studies found an inverse dose response relation between breastfeeding duration and later obesity risk. While observational studies cannot fully exclude residual confounding, biologically plausible hypotheses exist for a protective effect of breastfeeding.<sup>52</sup>

Children who were bottle-fed seem to be at greater risk of obesity later in childhood than those who were breastfed.<sup>54</sup> The explanation for this finding could relate to permanent physiological changes caused by some intrinsic factor unique to human milk or to psychological factors, such as locus of control over feeding rate or taste preferences.<sup>9,21</sup> The Early Protein Hypothesis indicates that high protein supplies in excess of metabolic requirements with conventional infant formulae enhances the concentrations of insulinogenic amino acids, release of insulin and insulin like growth factor 1 (IGF-1), and thereby increases both early weight gain and later obesity risk.<sup>55,56</sup> In a study by Reilly (2005), potential risk factors that were not independently associated with the risk of obesity in childhood included timing of introduction of complementary feeding, number of siblings and maternal age.<sup>10</sup> Reilly did not observe an independent protective effect of exclusive breastfeeding on obesity despite strong associations, and in contrast to previous studies.<sup>10</sup>

## 1.4 CONSEQUENCES OF CHILDHOOD OVERWEIGHT AND OBESITY

Obesity in childhood has serious medical and psychological consequences.<sup>57</sup> These consequences of childhood obesity are severe and wide ranging, and can manifest themselves almost immediately or may develop later on during childhood. Of immediate concern to the child is the negative psychological impact of the teasing and isolation that tends to be associated with being overweight.<sup>20,58</sup> This influences a child's well-being, with children as young as five developing low self-esteem and negative body image.<sup>57</sup> Note that psychosocial consequences probably depend on the social-cultural environment of the child, and different results can be expected in different populations.<sup>59</sup>

Research shows a twofold increase in the rate of cardiovascular disease and hypertension and a threefold increase in Diabetes mellitus in obese children compared to normal weight

children.<sup>57,60</sup> There is considerable evidence that obesity in childhood creates the metabolic platform for adult cardiovascular disease and that obesity is an important determinant of insulin resistance in children.<sup>36</sup> Results from one particular study found that excess body weight was associated with 96% of children presenting with type II Diabetes mellitus.<sup>58</sup> Later in life there is a higher risk of heart disease, asthma, osteoarthritis and some cancers, among other conditions.<sup>61</sup>

The longer a child has been overweight, the more likely that the overweight state will continue into adolescence and adulthood.<sup>60</sup> Since obesity in childhood appears to predispose a child to medical problems as an adult, it is important to establish a healthy eating pattern early in life.<sup>23</sup> The first five years are particularly important, as this is the period in which children acquire many of their physical attributes and habits.<sup>61</sup>

### **1.5 PREVENTIVE STRATEGIES OF CHILDHOOD OVERWEIGHT AND OBESITY**

It is well known that prevention is better than cure. The rationale for intervening in the early years and preventing obesity in childhood is the key to addressing the worldwide obesity epidemic. As described previously, lifestyle choices originate in the very early years of life and many of the social and environmental characteristics that has become part of a normal way of life has influenced this very vulnerable phase of life and may be contributing to the growing levels of childhood obesity. It is assumed that modifying the current social, cultural and economic food environment is essential in taking action against childhood obesity. Unfortunately, there is insufficient evidence that previous and current proposed interventions are effective.<sup>62</sup>

The 2005 Cochrane Review by Summerbell *et al.* on the prevention of obesity in children included a number of school-based interventions.<sup>63</sup> Only one of the three studies reviewed was a long-term study (intervention lasting more than 12 months) while the majority of studies were short term.<sup>63</sup> The studies that looked at diet or physical activity approaches, indicated a small but positive impact on BMI status and majority of the included studies reported some improvement in diet or physical activity.<sup>63</sup> Similar results were observed in a series of systemic reviews focusing on interventions related to physical activity and nutritional intake in children and young people.<sup>64,65</sup> A more optimistic view was provided by Doak *et al.* in 2006,<sup>66</sup> who reported that almost all of the published school-based interventions were actually effective. Unfortunately, it was not indicated which interventions were successful and neither was any distinction made between those most and least likely to be effective.<sup>62</sup> The review did indicate that interventions that focused on a single behavior were more effective than interventions targeting both diet and physical activity.<sup>62</sup>

Limited or no success was seen in interventions that focused only on the education of communities and individuals about behaviour change<sup>5,67</sup> due to environmental factors present. The environment in many communities provides very little support in promoting healthy food choices or to be less sedentary and more physically active.<sup>69</sup> The Federation of

International Societies of Paediatric Gastroenterology, Hepatology, and Nutrition (FISPGHAN), obesity working group's 2008 report on obesity in childhood and adolescence, suggested prevention strategies to address physical activity and the type of food eaten. These include town planning policies, creating play areas or other recreation areas to encourage physical activity, the regulation of food marketing that is specifically aimed at children as well as the food and drinks provided at schools, pricing and availability of food and to improve the quality of children's diet like encouraging the intake of fruit and vegetables.<sup>69</sup> Singapore's "Trim and Fit" program is an example of a nationwide intervention that appeared to prevent obesity. This program advocates healthier diets and improved physical fitness in primary and secondary schools. There was a 2% reduction in the prevalence of obesity in children aged 11 to 16 years.<sup>70</sup> Observational studies indicated that interventions geared towards young adults<sup>71</sup> at risk of becoming obese, based on risk factors and anthropometrical measures, instead of targeting a whole population have been successful.

Prevention studies targeting the physical environment to modify energy input and output is regarded as the ideal for preventing childhood obesity. Many overweight and obesity prevention studies were performed in the past but enjoyed limited success. In some instances the results was not published in peer-reviewed literature due to the fact that they weren't positive. In reality, research on childhood overweight and obesity prevention has shown that very little is known about effective intervention strategies.<sup>62</sup>

## **1.6 CONCLUSIONS AND RATIONAL FOR THE STUDY**

Obesity is common in children and adolescents and its prevalence is still increasing, but risk factors for childhood obesity are not well established. Existing prevention strategies, focusing on late childhood and adolescence, are largely unsuccessful.<sup>16,62</sup>

Parent-child interactions and the home environment can affect behaviours related to risk of obesity.<sup>9</sup> Socio-economic status, parents education and job, family size, parental weight, number of obese family members, marital status, parental style, intra-familial relationships, communication and support, as well as eating and activity patterns can all play an important potential role in the aetiology of obesity.<sup>36</sup> Parent eating styles and child feeding practices shape children's eating behaviour. Children depend on their parents to provide food and the food environment is constrained and shaped by the parents' own food preferences and food selections, which in turn are determined by the larger cultural, social and economic context.<sup>46</sup>

The role of the home environment in the development of childhood obesity has been recognised for a long period of time; nonetheless, few studies have documented the extent to which the home environment contributes to childhood obesity.<sup>7</sup> There is, however, an increasing body of evidence that the early life environment is an important determinant of risk of obesity in later life.<sup>10</sup>

Previous dietary studies in SA predominantly focused on childhood undernutrition since it has been regarded as one of the major health problems in the country (e.g. stunting) and already

receives special attention in terms of policy and intervention strategies.<sup>19</sup> However, the secondary analysis of the data from the NFCS suggest that overweight/obesity outweighs the problem of stunting. Moreover, it will be most unwise to overlook the looming importance of overnutrition since recent evidence suggest that stunted children are up to seven times more likely to become obese adults, when compared with children who had normal growth patterns in their childhood.<sup>16</sup> A study conducted in 2006 concluded that SA primary school children, aged 6-13 years, are showing trends of obesity and overweight, similar to values in developed countries about 10 years ago<sup>21</sup> and that the causes required further investigation. The WHO recommends that developing countries monitor these trends, particularly the co-existence of stunting and overweight in children, since these are risk factors for disease in adulthood.<sup>10,13</sup>

Bruch (1975) best summarised the importance of the family environment approximately a quarter of a century ago, stating: "*To understand the obese child, one needs to remember that he accumulated his extra weight while living in a family that, wittingly or unwittingly, encouraged overeating and inactivity.*"<sup>7</sup>

This study could provide evidence for a possible association between SES and the influence of the home environment on childhood obesity in the Stellenbosch area, Western Cape Province. Due to the environment being a possible determinant of obesity risk in later life it therefore suggests that several influences in early life might be suitable targets for future obesity prevention interventions.<sup>10</sup> This study may therefore identify these targets for provincial and possible SA interventions.



## **CHAPTER 2 METHODOLOGY**

## **2.1 RESEARCH PROBLEM**

This study investigated the association between the home environment and socio-economic factors and the occurrence of childhood overweight and obesity in the Stellenbosch area, Western Cape.

## **2.2 AIM AND OBJECTIVES**

The aim of the study was to determine the prevalence of overweight and obesity in children in the Stellenbosch area of the Western Cape and identify associated risk factors.

### **2.2.1 Specific Objectives**

The objectives of the study were to:

1. Determine the prevalence of overweight and obesity in children in the Stellenbosch area.
2. Assess the strength of the association of SES (based on family income, parental employment and education) and family characteristics (based on marital circumstances) as risk factors in overweight and obese children in the Stellenbosch area.
3. Assess the strength of the association of breastfeeding as protective factor in overweight and obese children in the Stellenbosch area.
4. Assess the strength of the association of dietary patterns and eating behaviour as risk factors in overweight and obese children in the Stellenbosch area.
5. Assess the strength of the association of a sedentary lifestyle as a risk factor in overweight and obesity children in the Stellenbosch area.

The following null hypotheses ( $H_0$ ) were tested:

1. Poor socio-economic and family environmental status is not associated with the development of childhood overweight and obesity in the Stellenbosch area.
2. Healthy eating behaviour and dietary patterns are not protective against the development of childhood overweight and obesity in the Stellenbosch area.
3. Sedentary lifestyle is not associated with the increased risk of childhood overweight and obesity in the Stellenbosch area.

## **2.3 STUDY DESIGN**

The study was designed as a retrospective case-control, analytical study with 2 phases i.e. a screening phase and the case-control study phase. The study results were however, statistically analysed as a cross-sectional, comparison study with 2 phases i.e. a screening phase and the group comparison study phase due to the diverse characteristics of the respondents that made it impossible to match them in a case-control design.

## **2.4 STUDY POPULATION**

The study population consisted of children aged 6-13 years attending primary schools in the Stellenbosch area.

The researcher contacted the Department of Education (DOE) regarding the details of all the primary schools within the Stellenbosch area and obtained permission from the Western Cape Education Department (WCED) to conduct the study (Appendix A and B). The list of all the primary schools in the Stellenbosch area was then used to stratify the 19 primary schools into three strata i.e. high (n=4), medium (n=6) and low (n=9) SES group, based on annual school fees paid as a proxy for SES (Table 2.1). Two schools from each SES group were randomly selected by using random number tables and a random starting point to provide a socio-demographic representative study population. One additional school from the lower SES group was randomly selected for the pilot study.

After permission was obtained from the WCED, the individual schools were approached to participate in the research project (Appendix C). Both schools randomly selected from the high as well as medium socio-economic group were unwilling to participate in the research project and the researcher had to contact the WCED again (Appendix D) and obtain permission (Appendix E) to conduct the research project in alternative randomly selected schools (Table 2.1).

**Table 2.1: List of primary schools in the Stellenbosch area, stratified according to SES groups indicating schools randomly selected for the study and pilot study**

High SES group	Medium SES group	Low SES group
AF Louw	Cloetesville	<b>Devon Valley (RS)</b>
<b>Eikestad (RS)</b>	<b>Idasvallei (RS)</b>	JJ Rhode
<b>Rhenish (RS)</b>	<b>*Pieter Langeveld (RS)</b>	<b>*Koelenhof (pilot study)</b>
<b>*Stellenbosch (RS)</b>	<b>Rietenbosch (RS)</b>	Lynedoch
	St. Idas	<b>*PC Petersen (RS)</b>
	Dorothea	Raithby
		Tonko Bosman
		Vlottenburg
		Weber Gedenk

*The schools randomly selected are indicated by (RS) and those willing to participate are indicated by (RS) and a star\**

#### 2.4.1 Sample Size

To determine sample size, the calculation was started with the expected sample for the second phase of the project. Thirty cases and 30 controls were seen as practically implementable for this phase of the project. Using the prevalence of 5% overweight children as found in the NFCS in the Western Cape for children aged 1 to 9 years<sup>16</sup>, a sample of 720 children was required for the screening phase of the study. This would indicate 120 children in each of the three selected schools. It was expected that selecting one class per grade per school should provide a sufficient sample size.

### 2.4.2 Selection of Sample

Once information from schools agreeing to participate had been provided regarding the number of classes in grades R to 7, one class per grade was randomly selected by using random number tables and a random starting point for each school. A total number of 24 classes were included. All children in that selected class that complied with the inclusion criteria were included in the screening phase of the project.

Inclusion criteria for children that took part in the screening phase were between the ages of 6 and 13 years, from both sexes, attended the randomly selected schools and were present on the day of screening. The children included were required to assent to partake in the study and had to be able to read and understand English or Afrikaans (randomly selected schools were in predominantly English or Afrikaans-speaking areas).

The comparison phase of the study included 2 groups according to their anthropometric measurements and classification. Overweight/obese group included all subjects with a BMI above the cut-off point as defined by Cole *et al* and IOTF for overweight and obesity<sup>†</sup>. Children in the comparison group were paired according to sex and age (within 1 year of age category) with children with a BMI of below the cut-off points in the same grade and class. This was done according to quota sampling.

## 2.5 METHODS OF DATA COLLECTION

The first phase of research involved the anthropometric screening of the children to determine their anthropometric status, enabling the prevalence of overweight and obesity to be determined. The second phase of the research followed a cross-sectional comparison design. Children that had been classified as overweight or obese comprised the overweight/obese group and individuals with a BMI of below the cut-off points paired for sex and age were assigned to the comparison group.

### 2.5.1 Anthropometric Screening Phase

The investigator arranged visits to the 3 randomly selected schools, once permission was provided, to allow the anthropometric measurements to be taken. All children complying with the inclusion criteria and giving verbal assent were weighed, measured and their BMI plotted

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<sup>†</sup> In the absence of local BMI reference charts, IOTF international cut-off points for overweight and obesity can be used. These do not allow positioning a child within its contemporaries e.g. no percentile position or SD score, and apply only to overweight and obesity. The IOTF cut-off points are however the first choice to make international comparisons.<sup>21</sup> Previous studies performed in SA used the two most common methods currently available for assessing over-nutrition (as specified by overweight and obesity), the WHO/NCHS and IOTF methods.<sup>7,16</sup> Based on the current literature and IOTF recommendations it is advisable to apply internationally accepted measures applicable in cross-cultural settings<sup>13,72</sup> Thus, for the purposes of this study overweight and obesity were defined by making use of the method described by Cole *et al*/using BMI cut-offs, namely curves for children corresponding to adult overweight of 25kg/m<sup>2</sup> and 30kg/m<sup>2</sup> for obesity.<sup>13,21,72-75</sup>

on the BMI chart for classification. An information leaflet was provided in both English (Appendix F) and Afrikaans (Appendix G) and given to each child to explain the details of the project to ensure an informed decision before giving assent.

Anthropometrical measurements were performed by the researcher using standard procedures. Weight was measured to the nearest 100g (0.1kg) using an electronic scale, which was calibrated before use. The children were measured twice, with the average calculated, without shoes and wearing minimal clothing. Children were instructed to stand still and upright, with mass equally distributed between the feet, looking straight ahead until the scale reading stabilised.<sup>16,21</sup>

To measure height, a height measure stand was used with increments of 0.5cm and each child was measured twice without shoes, with the average calculated. They were instructed to stand with their back against the measuring stand, shoulders relaxed with shoulders, buttocks and heels touching the back of the stand, arms relaxed at the sides, head raised and looking forward (Frankfurt plane). Palms turned inwards, resting on the thighs, legs straight with feet flat on the floor. The height measurement was defined as the distance from the floor to the vertex, in the mid-sagittal plane. The measured value was recorded to the nearest 0.1cm.<sup>16,21</sup>

BMI ( $\text{kg/m}^2$ ) was then calculated from the height (m) and weight (kg) measurements obtained from each child.

### **2.5.2 Comparison study phase to determine risk factors of childhood obesity**

A socio-demographic, behaviour and semi-quantified food frequency questionnaire (FFQ) was used to determine the SES, eating behaviour, family characteristics and food consumption of the overweight/obese group and their paired comparison group. Children received the questionnaires in an envelope (to ensure confidentiality) to be completed by the child's carer. The questionnaire was accompanied by an information leaflet explaining to the parents that by completing and returning the questionnaire they consented to their child participating in this phase of the study. The leaflet was available in English (Appendix H) and Afrikaans (Appendix I). Furthermore, a leaflet on healthy eating and the contact details of the Association for Dietetics for South Africa (ADSA) (should a parent wish to consult a dietitian following the completion of the study) were included with the questionnaires given to the participants. The information on healthy eating was based on the SA food based dietary guidelines (FBDG's) and was available in English (Appendix J) and Afrikaans (Appendix K). Parents/carers were requested to return the completed questionnaires to the schools in the envelope supplied, by the end of the 3<sup>rd</sup> school semester.

The questionnaire was available in English (Appendix L) and Afrikaans (Appendix M) and included five sections:

1. Socio-demographic factors, including two open-ended questions, seven close-ended questions with categorical answers
2. Family characteristics, including two open-ended questions, eight close-ended questions with categorical answers
3. Previous eating habits, including two open-ended questions, 12 close-ended questions with categorical answers
4. Lifestyle, including, four close-ended questions with categorical answers and one attitude question using a 10-point Likert scale indicating level of agreement or disagreement to statement
5. FFQ, including close-ended questions with nine response categories for frequency

#### **2.5.2.1 Socio-demographic and family characteristics sections of the questionnaire**

Information on SES, parental employment, parental education and household income was provided by completing questions on marital status, indicating maternal age, education level of both parents, indicating current employment status, household income as well as income generators and household composition.

#### **2.5.2.2 Eating habits section of the questionnaire**

The amount of money spent weekly on food; mealtimes - if eaten together and where meals are consumed, provided information on feeding practices. Information on breastfeeding and complementary feeding was obtained by indicating total amount of months exclusively breastfed.

#### **2.5.2.3 Lifestyle section of the questionnaire**

Sedentary lifestyle was assessed by asking questions pertaining to hours spent as 'screen-time' i.e. watching television and computer/games usage during schooldays and on the weekends. Each caregiver also needed to rate their child's activity levels on a scale of 0-10.

#### **2.5.2.4 FFQ section of the questionnaire**

The FFQ previously used in the 1999 NFCS was shortened by reducing the number of food options per section and simplifying the portion sizes for the purposes of this study to measure usual intake. The FFQ was face-validated during the pilot study (Appendix L and M, Questions 1-15). The diet history questionnaire, developed by the European Prospective Investigation into Cancer and Nutrition, served as an additional guideline in adapting the NFCS FFQ.<sup>77</sup>

The FFQ measures a participant's usual food intake during the previous year and contains a list of 132 foods divided into the following categories:

- Grains, cereal and cereal products
- Dairy products
- Fruit and Vegetables
- Meat, Fish, Chicken and Soya products

- Added sugar
- Dietary fat

For each item on the list, participants were asked to indicate their usual consumption, choosing from nine frequency categories. The categories ranged from "*never or less than once/month*" to "*6 times per day*". For each food item, an average portion or serving was specified in terms of natural (e.g. apple, slice of bread) or household units (e.g. glass, cup, spoon).

An information session was offered to be arranged at the participating schools to address any queries and concerns as well as assist parents with the completion of the questionnaires. However the participating schools felt that this wasn't necessary and unpractical, therefore contact details were made available for parents to contact the researcher if there were any queries.

## **2.6 PILOT STUDY**

A pilot study was conducted in May 2009 at a seventh randomly selected primary school and this school was excluded from the final study population. The purpose of the pilot study was to face validate the questionnaires and to test the logistics of conducting the study. Any problems encountered or refinements identified for the questionnaire were addressed and altered before the implementation of the research project.

## **2.7 DATA ANALYSIS AND STATISTICS**

Descriptive statistics were used to discuss the objectives of the study by means of Microsoft Excel® spreadsheets. Data was captured electronically and controlled for precision of data transfer with regular cross-referencing. Data was analysed by the Centre for Statistical Consultation using Statsoft Inc. (2011) STATISTICA (data analysis software system), version 10.0. [www.statsoft.com](http://www.statsoft.com).

Descriptive summary statistics such as frequencies, means, medians and standard deviations was used to describe the characteristics of the study population i.e. parent marital status and family characteristics, parental education, employment and household income, infant feeding and complementary feeding practices as well as dietary patterns and eating behaviour. Appropriate inferential statistics was used to determine relationships and associations between variables.

When continuous variables were compared to other continuous variables, regression or multiple regression analysis was used (like Spearman rank correlations). Appropriate scatter plots of the variables involved was given and normal probability plots was constructed to test for normality of residuals where required in the particular analysis.

When continuous variables were compared vs. nominal variables, analysis of variance was used. If the residuals were not normally distributed appropriate non-parametric methods like the Mann-Whitney test and Kruskal-Wallis test was used.

Where ordinal was compared vs. nominal variables non-parametric methods was used (like the Mann-Whitney test or the Kruskal-Wallis test) and where nominal variables was compared to other nominal variables appropriate contingency tables was constructed and categorical data analysis (Chi-square tests e.g. maximum-likelihood (M-L) Chi-square test) was used. A p-value of  $<0.05$  was used to indicate the significance of the results. Missing data was excluded per variable.

## **2.8 ETHICAL CONSIDERATIONS**

### **2.8.1 Ethical Approval and Permissions**

A research protocol for this study was submitted to and approved (Ref No. N08/08/232) by the Health Research Ethics Committee, Faculty of Health Sciences, Stellenbosch University (Appendix N). Permission to perform the research was obtained from the WCED (Appendix B, E) as well as individual primary schools in the Stellenbosch area, who were willing to participate.

### **2.8.2 Informed Consent**

Children participating in the initial screening phase of the study were required to give verbal informed assent, before being included in the study (parental consent was not required for this phase). In the second, comparison phase of the study, participation was voluntary and each study participants' parent/caregiver was given the opportunity to waive consent for their child to partake in the study by not completing the questionnaire which was available in English and Afrikaans. As parents/caregivers were completing the questionnaires on the child's behalf and no identifying data, other than the group was available, it was accepted that consent was implied with completion and returning of the questionnaire.

### **2.8.3 Patient Confidentiality**

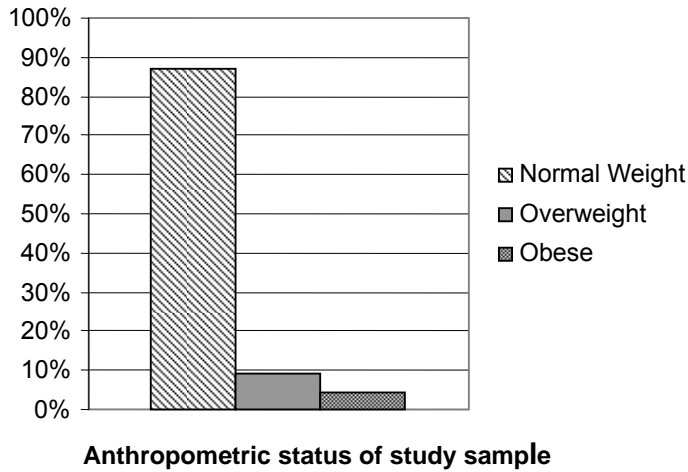
All questionnaires and study participants' names and details were kept anonymous throughout the study and thereafter. The participant was ensured of confidentiality by means of the informed consent leaflet. Information provided to the researcher was only used for the specified study, and would not be shared for any other purposes or projects.



## **CHAPTER 3 RESULTS**

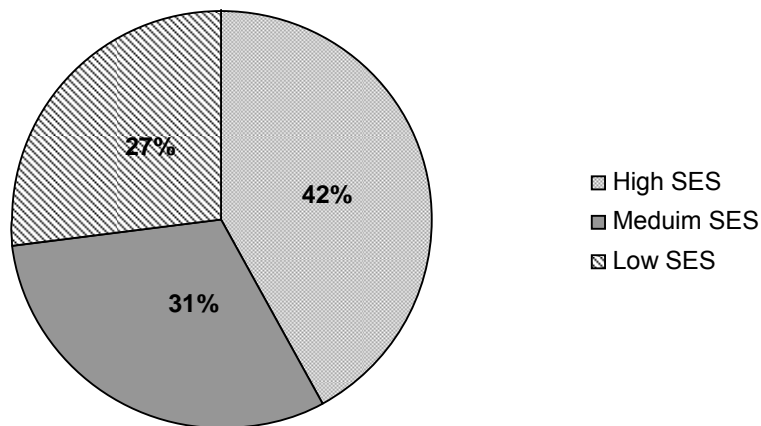
### 3.1 PREVALENCE OF OVERWEIGHT AND OBESITY

A total of 638 children who met the inclusion criteria and gave verbal assent, were weighed and measured during the anthropometrical screening phase of the study in the 3 randomly selected schools. The prevalence of overweight or obesity, BMI above the cut-off point as defined by Cole *et al* and IOTF, in this sample of primary school children (n=638) was 13% (n=84), of which 9% (n=57) were classified as overweight and 4% (n=27) as obese (Figure 3.1).



**Figure 3.1: Anthropometric status of primary school children in the Stellenbosch area, Western Cape (N=638)**

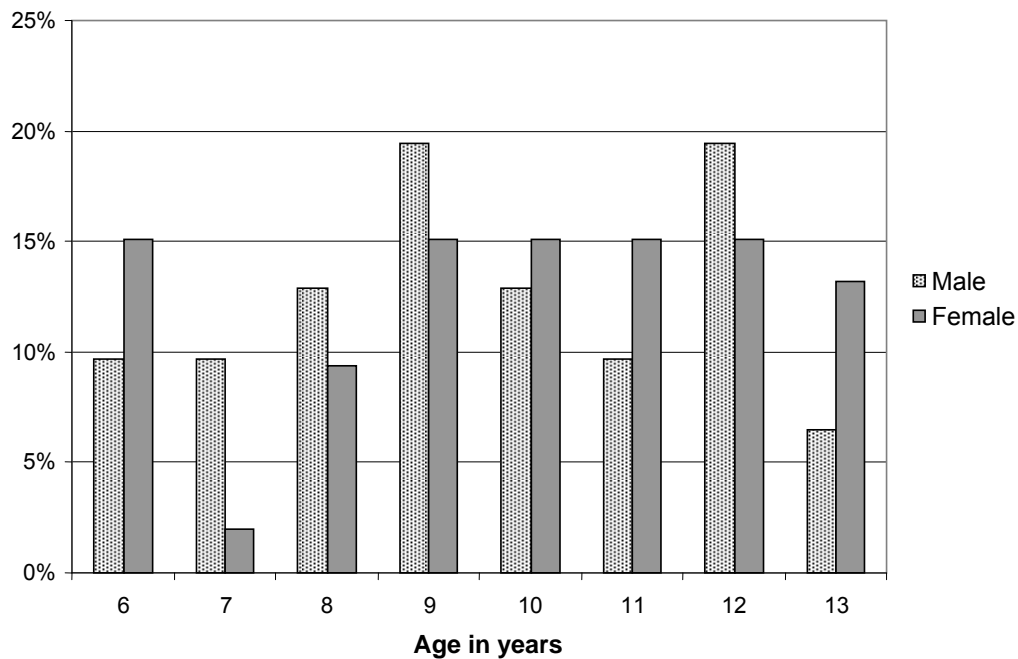
Within the sample, 38% (n=240) of children were in the low SES group, 34% (n=219) in the medium SES group and 28% (n=179) in the high SES group. Of the 84 children that were identified as overweight and obese, 42% (n=35) were in the high SES group, 31% (n=26) in the medium SES group and 27% (n=23) in the low SES group (Figure 3.2). The prevalence of overweight and obesity was highest in the high SES group, however no association was found between anthropometric status and SES ( $p=0.2998$ , Chi-Square test).



**Figure 3.2: Percentage distribution of overweight/obese group according to SES groups in primary school children in the Stellenbosch area, Western Cape (N=84)**

Although a higher prevalence of overweight and obesity was found in girls (63%, n=53) compared to the 37% (n=31) in boys, there was no association between anthropometric status and sex ( $p=0.9862$ , Chi-Square Test).

The prevalence of overweight and obesity was highest in the 9 (17%, n=14) and 12 year olds (17%, n=14), and lowest in the 7 year olds (5%, n=4) when data for girls and boys were combined (Figure 3.3). However no association was found between anthropometric status and age ( $p=0.7390$ , Mann-Whitney U Test).



**Figure 3.3: Percentage distribution of overweight/obese group according to sex in the different age-groups of the primary school children in the Stellenbosch area, Western Cape (N=84)**

### 3.2 RISK FACTORS ASSOCIATED WITH OVERWEIGHT AND OBESITY

#### 3.2.1 Sample Characteristics

During recruitment for the comparison phase of the study, children classified as overweight/obese were paired regarding sex and age with subjects with a BMI below the cut-off points (comparison group). A total number of 168 questionnaires, 84 in the overweight/obese group and 84 in the comparison group, were sent out during September 2009.

There was a response rate of 27% (n=45), which included 53% (n=24) overweight/obese children and 21 (46%) children in the comparison group (Table 3.1). Of the respondents, twenty seven percent (n=12) were in the high SES group, 49% (n=22) in the medium SES group and 24% (n=11) in the low SES group.

**Table: 3.1: Responses per SES group in the comparison study phase of primary school children in the Stellenbosch area, Western Cape (N=168)**

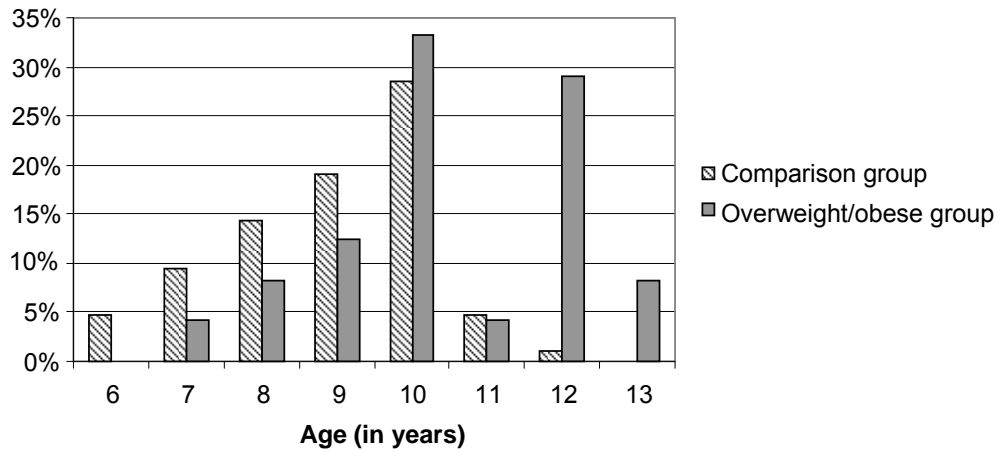
Primary schools	Questionnaires sent out (n=168)		Questionnaires returned (n=45)	
	Overweight/obese group	Comparison group	Overweight/obese group	Comparison group
High SES	35	35	4	8
Medium SES	26	26	12	10
Low SES	23	23	8	3
<b>Totals</b>	<b>84</b>	<b>84</b>	<b>24</b>	<b>21</b>

The distribution of anthropometric status of the respondents was 20% (n=9) obese, 33% (n=15) overweight and 47% (n=21) weight below the cut-off points (Table 3.2). More than two-thirds (69%) of the comparison phase sample were girls. In the group of respondents, 58% of the girls and 42% of the boys were overweight and obese. There was no association between anthropometric status and sex ( $p=0.3886$ , Mann-Whitney U Test).

**Table 3.2: Prevalence of overweight and obesity of respondents according to sex in the comparison study phase of primary school children in the Stellenbosch area, Western Cape (N=45)**

Sex	Comparison group (n=21)	Overweight/obese group (n=24)		Total
	Normal weight	Overweight	Obese	
<b>Female</b>	13	11	7	31
<b>%</b>	41.94%	35.48%	22.58%	69%
<b>Male</b>	8	4	2	14
<b>%</b>	57.14%	28.57%	14.29%	31%
<b>Total</b>	21	15	9	45
<b>Total as %</b>	<b>47%</b>	<b>33%</b>	<b>20%</b>	

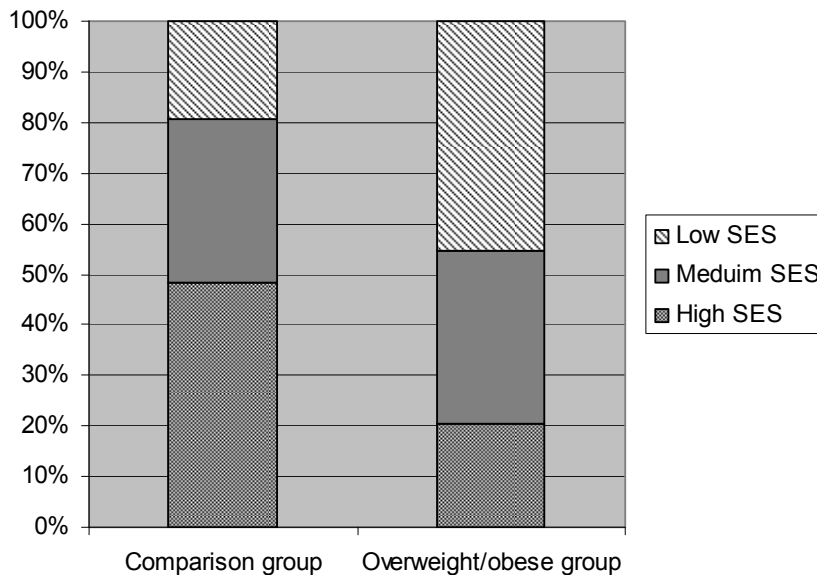
Furthermore, no association was found between anthropometric status and age ( $p=0.2622$ , Spearman Rank Order Correlations). Figure 3.4 indicates that overweight and obesity were more common in the 10 year olds, followed by the 12 year olds. Children older than 11 years were less likely to have a normal weight and more likely to be overweight or obese. The trends observed were that the prevalence of overweight and obesity more or less doubled from the ages of 8 to 10 years.



**Figure 3.4: Percentage distribution of anthropometric status according to age in the comparison study phase of primary school children in the Stellenbosch area, Western Cape (N=45)**

**3.2.2 Socio-economic Status**

The majority of the children (67%, n=8) in the high SES group (n=12) had a normal weight and more than half of the children (73%, n=8) in the low SES group (n=11) were overweight and obese, indicating a trend that the lower the SES, the more likely the children are to be overweight or obese (Figure 3.5).



**Figure 3.5: Percentage distribution of anthropometric status according to socio-economic status in the comparison study phase of primary school children in the Stellenbosch area, Western Cape (N=45)**

The children in the household income groups R31000 to R50000 and >R51000 were more likely to have a normal weight while overweight and obesity was more prevalent in the R11 000 to R20 000 household income group (Table 3.3). Overweight and obesity was mostly present where both parents or caregivers provided income and in households with a R400 to R500 weekly food expenditure, but there was not a significant difference. Eighty two percent

(n=37) of the total number of mothers (n=45) were employed of which the biggest proportion (57%, n=21) had overweight or obese children (Figure 3.6).

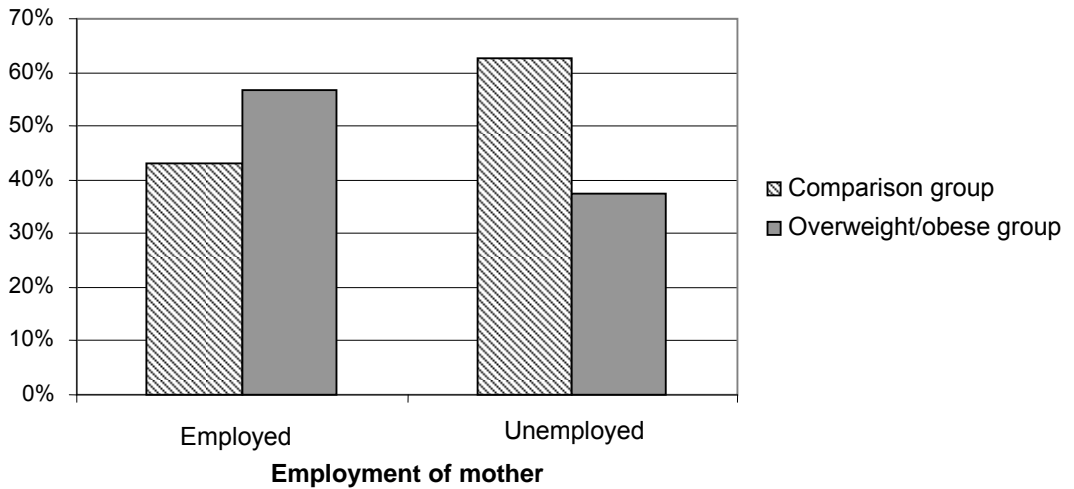
**Table 3.3: Anthropometric status in relation to indicators of SES of households in the comparison study phase of primary children in the Stellenbosch area, Western Cape**

Indicators	N	P	Comparison group	Overweight/obese group
<b>Household income</b>	<b>38</b>	*0.1098	<b>19</b>	<b>19</b>
<R1000			3 (16%)	2 (11%)
R1000-R5000			5 (26%)	5 (26%)
R6000-R10000			4 (21%)	3 (16%)
R11000-R20000			1 (5%)	6 (32%)
R20000-R30000			2 (11%)	2 (10.5%)
R31000-R50000			2 (11%)	0
>R51000			2 (11%)	1 (5%)
<b>Sources of income</b>	<b>45</b>	*0.1436	<b>21</b>	<b>24</b>
1 person			9 (43%)	3 (13%)
Both: 2 parents / caregivers			10 (48%)	19 (79%)
Grants			2 (10%)	1 (4%)
Family	0	1 (4%)		
<b>Weekly Food expenditure</b>	<b>44</b>	*0.1204	<b>20</b>	<b>24</b>
<R100			1 (5%)	0
R100-200			0	0
R200-300			2 (10%)	1 (4%)
R300-400			5 (25%)	2 (8%)
R400-500			4 (20%)	14 (58%)
>R500			8 (40%)	7 (29%)
<b>Paternal employment</b>	<b>41</b>	*0.0833	<b>20</b>	<b>21</b>
Employed			4 (20%)	1 (4.8%)
Self employed			8 (40%)	4 (19%)
Wage earner			8 (40%)	16 (76.2%)
Retired by choice	0	0		
<b>Maternal employment</b>	<b>37</b>	*0.0462	<b>15</b>	<b>22</b>
<16 hours/week			5 (33%)	4 (18%)
16-36 hours/week			5 (33%)	2 (9%)
36-40 hours/week			3 (20%)	8 (36%)
>40 hours/week			2 (13%)	8 (36%)
<b>Maternal education</b>	<b>45</b>	▶0.9516	<b>21</b>	<b>24</b>
None			0	0
Primary school			1 (5%)	1(4%)
Grade 8-10			3 (14%)	6 (25%)
Grade 11-12			8 (38%)	8 (33%)
College			4 (19%)	2 (8%)
University			5 (24%)	6 (25%)
Technicon	0	1 (4%)		
<b>Paternal education</b>	<b>43</b>	▶0.9097	<b>20</b>	<b>23</b>
None			1 (5%)	0
Primary school			0	0
Grade 8-10			4 (20%)	6 (26%)
Grade 11-12			5 (25%)	9 (39%)
College			3 (15%)	3 (13%)
University			7 (35%)	5 (22%)
Technicon			0	0

**Not all of the questions in the questionnaire were answered by the total study population and due to the missing data there was a difference in N totals.**

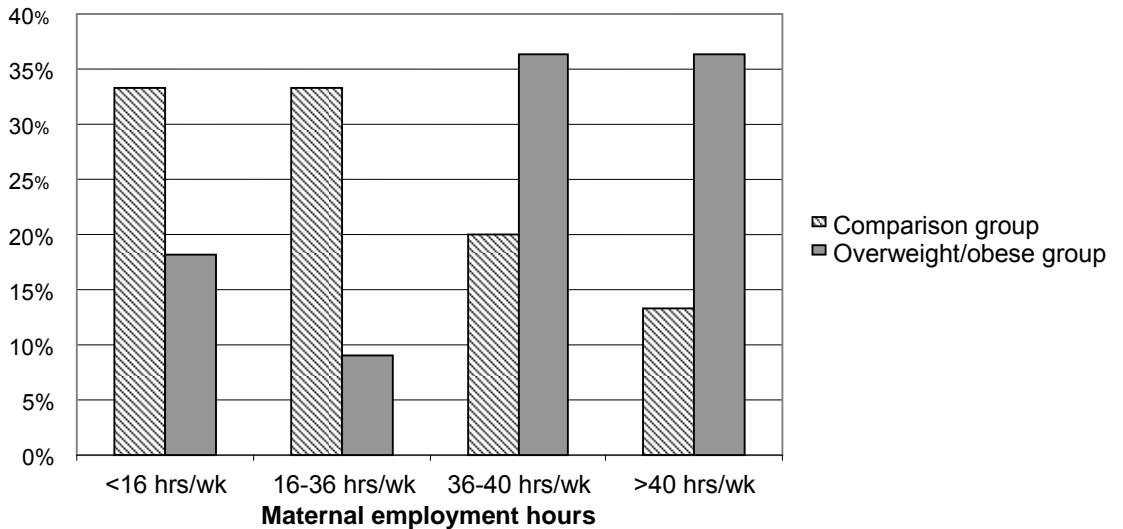
▣ P-value calculated by Kruskal Wallis p-test; \* P-value calculated by M-L Chi-square test;

▶ p-value calculated by Spearman rank correlation test



**Figure 3.6: Percentage distribution of anthropometric status according to mother's employment in the comparison study phase of primary school children in the Stellenbosch area, Western Cape (N=45)**

The highest prevalence of overweight and obesity was seen in the group where mothers as well as fathers had a low education level. Although differences were noted, most of the SES indicators were not significantly different according to anthropometric status and only indicated trends. However, participants whose mothers worked for more than 36 hours a week were statistically significantly more overweight or obese ( $p=0.0462$ , M-L Chi-square test) (Figure 3.7).



**Figure 3.7: Percentage distribution of anthropometric status according to employment hours of mother in the comparison study phase of primary school children in the Stellenbosch area, Western Cape (N=37)**

### 3.2.3 Family Characteristics

Seventy eight percent (n=35) of the mothers (n=45) were married and between the ages of 35-40 years (Table 3.4). The prevalence of overweight and obesity was higher in the age group of mothers between the ages of 35-40 years (75%, n=18) and those who were married (88%, n=21). Most of the households (69%, n=31) consisted of 4-6 members and included two children (47%, n=21). In households with 2 children there was a statistically significant association with anthropometric status ( $p=0.0231$ , Spearman Rank Correlation test) (Figure 3.8).

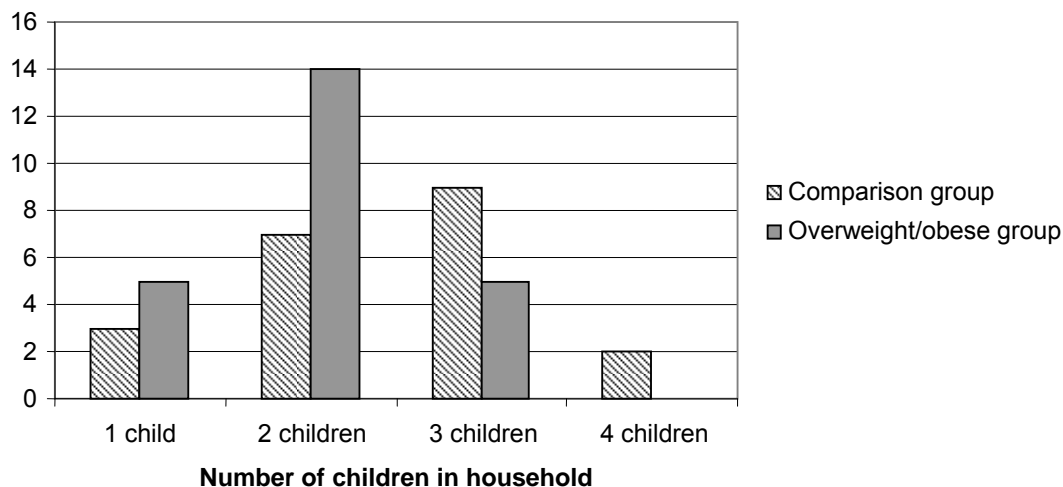
**Table 3.4: Anthropometric status in relation to indicators for family characteristics in the comparison study phase of primary school children in the Stellenbosch area, Western Cape**

Indicators	N	P	Comparison group	Overweight/obese group
<b>Mothers age (years)</b>	<b>45</b>	<b>►0.8668</b>	<b>21</b>	<b>24</b>
<16			2 (10%)	1 (4%)
16-18			0	0
18-20			0	0
20-25			1 (5%)	0
25-30			2 (10%)	1 (4%)
35-40			10 (48%)	18 (75%)
>40			6 (29%)	4 (17%)
<b>Marital circumstances</b>	<b>45</b>	<b>▣0.2851</b>	<b>21</b>	<b>24</b>
Married			14 (67%)	21 (88%)
Divorced/living alone			3 (14%)	0
Single/living alone			0	0
Live with partner			2 (10%)	0
Separated living alone			1 (5%)	1 (4%)
Widowed			1 (5%)	1 (4%)
Single/living with family			0	1 (4%)
<b>Household number</b>	<b>45</b>	<b>►0.7727</b>	<b>21</b>	<b>24</b>
1-3 persons			5 (24%)	6 (25%)
4-6 persons			15 (71%)	16 (67%)
7-10 persons			1 (5%)	2 (8%)
>10 persons			0	0
<b>Children in household</b>	<b>45</b>	<b>►0.0231</b>	<b>21</b>	<b>24</b>
1 child			3 (14%)	5 (21%)
2 children			7 (33%)	14 (58%)
3 children			9 (43%)	5 (21%)
4 children			2 (10%)	0

► p-value calculated by Spearman rank correlation

▣ p-value calculated by Kruskal Wallis test





**Figure 3.8: Distribution of anthropometric status according to the number of children within a household in the comparison study phase of primary school children in the Stellenbosch area, Western Cape (N=45)**

### 3.2.4 Breastfeeding Practices

Eighty-four percent (n=38) of the total number of children (n=45) were breastfed (Table 3.5). Two-thirds (n=23) of the children (n=37) that were breastfed seem to have been exclusively breastfed for at least 6 months. The distribution was very similar in overweight/obese group (32%, n=12) and comparison group (30%, n=11) therefore no trends were observed for breastfeeding being a protective factor against childhood overweight or obesity.

**Table 3.5: Anthropometric status in relation to breastfeeding practices as protective factors in the comparison study phase of primary children in the Stellenbosch area, Western Cape**

Indicators	P	N	Comparison group	Overweight/obese group
<b>Breastfeeding initiated</b>	*0.3651	45	<b>21</b>	<b>24</b>
Yes			19 (91%)	19 (79%)
No			2 (10%)	5 (21%)
<b>Duration of exclusive breastfeeding</b>	*0.1264	37	<b>18</b>	<b>19</b>
<4 months			4 (22%)	6 (32%)
4-5 months			3 (17%)	1 (5%)
6 months			5 (28%)	0
7-12 months			1 (6%)	3 (16%)
>12 months			5 (28%)	9 (47%)

*Not all of the questions in the questionnaire were answered by the total study population and due to the missing data was there a difference in N totals.*

\* p-value calculated by M-L Chi-square test

### 3.2.5 Eating Habits

More than 60% (n=30) of the sample (n=44) had set-meal times during the day and those who didn't have set meal times were more likely to be overweight and obese (p=0.0511) (Table 3.6). Half of the children (n=22) ate seven meals a week together as a family. Most of the meals took place in front of the television (48%, n=21) while only 25% (n=11) ate meals in the dining area. Food preparation was mainly (68%, n=30) prepared by the mother and was

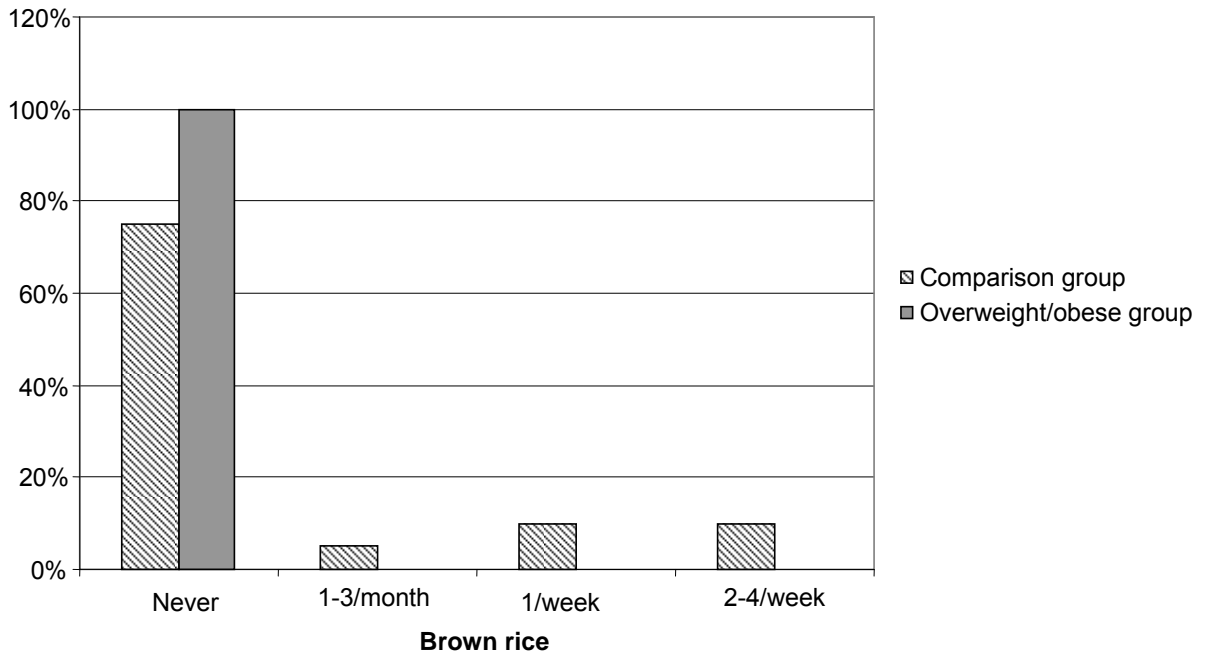
least likely to be prepared by the father. More children whose mothers cooked their meals were of a normal weight (70%, n=14) than those whose cooking was done by other members of the family. Although trends were noted, none of these factors indicated a statistically significant association between anthropometrical status and eating habits.

**Table 3.6: Anthropometric status according to indicators for dietary patterns in the comparison study phase of primary school children in the Stellenbosch area, Western Cape**

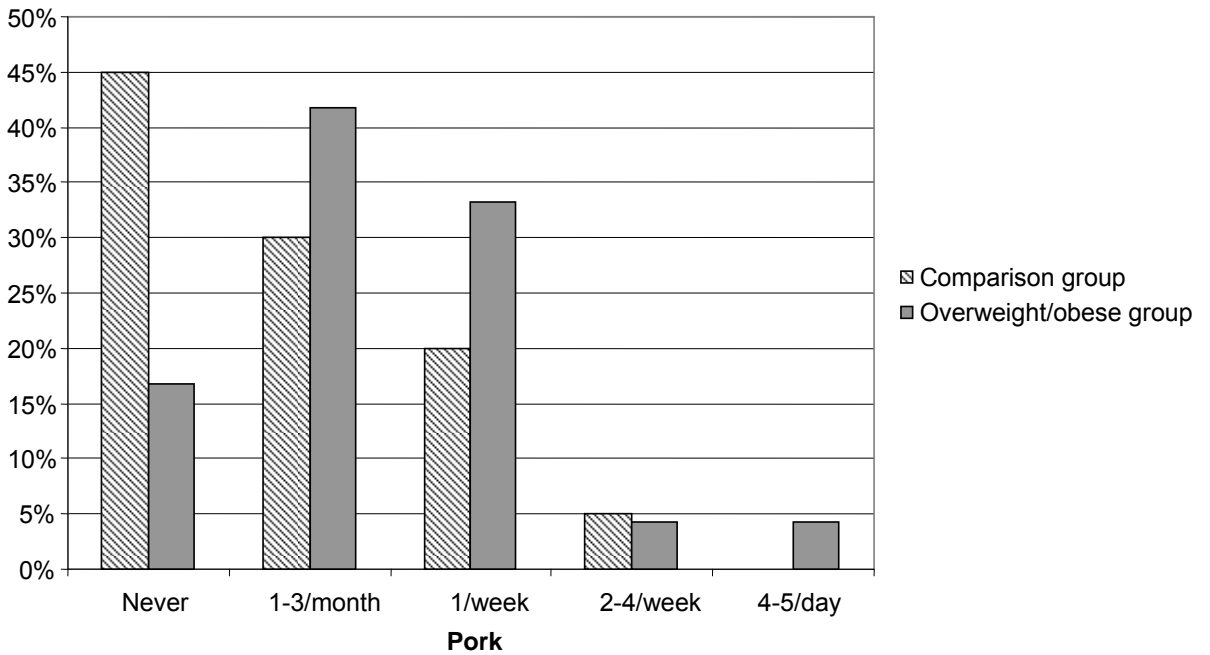
Indicators	P	N	Comparison group	Overweight/obese group
<b>Set meals</b>	° 0.0511	44	<b>20</b>	<b>24</b>
Yes (%)			17 (85%)	13 (54%)
No (%)			3 (15%)	11 (46%)
<b>Meals eaten together</b>	° 0.2215	44	<b>20</b>	<b>24</b>
1-2 a week			3 (15%)	3 (13%)
3-4 a week			3 (15%)	4 (17%)
5-6 a week			4 (20%)	5 (21%)
7 a week			10 (50%)	12 (50%)
<b>Where eaten</b>	° 0.9538	44	<b>20</b>	<b>24</b>
Television			9 (45%)	12 (50%)
Dining area			6 (30%)	5 (21%)
Kitchen			5 (25%)	7 (29%)
<b>Food preparation</b>	° 0.5242	44	<b>20</b>	<b>24</b>
Mother			14 (70%)	16 (67%)
Father			0	2 (8%)
Both			3 (15%)	4 (17%)
Family member			3 (15%)	2 (8%)

° p-value calculated by Chi-square test

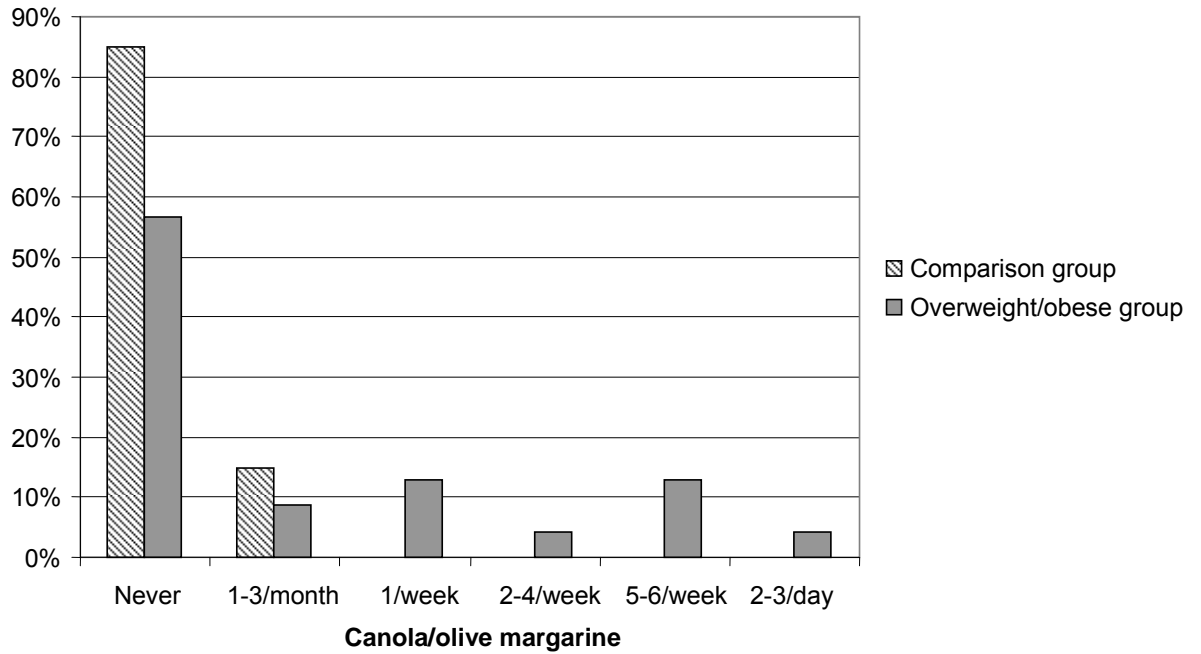
Usual food intake according to the FFQ (Appendix O) indicated a statistically significant association with anthropometric status for intake of pork ( $p=0.0143$ ), brown rice ( $p=0.0371$ ), canola or olive margarine ( $p=0.0398$ ), poly-unsaturated margarine ( $p=0.0481$ ) and doughnuts ( $p=0.0280$ ) [Kruskal-Wallis p-test]. An increased frequency of intake of brown rice showed an association with normal weight (Figure 3.9). The more frequently pork, canola/olive or poly-unsaturated margarine and/or doughnuts were consumed the higher the presence of overweight and obesity (Figures 3.10-3.13).



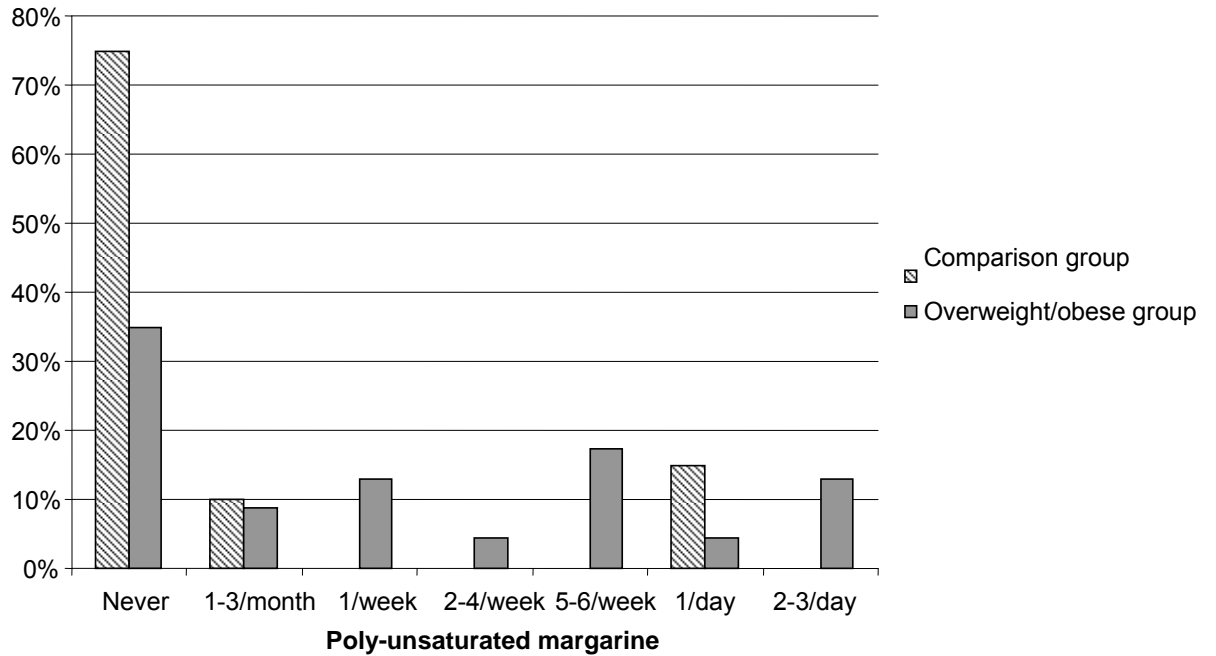
**Figure 3.9: Percentage distribution of anthropometric status according to brown rice consumption in the comparison study phase of primary school children in the Stellenbosch area, Western Cape (N=44)**



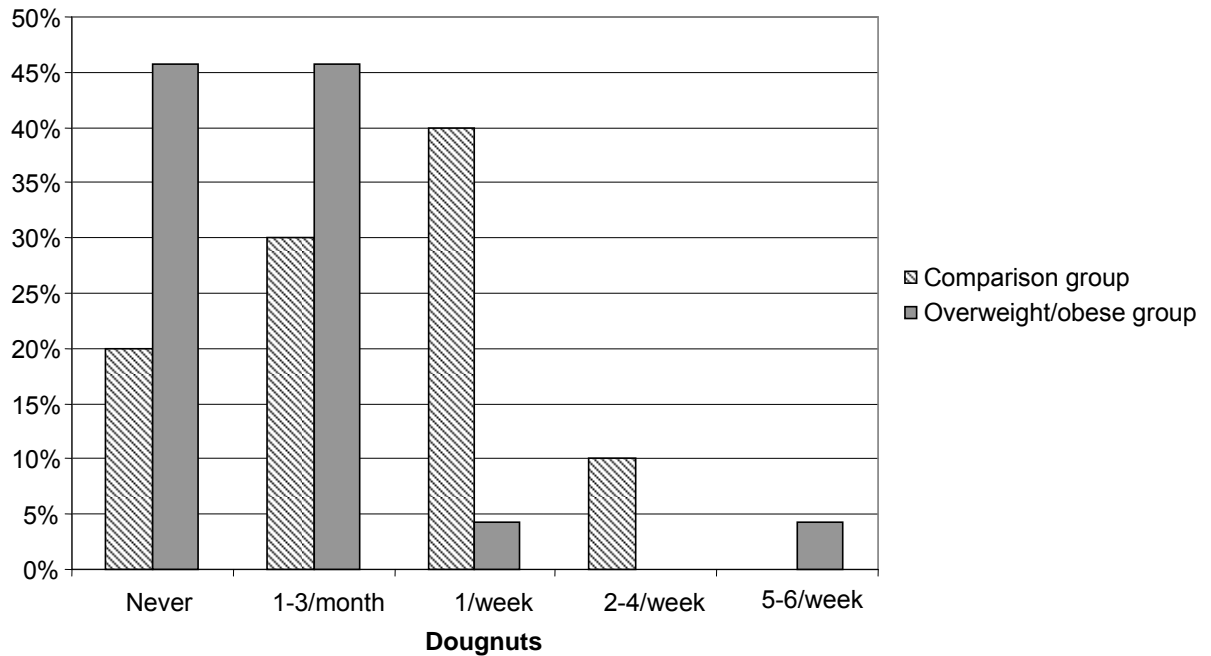
**Figure 3.10: Percentage distribution of anthropometric status according to pork consumption in the comparison study phase of primary school children in the Stellenbosch area, Western Cape (N=44)**



**Figure 3.11: Percentage distribution of anthropometric status according to canola/olive margarine consumption in the comparison study phase of primary school children in the Stellenbosch area, Western Cape (N=43)**



**Figure 3.12: Percentage distribution of anthropometric status according to poly-unsaturated margarine in the comparison study phase of primary school children in the Stellenbosch area, Western Cape (N=43)**



**Figure 3.13: Percentage distribution of anthropometric status according to doughnuts consumption in the comparison study phase of primary school children in the Stellenbosch area, Western Cape (N=44)**

### 3.2.6 Exercise Habits

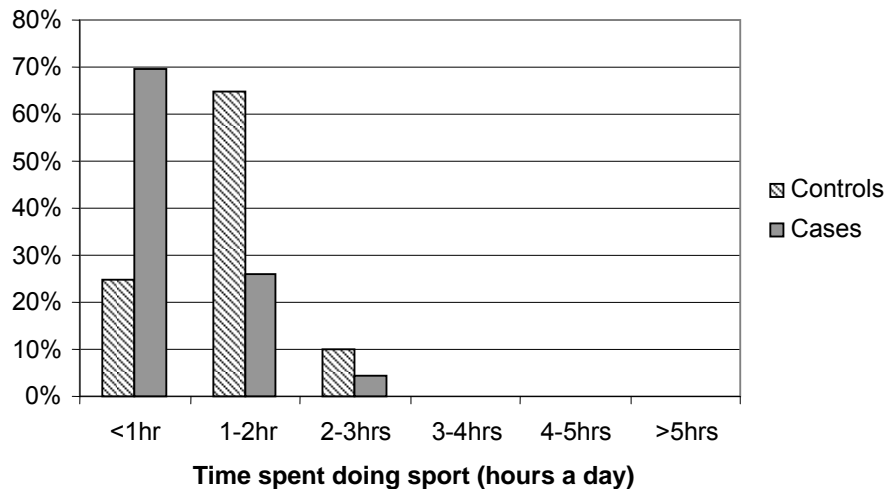
Children with a normal weight ( $n=20$ ) were more likely (35%,  $n=7$ ) to watch television for less than an hour a day and as the screen time increased so did the level of overweight and obesity (Table 3.8). The weekend screen time was predominantly 2-3 hours a day in 25% ( $n=11$ ) of the comparison study phase sample ( $n=44$ ) and a trend was observed that overweight as well as obesity risk increased as screen time increased. The mean value for activity perception by parents ( $n=43$ ) was seven, when asked to rate their children's level of activity on a scale of one to ten (ten indicating very active). As the perception of activity levels increased, so did the presence of normal weight although there was not a statistically significant association. About half (52%  $n=23$ ) of the comparison study phase sample reportedly participated in sport, of which 57% were classified in the normal weight group and 30% as overweight and 13% as obese. The majority of the group that didn't participate in sport were more prone to be overweight (38%). Most of the children spent 1-2 hours a day doing sport and this showed a positive association in the prevention of obesity and overweight (Figure 3.4).

**Table 3.8: Anthropometric status according to indicators for activity levels in the comparison study phase of primary children in the Stellenbosch area, Western Cape**

Indicators	P	N	Comparison group	Overweight/obese group
<b>Screen time: week</b> <1 hour a day 1-2 hours a day 2-3 hours a day 3-4 hours a day 4-5 hours a day >5 hours a day	° 0.1185	44	<b>20</b> 7 (35%) 4 (20%) 4 (20%) 3 (15%) 0 2 (10%)	<b>24</b> 5 (21%) 6 (25%) 4 (17%) 2 (8%) 4 (17%) 3 (13%)
<b>Screen time: weekend</b> <1 hour a day 1-2 hours a day 2-3 hours a day 3-4 hours a day 4-5 hours a day >5 hours a day	° 0.3593	44	<b>20</b> 4 (20%) 6 (30%) 4 (20%) 0 3 (15%) 3 (15%)	<b>24</b> 2 (8.3%) 3 (13%) 7 (29%) 3 (13%) 4 (17%) 5 (21%)
<b>Activity perception</b> 1 2 3 4 5 6 7 8 9 10	° 0.1089	43	<b>19</b> 0 1 (5%) 0 0 3 (16%) 1 (5%) 1 (5%) 6 (32%) 3 (16%) 4 (21%)	<b>24</b> 0 0 2 (8%) 1 (4%) 4 (17%) 4 (17%) 6 (25%) 4 (17%) 0 3 (13%)
<b>Participation in sport</b> Yes No	° 0.2438	44	<b>20</b> 13 (65%) 7 (35%)	<b>24</b> 10 (42%) 14 (58%)
<b>Time spent doing sport</b> <1hour a day 1-2 hours a day 2-3 hours a day 3-4 hours a day 4-5 hours a day >5 hours a day	° <b>0.0450</b>	43	<b>20</b> 5 (25%) 13 (65%) 2 (10%) 0 0 0	<b>23</b> 16 (70%) 6 (26%) 1 (4%) 0 0 0

**Not all of the questions in the questionnaire were answered by the total study population and due to the missing data was there a difference in N totals.**

° p-value calculated by Chi-square test



**Figure 3.14: Percentage distribution of anthropometric status according to time spent doing sport in the comparison study phase study of primary school children in the Stellenbosch area, Western Cape (N=43)**

### 3.3 HYPOTHESES

- The null hypothesis that poor socio-economic and family environmental status is not associated with the development of childhood overweight and obesity in the Stellenbosch area is rejected as the number of children in the household and mothers working full-time were associated with overweight and obesity in the children.
- The null hypothesis that healthy eating behaviour and dietary patterns are not protective against the development of childhood overweight and obesity in the Stellenbosch area can neither be accepted nor rejected since only single foods and not dietary patterns were implicated as being associated with normal weight or overweight
- The null hypothesis that sedentary lifestyle is not associated with the increased risk of childhood overweight and obesity in the Stellenbosch area is rejected as there is a negative association with the time spent on sport and overweight and obesity in childhood.

**CHAPTER 4  
DISCUSSION**



#### 4.1 PREVALENCE OF OVERWEIGHT AND OBESITY

This Stellenbosch-based study found a prevalence rate of 13% of 6-13 year old children being overweight (9%) and obese (4%), which is lower than the current estimated childhood international prevalence of 25% including overweight (14%) and obesity (11%) for children between the ages of 6-17 years.<sup>78</sup> This estimation was obtained from a study conducted in Australia, Brazil, Canada, China, Spain, UK and United States of America (USA) during 1970-2000<sup>78</sup> and was a dramatic increase from the 1963–1970 prevalence rates, when approximately 4-4.5% of 6-17 year olds were found to be overweight and obese.<sup>78</sup> More recent global research conducted between 2000-2007 on the prevalence of childhood overweight and obesity (Table 4.1)<sup>19,79-90</sup> indicates a higher prevalence than earlier international studies and the current estimation of 25%.

**Table 4.1: Comparison of global percentage prevalence rates of childhood overweight (OW) and obesity (O) (using IOTF cut-off points) - ©IASO, September 2010<sup>19,79-90</sup>**

Country	Year of survey	Age range (years)	% OW and O	Boys			Girls		
				Total	OW	O	Total	OW	O
Australia <sup>80</sup>	2007	2-16	46.0	22	17	5	24	18	6
Brazil <sup>81</sup>	2002	7-10	44.0	23	17.1	6	21	16.1	5
Chile <sup>82</sup>	2002	6	55.6	28.6	18.8	9.8	27	19.6	7.5
China <sup>83</sup>	2002	7-17	10.4	5.9	4.8	1.1	4.5	3.9	0.6
England <sup>84</sup>	2007	5-17	49.3	22.7	17	5.7	26.6	19.6	7
Japan <sup>85</sup>	1996-2000	6-14	30.6	16.2	12.4	3.8	14.4	11.5	2.9
Mexico <sup>86</sup>	2006	5-17	57.1	28.1	18.6	9.5	29	20.3	8.7
<b>SA<sup>19</sup></b>	<b>2001-4</b>	<b>6-13</b>	<b>35.6</b>	<b>13.3</b>	<b>10.9</b>	<b>2.4</b>	<b>22.3</b>	<b>17.5</b>	<b>4.8</b>
Sweden <sup>87</sup>	2000-1	10	36.5	17	14.2	2.8	19.5	16.5	3
Switzerland <sup>88</sup>	2007	6-13	29.8	16.7			13.1		
Taiwan <sup>89</sup>	2001	6-18	43.4	26.8	18.6	8.2	16.6	13	3.6
USA <sup>90</sup>	2003-4	6-17	71.1	35.1	21.9	13.1	36	22.3	13.6

Please note that the data provided is limited by data availability. Not all the above figures are based on nationally representative studies (<http://www.iaso.org/iotf/obesity/>).

The lower prevalence rates in the Stellenbosch study (13%), when compared to international research, may be due to the fact that SA, including Stellenbosch, is still in the early stages of a complex nutritional transition from poverty-associated infectious diseases to the burden of chronic diseases associated with overnutrition. It may still be too early for these dynamic developmental processes to substantially alter nutritional and other health indicators within SA.<sup>13</sup> Several studies have documented the dietary and lifestyle changes that have been part of this transition.<sup>91,92</sup> The 2004 Health of the Nation study, showed a trend of obesity and overweight in SA children to be similar to values in developed countries about 10 years ago.<sup>19</sup> This scenario has also been described in other low to middle income countries undergoing rapid urbanization, with its concomitant lifestyle changes.<sup>93</sup> When looking at other developing countries<sup>81,82,86</sup> and Asia, Iran (10%)<sup>12</sup> had a childhood overweight and obesity prevalence that is lower than the Stellenbosch study (13%) and SA prevalence (35.6%).<sup>19</sup> However, Iranian children made up most of the total obese population in this particular study and indicate a trend that the rate of increase appears to be higher for children.<sup>12</sup> This suggests that developed and developing countries are not spared from this health concern and serves

as confirmation of the so-called nutritional transition that developing countries, like SA are undergoing. The co-existence of an increasing prevalence of overweight with persistent moderate stunting and wasting at a lower level poses unique challenges in the African and global context.<sup>13</sup> Emphasis is therefore placed on the need to understand the nature of the nutrition transition in SA and warrants further research into this matter.

From a SA point of view, the overweight and obesity prevalence in Stellenbosch (13%) was lower than previous national studies like the 1999 NFCS (17%)<sup>16</sup> and the 2001-2004 Health of the Nation Study (35.6%)<sup>19</sup> but was higher when compared to 1999 prevalence data relating to the Western Cape (5%)<sup>16</sup>. The lower prevalence rate, when compared to these national studies<sup>16,19</sup> should be treated with caution due to differences in the study methodologies. The current study included a smaller, more urbanised and older study population; as compared to the 1999 NFCS where the highest prevalence of overweight was among children aged 1 to 3 years living in urban areas.<sup>19</sup> Other SA studies indicated trends of overweight being higher in girls<sup>13,19,20</sup> and in smaller households,<sup>20</sup> which could possibly account for the higher prevalence found in Stellenbosch versus that of the Western Cape as more than two-thirds of the Stellenbosch study population were girls and most of the households were small (consisted of 4-6 members which included two children).

In the current Stellenbosch study, a higher prevalence trend of overweight and obesity was seen in girls (8%) than in boys (5%). International datasets (Table 4.1) from Australia (24%),<sup>80</sup> England (26.6%),<sup>84</sup> Mexico (29%),<sup>86</sup> Sweden (19.5%),<sup>87</sup> USA (36%),<sup>90</sup> Philippines<sup>12</sup> and a 2002 study conducted by IOTF in conjunction with the European Childhood Obesity Group<sup>79</sup> also found overweight and obesity to be more prevalent in girls<sup>79</sup> and corresponds with the sex prevalence findings from the current Stellenbosch study. However, in China<sup>83</sup> and Cyprus (2000)<sup>12,94</sup> boys are more likely to be overweight and obese than girls, whereas in Stellenbosch and SA data, this appears to be reversed.

For several decades, there has been a progressive increase in the prevalence of overweight and obesity in SA women,<sup>95-97</sup> and an increasing prevalence has been observed in children, particularly among girls.<sup>13,20,95,96</sup> Earlier SA regional studies reported that overweight was almost non-existent among younger boys in rural areas.<sup>97-99</sup> Although, not statistically significant, the higher prevalence trend observed among girls in this Stellenbosch study supports previous findings that within the SA setting, girls are more prone to being overweight and obese than boys.<sup>100,101</sup>

The Institute of Education (IOE) in London have postulated reasons for the higher prevalence among girls and indicated that it was not clear whether the increased risk for girls is due to them being overfed compared to boys, or because they are involved in less physical activity – or perhaps due to the over protectiveness of parents – or some combination of the two.<sup>102</sup> When considering the relationship between determinants such as obesity and sex there could be many role playing factors involved. Biologically, energy needs differ for boys and girls and also in relation to rate of growth. Further, timing of sexual maturation differs by sex.<sup>103</sup>

Behavioural factors are also important in explaining the sex differences, of which boys are generally more physically active compared to girls<sup>77,78</sup> and girls in general have higher adipose tissue and are less active than boys.

A high prevalence trend of overweight and obesity was noted, in terms of age, among the older children comprising the Stellenbosch study population. The Stellenbosch study showed that overweight and obesity was most prevalent in both the 9 (17%) and 12 year olds (17%). A more detailed investigation into the particular study indicated that children older than 11 years were less likely to have a normal weight and more likely to be overweight or obese. These results correlate well with the findings of other international research. In three cohort studies and three surveys,<sup>104-107</sup> obesity was found to be more prevalent with increasing age in British children. A 2002 study conducted by IOTF in conjunction with the European Childhood Obesity Group showed that the overweight and obesity prevalence was also more dominant in children between the ages of 6-8 years and 12-13 years.<sup>79</sup> In contrast, the 1999 SA NFCS, found the highest prevalence of overweight in children aged 1 to 3 years.<sup>16</sup> However, another SA study conducted in 1999, found children (in particular girls) more prone to obesity and overweight, occurring prior to the growth spurt at 10 years, as well as after menarche.<sup>97</sup>

The increased prevalence in these age groups is perhaps due to the children having less adult supervision in terms of selection of food relating to quality as well as quantity and the nature of the physical activity they engage in.<sup>12</sup> This is a matter of concern since the probability of continuation of obesity or overweight into adulthood, when acquired during childhood, varies with age and the prevalence of obesity and overweight in parents.<sup>108</sup> Other international data found that approximately 20 to 50% of children who are obese before puberty will remain so in adulthood, and 50 to 70% of obese adolescents will retain this obesity in adulthood.<sup>108</sup> Similar studies indicated that 85% of obese youngsters will become obese adults.<sup>109</sup> The picture isn't much different in SA, with earlier SA data showing that 10% of women were already obese at the ages 15 to 24 years.<sup>95</sup> Thus, adolescence is a crucial risk period for the development of persistent obesity<sup>110</sup> and the co-morbidity profiling exerts an important toll on most societies.<sup>109</sup> Although the Stellenbosch study found no association between nutritional status and age, the trend observed in combination with findings from previous research and SA data indicates that it is important to give children a healthy start on life. Instilling healthy eating habits and encouraging children to get active when they are young, sets them up for their teenage years when the responsibility becomes their own.<sup>57</sup>

On average the Stellenbosch study showed a lower prevalence rate of overweight and obesity than previous international as well as SA studies but was still higher than the prevalence previously found in the Western Cape.<sup>16</sup> Although the prevalence of obese subjects was lower than that of overweight children, the latter are still considered predisposed to becoming obese in the future. Concern for the health of SA children, especially in Stellenbosch and the Western Cape, is increased when looking at the prevalence rates as

well as some factors identified from the results of previous international and local research.<sup>16,19</sup> Healthy lifestyle behaviours develop during childhood and tracked across the lifespan, and early life experiences most often lay the foundation for adult health and quality of life. Previous European studies showed that the impact of social inequality on the development of childhood obesity seem to be especially apparent at the time of adolescence, particularly in girls.<sup>108</sup> Adolescence is a period of increased autonomy often associated with irregular eating patterns, change in eating habits and periods of inactivity. These changes are added to physiological changes, particularly in woman. During the period of high individual sensitivity to weight gain, the ability to adjust eating habits and the level of physical activity can be affected by factors such as the child's level of education and that of his/her parents, and (cultural and financial) access to advice.<sup>108</sup> Making parents aware of the increased risk of obesity and overweight in girls and children aged 9 and 12 years, may help to modify their own behaviour.

#### **4.2 SOCIO-ECONOMIC AND FAMILY FACTORS**

Trends from the results of this Stellenbosch study are contradictory. In the overall sample of primary school children, overweight and obesity were more prevalent in the higher SES groups but in the comparison phase of the study overweight and obesity were more prevalent in the low SES group. When these findings are compared to other international and national research on the association of SES with childhood overweight and obesity, the prevalence of overweight and obesity differs among countries depending on their level of development.

From a SA point of view, Puoane investigated the influence of SES on BMI and found a direct relationship between male SES, defined by educational status and BMI in SA adults.<sup>12</sup> Conversely; this may play a similar role when looking at the relationship between SES and childhood obesity since a child's SES depends on that of his or her parents.<sup>108</sup> In keeping with these findings, the 1999 NFCS indicated a higher prevalence of overweight among children, 1-9 years living in urban areas.<sup>16</sup> Urban areas are typically associated with nutrition transition, often accompanied by a higher income.<sup>100</sup> This corresponds with the trends observed in the initial phase of the Stellenbosch study, where childhood overweight and obesity was more prevalent in the high SES group.

Previous research indicates that overweight prevalence is high among the poor in developed countries and high among the rich in developing countries.<sup>79,109,111</sup> Data from developing countries, other than SA, indicate that the determinants of overweight vary greatly across countries and cultural groups.<sup>16</sup> A 2002 study that looked at trends of obesity among older children and adolescents in the USA, Brazil, China and Russia found obesity to be more prevalent among the higher SES groups.<sup>111</sup> In Brazil the prevalence was the highest (20%) in the high household income group and the least in the low income group (7%) whereas in China the prevalence was equally distributed among all the SES groups.<sup>111</sup> Despite obesity being more prevalent in the high income groups, previous research showed that countries in economic transition from developing to developed, such as China, Brazil and SA, also have a

general increase in the rate of obesity across all economic levels.<sup>97</sup> In Russia, that is also undergoing an economic transition, a trend was indicated of an increase in household income resulting in increased weight in adults.<sup>111</sup> Other studies in developing countries have identified high family income and low level of education as risk factors for obesity<sup>113-116</sup> which correlate with results from the Stellenbosch study.

Other international studies observed that social inequality impacted on the development of childhood obesity.<sup>108</sup> The occurrence of new cases of obesity is higher in teenagers from underprivileged social classes and the regression of existing obesity is less frequent than in the more privileged classes of society.<sup>108</sup> Just over half of obese children in the UK resided in households of a lower socio-economic group compared to over three-quarters of children in France. In industrialised countries, food shortages have become very rare. Groups of subjects whose socio-economic condition is less privileged do not necessarily have a lower energy intake than subjects in a higher financial bracket.<sup>108</sup> Furthermore, some studies have indicated that an increase in income more often results in the purchase of foods with more developed preparation and packaging and better quality, rather than in an increase in the quantity. In the poorest population groups, the diet tends to involve a higher number of calories and is characterised by a very high fat intake with the generally more expensive vegetables, fruit and whole grains being eaten in lesser amounts.<sup>108</sup>

Thus, the higher prevalence of obesity in children from lower SES groups living in developed countries, is mainly attributed to a lower quality diet, and less physical activity or lack of opportunity to be physically active.<sup>79</sup>

The world-wide increase in childhood overweight and obesity over the past decades<sup>92</sup> was initially observed in developed countries. Recently an increase in obesity has been the greatest in developing nations undergoing epidemiological transition. Several studies have documented the dietary and lifestyle changes that have been part of the nutritional transition.<sup>91,92</sup> This transition is driven by rapid economic transition, urbanization, globalization, technological and social changes.<sup>117,118</sup> The nutrition transition typically begins with urban populations and those in higher socio-economic strata,<sup>117</sup> which corresponds with the results from the Stellenbosch study. Nutrition transition is a major driving force behind the double burden of malnutrition, a phenomenon that has become important in low to middle income countries where high levels of obesity have been documented despite persistence of undernutrition.<sup>117-119</sup> SA is seen as a developing country but by virtue of the economic growth, it is considered to be one of the countries in Africa that is undergoing rapid demographic and nutritional transitions.<sup>119</sup> Similarly, childhood obesity and overweight are becoming increasingly evident in SA due to this nutrition transition.<sup>120-122</sup> Compelling evidence, based on large numbers of studies conducted in both developing and developed countries, including SA, links childhood stunting to the subsequent development of overweight and obesity in later life.<sup>96,100</sup> Some research indicates that as long as the stunted individual remains lean and is not exposed to an obesogenic environment, like the dietary and lifestyle changes mentioned

before, he/she would have a reduced risk of becoming overweight or obese.<sup>123</sup> The Stellenbosch study and other SA studies<sup>19</sup> may indicate the beginning of such a transition.

At present children from a higher SES group are at greater risk of being overweight and obese, however over time children from lower SES groups would also become more prone to obesity due to already being undernourished e.g. stunted children being exposed to the changes in lifestyle and diet associated with such a nutritional transition. SA is showing an increased trend of obesity and overweight in children that are similar to values in developed countries about 10 years ago<sup>19</sup> which reinforces the early stages of a nutrition transition. The shift from childhood obesity being more prevalent in the high SES groups to the low SES groups could be exacerbated by the fact that children who come from more disadvantaged circumstances are less likely to participate in leisure-time physical activity.<sup>124</sup> In addition, the low frequency of fruit and vegetable consumption is linked to adverse socio-economic conditions and household food insecurity in SA.<sup>125</sup> There is also some indication that, particularly in rural settings, healthy food may be a more expensive option than a less healthy equivalent. A simple comparison between a day's intake purchased from small, rural shops showed that the healthy version was nearly twice the cost of the less healthy option.<sup>126</sup> There is a need for national programmes and food policies that will ensure that healthy foods are accessible and affordable to all individuals.

When looking at the other socio-economic indicators like household income, sources of income, parental employment and education that were also investigated in the Stellenbosch study, only trends were observed according to nutritional status and the above-mentioned SES indicators. The only significant association was found between maternal weekly working hours and participants being overweight or obese. Generally the Stellenbosch study results, from a SES viewpoint, were more positive in comparison to that of the 1999 NFCS. This could be attributed to the Stellenbosch study including a smaller population living in a more urban area as compared to the 1999 NFCS. In Stellenbosch, 1 in 8 households had a monthly household income of less than R1000 while in the 1999 NFCS one third of the households had a monthly income of between R100 and R500.<sup>16</sup> With regards to parental employment, in one in 12 Stellenbosch households the father was unemployed and in the 1999 study it was the case in approximately one in five households.<sup>16</sup> Interestingly, 82% of the mothers living in Stellenbosch were employed, of which the larger proportion had overweight and obese children. In the 1999, NFCS only one in five households had a mother who was a wage earner.<sup>16</sup> Stellenbosch primary school children whose mothers worked for more than 36 hours a week were significantly more overweight or obese. Preceding studies conducted in developed countries, have also found a link between mothers working and obese children.<sup>127,128</sup> In most developed countries, maternal employment has increased rapidly. Changing patterns of family life e.g. mothers working, has been suggested to be contributing to the rising prevalence of childhood obesity. Policies in these countries to reduce child poverty may have resulted in an increase of the number of parents, primarily women with young children, entering the workforce.<sup>129,130</sup> Studies in school-aged children have found that

the greater the number of hours a mother worked per week increased the likelihood of childhood overweight.<sup>127,128</sup> The results of the Stellenbosch study corresponded with these findings. The increased prevalence of overweight and obesity might be due to the fact that the more hours the mother is away from home, less time is available for food preparation with a resultant increase in usage of fast food or convenience meals and fewer opportunities for education on healthy eating by the mothers.

In terms of parental education a trend was observed that the prevalence of overweight and obesity in Stellenbosch primary school children was the highest where mothers and fathers both had a low educational level. The 2002 SA Demographic and Health survey<sup>95</sup> as well as Sundquist and Johansson<sup>131</sup> showed a direct relationship between male socio-economic status (defined by educational level) and overweight, whereas, in woman only low educational levels were associated with a higher BMI. In the Stellenbosch study all mothers had some level of education with 64% having attained primary or high school education versus only 25% in the 1999 NFCS.<sup>16</sup> The 1999 NFCS found one of 10 mothers of children aged 1 to 9 years had no formal education and one in four mothers had attained primary school or high school education.<sup>16</sup>

The 1999 NFCS also found the prevalence of overweight was one in eight children of well-educated mothers.<sup>16</sup> The survey report indicated that the determinants for stunting and overweight were generally similar and included maternal education as well as the educational level of the caregiver.<sup>16</sup> European studies have indicated that an inverse relationship exists between education and BMI in industrialised countries.<sup>108</sup> This can be attributed to the fact that subjects who have completed a higher grade in school are more likely to follow dietary recommendations and to change their behaviour to avoid risks than subjects who have a lower level of education.<sup>108</sup> However, the advantages associated with proper nutrition knowledge seem to be limited, since surveys in Europe indicated that even though some people know what a 'healthy diet' is, in practice their eating habits are much less 'healthy'.<sup>108</sup>

Further, families with the least educated mothers are more likely to watch television during evening meals, a behaviour which is associated with poorer eating practices.<sup>132</sup> When looking at other international findings, an Australian study that obtained data from 560 families of young children from a wide SES range revealed that families in the highest maternal educated group reported greater time pressures for meal preparation and a lower frequency of the family eating evening meals together. This Australian study also noted that those with the lowest maternal education had a perceived lower availability of fresh fruit and vegetables and were more likely to buy takeaway meals.<sup>133</sup>

Taking these SA and international findings in consideration, a varied picture is seen regarding parental educational status and nutritional status. These different scenarios might be present in the Stellenbosch study due to the variance in SES and parental education within the



Stellenbosch study population as well as the co-existence of stunting and overweight or obesity.

Focusing on family characteristics and the prevalence of overweight and obesity among Stellenbosch primary school children, only the number of children within a household showed a significant association with nutritional status. Households with two children had a significantly higher prevalence of overweight and obesity. Mother's age, marital circumstances and total household number did not seem to play a significant role. A 2006 study, focusing on the transition and health during urbanisation of SA aged 10-15 years, found that the prevalence of overweight was more apparent in urban areas, smaller households and children of parents with low- or high income occupations<sup>20</sup> which correlates with the Stellenbosch study results. In keeping with these findings, a UK based survey conducted by the IEO in London, found that 'only' children were more likely to become overweight between the ages of 5 and 7 years. They could not conclude whether these children were less active due to the absence of siblings, or overfed by parents.<sup>102</sup>

Despite the findings from this Stellenbosch study and in keeping with previous literature, SES can have an impact on the level of physical activity or the sedentary lifestyles of subjects. Indeed, access to leisure physical activities varies considerably between different social classes of society due to financial reasons or reasons involving information on the physical activity-related benefits.<sup>108</sup> Better understanding of the influence of socio-economic factors in the development of obesity in children is essential to set up effective prevention policies. A policy on prevention focused solely on education measures cannot effectively solve the problem of obesity. It must take into account the major obstacles related to the cost of access to a balanced diet and to leisure physical activity.

#### **4.3 BREASTFEEDING PRACTICES**

No significant association was found in the Stellenbosch study for breastfeeding practices as protective factor in the prevention of childhood overweight or obesity. However, a trend was observed that the majority of children that were not breastfed presented as being overweight or obese and that most of the normal weight children were breastfed beyond six months of age. A possible protective effect of breastfeeding on the subsequent development of obesity is one of the infant feeding practices that have been a focus of interest in recent years. The literature indicates that the initiation and the duration of breastfeeding may reduce the risk of later life overweight and obesity, in addition to the other benefits of breastfeeding.<sup>44,49,52,56</sup> The lower growth trajectory in breast-fed infants compared to bottle-fed infants, or different feeding patterns, may provide a beneficial effect on longterm weight status. The higher protein content of formula milk compared to breast milk has also been implicated as a contributing factor to overweight in later life.<sup>56</sup>

While many early studies were inconsistent<sup>48</sup>, more recent observational studies are suggesting a negative association between breastfeeding or duration of breastfeeding with



the later risk for obesity in children and adults.<sup>51</sup> The association between breastfeeding practices and later obesity risk, in the Stellenbosch study, was inconclusive and should be considered with caution due to interpretation issues of the question relating to breastfeeding duration by the respondents. The limitation of these observational studies and possibly also of the Stellenbosch study, is that mothers who chose to breastfeed may be different from mothers who chose not to breastfeed in ways that are related to other behaviors associated with obesity. In contrast, a series of observational studies suggest that breastfeeding and the prevention of rapid infancy weight gain may be associated with a lower risk for subsequent obesity,<sup>49-52</sup> but randomized experimental evidence, on breast- and formula fed infants<sup>56</sup> is insufficient to translate these findings into clinical practice for obesity prevention. However, breastfeeding promotion remains an important public health priority because of its health benefits other than obesity prevention. Importantly studies in experimental animals provide very strong evidence for the concept that the nutritional status in early life can influence the risk of obesity.<sup>135</sup> Further research will help define if interventions targeted at feeding practice during the critical period of infancy could have a long-term effect in preventing obesity.

#### **4.4 EATING BEHAVIOUR**

In the Stellenbosch study, eating meals together was not an indicator of childhood overweight or obesity as found in previous studies.<sup>57,135,136</sup> Neither was there any significant association between set meals, where meals are eaten and the prevalence of overweight and obesity, except that a trend was seen where children of mothers who did most of the cooking were more likely to be of normal weight. It was positive to see that more than half of the Stellenbosch study population (normal weight, overweight and obese) had set mealtimes and 50% ate most of their meals together as a family. Whereas, only 14% of UK families eat together at mealtimes compared to 25% in France, 24% in Sweden and 18% in Italy.<sup>57</sup> From these European studies it was apparent that families with normal weight children were more likely to eat together than those with overweight or obese children.<sup>57</sup>

From previous research, the environmental factors that contribute to the development of obesity early in life include a shift in diet towards more fast foods with a low fibre and a high fat and calorie content.<sup>109</sup> Similar results were evident in this particular study, since a significant association was found between increased fat intake e.g. olive/canola margarine, poly-unsaturated margarine, doughnuts, pork and an increased risk of overweight or obesity. While an increased intake of brown rice showed an association with normal nutritional status.

The Kellogg's 2005 Family Health Study indicated that over two-thirds of British children, aged between 6 and 16 years, cited their parents as their most important source of believable information on food and healthy eating.<sup>57</sup> This provides a good rationale for encouraging parents to model healthy eating behaviour and encourage positive family mealtimes.

#### **4.5 PHYSICAL ACTIVITY**

The Stellenbosch study supports previous findings<sup>100,108,109</sup> that specifically overweight and obesity prevalence increased as screen time increased<sup>137</sup> and the majority of the group that

didn't participate in sport were more prone to be overweight or obese.<sup>100</sup> A trend was observed that the overweight and obese individuals watched more than the recommended television (TV) time of less than two hours per day<sup>24</sup> and those that did not participate in sport did significantly less sport than the recommended one hour a day.<sup>138</sup> This correlates with findings in the Healthy Active Kids SA Report in 2010 where it was reported that nearly one in three SA adolescents watch more than three hours of TV daily.<sup>124</sup>

These findings imply that the overweight and obese children in Stellenbosch are preoccupied with sedentary activities that do not require movements for a long period of time. Despite the advances of technology, physical activity in schools has also decreased and contributes to a further increase in sedentary activities. An editorial released in 2002<sup>139</sup> indicated that less than one-third of black SA school children, living in disadvantaged areas, were offered physical education at school. To compound the problem, the conduct of physical activities is limited not only by time but also by the lack of adequate facilities in schools and in communities.<sup>12</sup> There is also the security risk, which is applicable to SA as well as the Stellenbosch environment, that the children are exposed to whenever they are away from home. The inadequacy of facilities where children can safely engage in physical activity, both in schools and in the community, contribute to the problem.<sup>12</sup>

The increase in physical activity is central to the management of weight problems in all age groups. Sedentary children require a very low dietary energy intake in order to control their weight. It is difficult to consume a diet that is adequate in minerals, vitamins and trace elements within such a restricted calorie intake. Young children need to increase their physical activity not only to prevent and manage overweight and obesity, but also to ensure they are able to consume a diet that is adequate in all nutrients.<sup>140</sup>

This information in association with other research results indicates the need to address, as a matter of urgency, the risks associated with modern society and increased sedentary living within the SA context to combat any increase in the levels of overweight and obesity among SA children.<sup>19</sup> By preventing or reducing the prevalence of childhood overweight and obesity, it may be possible to reduce the prevalence in adult obesity by between 7% and 13%.<sup>141</sup>

The levels of overweight and obesity among Stellenbosch children indicated in this study, coupled with the results from other SA research, are of concern both at present and for the future of SA.

#### **4.6 LIMITATIONS OF THE STUDY**

This study was limited by some factors. The first was that some of the selected schools were unwilling to participate in the study and alternative schools had to be included in the study and could possibly have impacted the characteristics of the sample in the second phase of the study and consequently the findings of the project. Another limitation was the small sample size in the second phase as a result of the poor response to the questionnaires, which led to

a decision to analyse the data as that of a comparison study and not a case-control study as initially intended.

The implementation of only one research instrument to measure dietary intake of respondents could also be seen as a possible limitation as FFQ provide only estimates and not absolute nutrient intakes. The use of an additional method would have been preferable since the true, accurate dietary intake of respondents can never be determined with absolute certainty and therefore there is no guarantee that the observed intake truly represents the usual intake of the respondents.<sup>142-144</sup>

The fact that the questionnaire was self-administered by the caregivers of the children could have had an influence on the number of the questionnaires returned in the second phase of the study. Illiterate or semi-illiterate parents could have struggled with the completion of the questionnaire and might therefore have been inclined not to fully complete and return the questionnaire while literate parents may have completed and returned the questionnaire in more detail.

The nutrition education material provided to the parents in conjunction with the questionnaires could also have influenced responses.

It should be noted that the question relating to breastfeeding practices could have been incorrectly interpreted by the respondents. Although the question asked about duration of exclusive breastfeeding, the options provided for answers by respondents continued beyond the recommended duration of 6 months. It seems that the mothers/caregivers therefore interpreted the question as the duration of any breastfeeding and not as the duration of exclusive breastfeeding. This could have had a negative impact on the results obtained and the interpretation should therefore be read with caution.

The conclusions cannot be generalized, but can only be considered preliminary, warranting further investigation.

**CHAPTER 5**  
**CONCLUSIONS AND RECOMMENDATIONS**

## 5.1 CONCLUSION

Stellenbosch primary school children, aged 6-13 years, showed a 13% prevalence of overweight (9%) and obesity (4%) which is slightly lower than the national average (17%) in 1999 but higher than the prevalence in the Western Cape (5%). The prevalence of overweight and obesity was highest in girls (8%), in children within the age group of 9 to 12 years and in higher SES areas. No significant association was found between nutritional status and SES, sex or age.

The results suggest that aspects of SES such as maternal employment hours, number of children in the household; eating habits like the regular consumption of brown rice, pork, canola/olive- and poly-unsaturated based margarine, doughnuts and time spent doing sport are important predictor variables for childhood overweight and obesity.

Other factors such as household income, food expenditure and parental education, breastfeeding practices and family characteristics like marital circumstances, household number, and mother's age did not appear to play a role in the development of childhood overweight and obesity in the Stellenbosch area. The  $H_0$  outlined in this particular Stellenbosch study were thus rejected.

## 5.2 RECOMMENDATIONS

From a public health point of view, it is essential to focus on obesity prevention to address the steady rise in the prevalence of obesity and overweight within SA school-aged children. Due to the environment being a possible determinant of obesity risk in later life it is important to make carers and parents, especially mothers, aware of the potential for environmental factors to contribute to the obesity problem. In light of this study's evidence, it seems necessary to pro-actively promote healthy eating behaviour and physical activity to children at an early age.

Based on the findings of this Stellenbosch study, in conjunction with the results from previous international and SA research, the following recommendations are proposed to address the problem of obesity and overweight among primary school children:

1. In SA and the Stellenbosch study, obesity seems to be higher among pre-puberty girls and in the Stellenbosch study overweight and obesity was most prevalent at the pre-adolescent ages of 9 and 12 years. The case for intervening in the early years to prevent obesity is therefore compelling and evidence from other sources highlights how lifestyle choices – both food preferences and physical activity – have their roots in the very early years. When considering that young children are likely to be more receptive at this age, it becomes clear that special attention should be given to the dietary habits of school-aged children, in particular for girls, before they progress onto adolescence. Instilling healthy eating habits and encouraging children to get active when they are young will help set them up for their teenage years when the responsibility becomes their own. This can be achieved by empowering parents, especially mothers, carers and schools to promote children's ability to self-regulate

energy intake, whilst providing appropriate structure and boundaries around eating. The school environment provides an excellent setting for health and nutrition promotion and supporting the Health Promoting Schools initiative in SA could ensure momentum for interventions addressed at overweight and obesity. Strategies can include ensuring healthy lunch boxes at schools, tuck shops providing healthier food options, having so-called 'nutrition days' at schools or aftercare facilities to educate children and promote healthier food choices, nutrition education being incorporated into the curriculum of different school subjects. Unlike adults, children don't have the ability or competence to make healthy dietary choices and resist marketing when unhealthy food options are available. Thus, the promotion and marketing of energy dense foods or fast-food outlets could potentially undermine healthy food selection and threaten healthy lifestyle choices. Government should consider policies and strategies to deal with the marketing and advertising of unhealthy food to children. This can be achieved by implementing some form of legislation or code of marketing of food and beverages to reduce sponsorship, promotion and advertising of unhealthy foods or fast foods to children. Alternatively, these should be replaced with positive health 'messages' to encourage healthy food choices and favourably influence children's attitudes, preferences and behaviour towards the healthier foods being advertised.

2. Results from the Stellenbosch study and from other research indicate that maternal employment hours are a predictor variable for childhood overweight and obesity. This translates into mothers spending less time at home and more hours away from home. The implications are that many children eat meals in day-care settings away from the family and often receive commercially pre-prepared foods or foods low in nutritional value. Due to this reason, attention should be given to the mother's workplace by means of legislation that regulate the number of hours a mother work, addressing the duration of maternity leave and making the workplace more 'child-friendly' or by the provision of childcare facilities. At the other spectrum a good platform should be set at home to counteract the above-mentioned negative effect. In most households women are the key figures responsible for food shopping and preparation, which means that they determine the so-called feeding environment in which children grow-up in. Health messages should therefore be targeted at mothers, in particular those working long hours away from home. Messages should include the importance of providing nutritious meals, within budget allowance and raising the awareness that despite them spending less time at home they would need to create opportunities to educate their children on the benefits of healthy eating habits and regular physical activity. Nutritionally reliable resources and information should be made available, that is appropriate to all parental educational levels in attempt to empower parents, mothers and caregivers with simpler, more actionable messages about nutritional choices based on the latests FBDG for healthy eating at all socio-economic levels. By directing policies towards women, an opportunity is created to improve the nutritional status of a household but also of the whole nation.

3. Children take cues from parents, in particular from mothers and adopting healthy behaviour and habits is no exception. Parents must set good examples to their children and start early. Emphasis should be placed on parents' own lifestyle, recognising that not all parents will have healthy lifestyles so may need to address their own diet and activity. It is therefore important to help parents, especially mothers to acknowledge their responsibility as role models to their children when it comes to healthy eating and lifestyle modifications. Action should be taken to ensure that mothers are knowledgeable and supported in making lifestyle changes themselves. Parents and carers should also be educated about the importance of taking a whole family approach and the entire family should be engaged in healthy eating and physical activity. Even small changes such as regular family meals, establishing order to eating habits like the regular consumption of fruit and vegetables coupled with limitations on foods empty in calories and taking part in simple activities to increase physical activity, such as playing, can add up to making a positive difference. These factors were seen to be important predictor variables for childhood overweight and obesity in previous research and in the Stellenbosch study. Parents taking the central role in encouraging the concept of family meals, is an excellent opportunity for parent modelling of enjoyment of healthy foods and positive eating behaviours and attitudes towards food, along with children having greater access to healthier alternatives as well as creating a platform for the prevention of childhood obesity.
4. Physical activity, in particular time spent doing sport, was found to be an important predictor variable for childhood overweight and obesity in the Stellenbosch study. As a result, preventative strategies should be aimed at discouraging inactivity and encouraging physical activity in attempt to get school children more physically active. This can be achieved by involving the family but also the schools. Parents should make time for the family to engage in sports activities and other regular physical activities like playing games, going for walks and outings. To minimise sedentary behaviour, parents should encourage their children to develop hobbies and interests other than television watching and playing computer games. They should also encourage children to perform general household chores that will contribute to their children being more physically active. Other environmental factors e.g. the absence of physical education in many SA schools, television viewing for more than 3 hours daily, a lack of sports facilities in schools and communities and high crime rates prevent SA school children from engaging in optimal physical activity. Quality physical education classes in schools and other opportunities in and after school, is a good instrument and model for promoting physical activity among school-aged children. However, it is very important to ensure that physical education classes are equally distributed across schools from different SES groups. Other factors that needs addressing are aspects of the built-up environment that make it difficult for children to walk or cycle safely in their communities and improving access to safe parks, playgrounds and indoor and outdoor

recreational facilities. If children remain active into adulthood we would be able to reduce the prevalence of sedentary activities and possibly have an impact on chronic diseases associated with obesity and inactivity in later life.

5. Even though childhood overweight and obesity is more prevalent in the high SES income group, as seen in the Stellenbosch study, it is still important for government to look at improving access to healthy, affordable food. This can be done by lowering the relative prices of healthier foods, developing or reformulating food products to be healthier and reducing the incidence of undernutrition. The more expensive healthy food becomes, the lower the consumption by disadvantaged socio-economic groups, making them more vulnerable to poor nutrition. This consequently, over time could contribute to the growing problem of childhood obesity. Large scale interventions involving the government, food producers and retailers must be implemented in addressing 'malnutrition in all its forms'.
  
6. It has been observed from previous international studies that the prevalence of childhood overweight and obesity has been increasing over the past number of years up until the point where it has been identified as a major threat to children's health worldwide. SA data indicated that the prevalence among children is very similar to that of developing countries several years ago. In order to prevent and manage the progression of this epidemic it is necessary to monitor the status of overweight and obesity prevalence among SA children from all social backgrounds. This should be done on an ongoing basis to improve the understanding of factors and causes thereof among children from all entities living in specific communities. This will also help to determine if intervention strategies already implemented nationally or in local communities are successful. The above-mentioned can be achieved by the establishment of a national overweight and obesity monitoring system focusing specifically on children. Children, of different age groups, can be weighed and measured nationally, at school level and at timely intervals. This could then be used to calculate BMI but also serve as a tool to examine the possible future trend of overweight and obesity prevalence at a population level. BMI measurements and other tools like questions about physical activity, diet and exercise as part of vital signs during a general check-up can also be used by health professionals in identifying at risk children. Other considerations are that provinces and different local communities in SA may have different causes or associated factors that play a role in childhood obesity due to SA's very diverse population, culturally and socio-demographically. Trends and data obtained from this monitoring system can be used in national and local planning to ensure that resources and interventions are target-specific within the different areas and populations. The data obtained from such a monitoring system, exploring the patterns of childhood overweight and obesity in SA could also serve as a contribution to the already existing international information on childhood obesity.



The above-mentioned intervention strategies to address childhood obesity will require a coordinated effort between the various parties involved in modern society. This will involve politicians and legislators within government at a national and provincial level, health professionals, teachers at school level, parents and carers within the family environment, food manufacturers and retailers, the media, recreation and sport planners, city planners and architects. It is hoped that should these strategies be applied within the SA context it would help and encourage healthy eating behaviour and active living, which in turn, should enable school children to maintain their weight within a healthy range.

Additional research is required on a larger sample, possibly of a multi-centre nature to better understand the influence of the home environment and socio-economic factors in the development of childhood obesity, due to the fact that obesity is rapidly becoming one of the most important medical and public health problems of our times.

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## **APPENDICES**

## APPENDIX A

Dear Dr A Siyengo

### **Letter requesting approval and participation in a research project**

I am a dietitian currently busy with my Master of Nutrition degree in Nutrition at Stellenbosch University. As part of my Masters degree I will be performing a research project titled:

#### ***The influence of socio-demographic factors on the nutritional intake of overweight and obese children in the Stellenbosch area, Western Cape.***

The aim of the study is to determine the prevalence of overweight and obesity in children in the Stellenbosch area of the Western Cape and identify associated risk factors in relation to eating behaviour, food composition and sedentary lifestyle.

Overweight and obesity is common in children and adolescents and its prevalence is still increasing. Risk factors for being overweight and childhood obesity are not well established. Existing prevention strategies focusing on late childhood and adolescence are largely unsuccessful. There is however a consistently increasing body of evidence that the early life environment is an important determinant of risk of overweight and obesity in later life. By exploring the impact of the home environment on nutritional and health educational programmes, one may be able to help children establish healthy eating patterns and lifestyle that contributes to the prevention or, at least, delay of chronic diseases later in life.

The study will include all children from both genders, between the ages of 6-13 years, attending randomly selected primary schools in the Stellenbosch area.

It would be much appreciated if you would be so kind as to grant permission to proceed with the research project at the following schools that were randomly selected:

- **Devon Valley Primary School**, PO Box 4046, Stellenbosch 7609
- **Eikestad Primary School**, Doornbosch Street, Stellenbosch, 7600
- **Idasvallei Primary School**, PO Box 6129, Uniedal, 7612
- **PC Petersen**, 7 School Street, Kylemore, 7608
- **Rhenish Primary School**, Doornbosch Street, Krigewille, Stellenbosch, 7600
- **Rietenbosch Primary School**, 90 Long Street, Cloeteville, Stellenbosch, 7600
- **Koelenhof Primary School**, Station way, PO Box 55, Koelenhof, 7605

Once I have received your approval I will also contact the respective schools and obtain permission from each school to proceed with the research project. The first stage of research will involve the anthropometric screening of the children to determine their nutritional status enabling the prevalence of overweight and obesity to be determined. Only children who give verbal assent will be included in the study, by being weighed and measured, thus participation in the study is completely voluntary.

Subjects participating in the second stage of the research will be divided into cases and controls groups according to their weight classification. Cases will include 30 children with a BMI above the cut-off point for overweight and obesity and a further 30 children will be matched according to the cases' gender and age. Children selected for this stage of the research study will receive an information leaflet that explains the details of the study, socio-demographic and general questionnaire to be completed and returned by the child's carer. An information session will also be arranged at each of the participating schools – during which any queries or concerns by the parents could be addressed by the researcher herself and assistance in completing the questionnaire will be provided.

The study has been approved by the Human Research Committee, Faculty of Health Sciences, Stellenbosch University, (Project number: **N08/08/232**).

Please don't hesitate to get in contact should you have any questions or concerns. Your participation would be much appreciated and I look forward in hearing from you.

Kind Regards

**Anél Kirsten**

**Tel: 021 885 5383 or 021 851 6228 (work) or Tel 083 210 1125 (cell)**

**APPENDIX B**



Navrae  
Enquiries **Dr RS Cornelissen**

***IMibuzo***

Telefoon  
Telephone (021) 467-2286

***IFoni***

Faks  
Fax (021) 425-7445

***IFeksi***

Verwysing  
Reference 20090320-0007

***ISalathiso***

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**Wes-Kaap Onderwysdepartement**

---

**Western Cape Education Department**

---

**ISEbe leMfundo leNtshona Koloni**

---

Mrs A.P. Kirsten  
P.O. Box 7041  
NORTHERN PAARL  
7623

**Dear Mrs A.P. Kirsten**

**RESEARCH PROPOSAL: THE INFLUENCE OF SOCIO-DEMOGRAPHIC FACTORS ON THE NUTRITIONAL INTAKE OF OVERWEIGHT AND OBESE CHILDREN IN THE STELLENBOSCH AREA, WESTERN CAPE.**

Your application to conduct the above-mentioned research in schools in the Western Cape has been approved subject to the following conditions:

1. Principals, educators and learners are under no obligation to assist you in your investigation.
2. Principals, educators, learners and schools should not be identifiable in any way from the results of the investigation.
3. You make all the arrangements concerning your investigation.
4. Educators' programmes are not to be interrupted.
5. The Study is to be conducted from **1<sup>st</sup> April 2009 to 30<sup>th</sup> September 2009**.
6. No research can be conducted during the fourth term as schools are preparing and finalizing syllabi for examinations (October to December).
7. Should you wish to extend the period of your survey, please contact Dr R. Cornelissen at the contact numbers above quoting the reference number.
8. A photocopy of this letter is submitted to the principal where the intended research is to be conducted.
9. Your research will be limited to the list of schools as forwarded to the Western Cape Education Department.
10. A brief summary of the content, findings and recommendations is provided to the Director: Research Services.
11. The Department receives a copy of the completed report/dissertation/thesis addressed to:

**The Director: Research Services  
Western Cape Education Department  
Private Bag X9114  
CAPE TOWN  
8000**

We wish you success in your research.

Kind regards.

Signed: Ronald S. Cornelissen  
for: **HEAD: EDUCATION**

## APPENDIX C

Dear Sir/Madam

**Letter requesting approval and participation in a research project**

I am a dietitian currently busy with my Masters degree in Nutrition at Stellenbosch University. As part of my Masters degree I will be performing a research project titled:

***The influence of socio-demographic factors on the nutritional intake of overweight and obese children in the Stellenbosch area, Western Cape.***

Your school had been randomly selected from all the primary schools in the Stellenbosch area, to participate in the above mentioned research project.

The aim of the study is to determine the prevalence of overweight and obesity in children in the Stellenbosch area of the Western Cape and identify associated risk factors in relation to eating behaviour, food composition and sedentary lifestyle.

Overweight and obesity is common in children and adolescents and its prevalence is still increasing. Risk factors for being overweight and childhood obesity are not well established. Existing prevention strategies focusing on late childhood and adolescence are largely unsuccessful. There is however a consistently increasing body of evidence that the early life environment is an important determinant of risk of overweight and obesity in later life. By exploring the impact of the home environment on nutritional and health educational programmes, one may be able to help children establish healthy eating patterns and lifestyle that contributes to the prevention or, at least, delay of chronic diseases later in life.

The study will include all children from both genders, between the ages of 6-13 years, attending randomly selected primary schools in the Stellenbosch area.

I have received approval from the Western Cape Education Department to proceed with the study.

It would be much appreciated if you would be so kind as to grant me permission to proceed with the research project in your school. Once I have received your permission to continue with the research project the first stage of research will commence.

This involves the anthropometric screening of the children to determine their nutritional status enabling the prevalence of overweight and obesity to be determined. Only children who give verbal assent will be included in the study, by being weighed and measured, thus participation in the study is completely voluntary.

Subjects participating in the second stage of the research will be divided into cases and controls groups according to their weight classification. Cases will include 30 children with a BMI above the cut-off point for overweight and obesity and a further 30 children will be matched according to the cases' gender and age. Children selected for this stage of the research study will receive an information leaflet that explain the details of the study, socio-demographic and general questionnaire to be completed and returned by the child's carer. An information session will also be arranged at each of the participating schools - during which any queries or concerns by the parents could be addressed by the researcher herself and assistance in completing the questionnaires will be provided

The study has been approved by the Human Research Committee, Faculty of Health Sciences, Stellenbosch University (Project number: **N08/08/232**)

Please don't hesitate to get in contact should you have any questions or concerns.

Your participation would be much appreciated and I look forward in hearing from you.

Kind Regards

**Anél Kirsten**

**Tel: 021 885 5383 or 021 851 6228 (work), Tel: 083 210 1125 (cell)**

## APPENDIX D

Dear Dr Ronald S. Cornelissen

**Ref 20090320-0007: Letter regarding Research Project**

I am a dietitian currently busy with my Master of Nutrition degree in Nutrition at Stellenbosch University. We have been in correspondence regarding my research project titled:

***The influence of socio-demographic factors on the nutritional intake of overweight and obese children in the Stellenbosch area, Western Cape.***

You have granted me permission to proceed with the research project at the following schools that were randomly selected:

- **Devon Valley Primary School**, PO Box 4046, Stellenbosch 7609
- **Eikestad Primary School**, Doornbosch Street, Stellenbosch, 7600
- **Idasvallei Primary School**, PO Box 6129, Uniedal, 7612
- **PC Petersen**, 7 School Street, Kylemore, 7608
- **Rhenish Primary School**, Doornbosch Street, Krigewille, Stellenbosch, 7600
- **Rietenbosch Primary School**, 90 Long Street, Cloeteville, Stellenbosch, 7600
- **Koelenhof Primary School**, Station way, PO Box 55, Koelenhof, 7605

However some of the primary schools mentioned aren't able to participate in the project and therefore I need to request the participation of other schools to ensure that the study is representative of all socio-demographic groups living in Stellenbosch.

It would be much appreciated if you would be so kind as to grant permission to proceed with the research project at the following schools that were randomly selected:

- **AF Louw Primary School**, PO Box 2113, Dennesig, 7600
- **Stellenbosch Primary School**, Endler Street Stellenbosch 7600
- **Cloeteville Primary School**, Curry Street, Cloeteville, Stellenbosch
- **Pieter Langeveldt Primary School**, Lang Street Cloeteville Stellenbosch
- **Vlottenburg Primary School**, P.K Vlottenburgpad, Vlottenburg, 7604
- **Lynedoch Primary school**, PO Box 80 Lynedoch 7603
- **JJ Rhode Primary School** , PO Box 50, P.K Elsenburg 7607
- **St Idas Primary School**, P O Box 4090 Idasvallei, 7609

Once I have received your approval I will also contact the respective schools and obtain permission from each school to proceed with the research project.

The study has been approved by the Human Research Committee, Faculty of Health Sciences, Stellenbosch University,(Project number: **N08/08/232**).

Please don't hesitate to get in contact should you have any questions or concerns. Your participation would be much appreciated and I look forward in hearing from you.

Kind Regards

**Anél Kirsten**

**Tel: 021 885 5383 or 021 851 6228 (work)**

**Tel: 083 210 1125 (cell)**



## APPENDIX E

Navrae  
Enquiries **Dr RS Cornelissen**  
**IMibuzo**  
Telefoon  
Telephone (021) 467-2286  
**IFoni**  
Faks  
Fax (021) 425-7445  
**IFeksi**  
Verwysing  
Reference 20090320-0007  
**ISalathiso**



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**Wes-Kaap Onderwysdepartement**

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**Western Cape Education Department**

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**ISEbe leMfundo leNtshona Koloni**

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Mrs A.P. Kirsten  
P.O. Box 7041  
NORTHERN PAARL  
7623

Dear Mrs A.P. Kirsten

**RESEARCH PROPOSAL: THE INFLUENCE OF SOCIO-DEMOGRAPHIC FACTORS ON THE NUTRITIONAL INTAKE OF OVERWEIGHT AND OBESE CHILDREN IN THE STELLENBOSCH AREA, WESTERN CAPE.**

Your application to conduct the above-mentioned research in schools in the Western Cape has been approved subject to the following conditions:

12. Principals, educators and learners are under no obligation to assist you in your investigation.
13. Principals, educators, learners and schools should not be identifiable in any way from the results of the investigation.
14. You make all the arrangements concerning your investigation.
15. Educators' programmes are not to be interrupted.
16. The Study is to be conducted from **1<sup>st</sup> April 2009 to 30<sup>th</sup> September 2009.**
17. No research can be conducted during the fourth term as schools are preparing and finalizing syllabi for examinations (October to December).
18. Should you wish to extend the period of your survey, please contact Dr R. Cornelissen at the contact numbers above quoting the reference number.
19. A photocopy of this letter is submitted to the principal where the intended research is to be conducted.
20. Your research will be limited to the list of schools as forwarded to the Western Cape Education Department.
21. A brief summary of the content, findings and recommendations is provided to the Director: Research Services.
22. The Department receives a copy of the completed report/dissertation/thesis addressed to:

**The Director: Research Services  
Western Cape Education Department  
Private Bag X9114  
CAPE TOWN  
8000**

We wish you success in your research.

Kind regards.

Signed: Ronald S. Cornelissen  
for: **HEAD: EDUCATION**  
**DATE: 26<sup>th</sup> March 2009**

## APPENDIX F

# PARTICIPANT INFORMATION LEAFLET FOR USE BY THE LEARNERS

**TITLE OF THE RESEARCH PROJECT:** The influence of socio-demographic factors on the nutritional intake of overweight and obese children in the Stellenbosch area, Western Cape.

**REFERENCE NUMBER:** N08/08/232

**PRINCIPAL INVESTIGATOR:** Mrs AP Kirsten

**ADDRESS:** Stellenbosch and Vergelegen Nutrition Centre  
14B Oewerpark, Die Boord  
Stellenbosch, 7600

**CONTACT NUMBER:** 021 887 5383 or 021 851 6228 or 083 210 1125

**Why have I been invited to take part in this research project?**



All children between the ages of 6 to 13 years, girls and boys, who go to your primary school in Stellenbosch are invited to take part in the study. Your mother or father will have to give permission for you to take part in the study.

**Who is doing the research?**



I am a dietitian doing a study that looks at what children eat and how active they are.

### What do I need to do if I decide to take part?



You will be weighed and measured to see how tall you are and whether you have a healthy weight.



You might be asked to take a form home for your mom or dad to fill in with questions about the food you eat and what you do to keep active like the sports you do and the games you play.

### Must I take part in the research project?

No, you don't have to if you don't want to! It is completely up to you and nothing will happen to you if you decide not to take part or if you decide to stop at any time.

### Who can I talk to if I don't know what to do?



Please ask the study researcher any questions about any part of this project that you don't understand. It is very important that you understand what this research is about.

**THANK YOU VERY MUCH!**



## APPENDIX G

# DEELNEMER INLIGTINGSPAMFLET VIR GEBRUIK DEUR DIE LEERDERS

**TITEL VAN DIE NAVORSINGS PROJEK:** Die invloed van sosio-demografiese faktore op die nutrisionele inname van oorgewig en vetsugtige kinders in die Stellenbosch area, Wes-Kaap.

**VERWYSINGSNOMMER:** N08/08/232

**HOOFNAVORSER:** Mev AP Kirsten

**ADRES:** Stellenbosch and Vergelegen Nutrition Centre  
14B Oewerpark, Die Boord  
Stellenbosch, 7600

**KONTAK BESONDERHEDE:** 021 887 5383 of 021 851 6228 of 083 210 1125

**Hoekom word ek uitgenooi om deel te neem aan die navorsingsprojek?**



Alle kinders tussen die ouderdomme van 6 tot 13 jaar, dogters en seuns, wat skool gaan by jou skool in Stellenbosch word uitgenooi om deel te wees van die studie. Jou ma of pa sal toestemming moet gee vir jou om deel te neem aan die studie.

**Wie doen die navorsing?**



Ek is 'n dieetkundige wat besig is met 'n studie wat kyk na watter kos kinders eet en hoe aktief hulle is.

### Wat moet ek doen sou ek besluit om deel te neem aan die studie?



Jy gaan geweeg en gemeet word om uit te vind hoe lank jy is en of jy 'n gesonde gewig weeg.



Jy gaan moontlik 'n vorm kry wat jy moet huis toe neem vir jou ma of pa om in te vul met vrae oor kos wat jy eet, wat jy doen om aktief te bly soos sport en speletjies wat jy speel.

### Moet ek deel neem aan die navorsingsprojek?

Nee, jy hoef nie as jy nie wil nie! Dit hang heeltemal van jouself af en niks gaan met jou gebeur as jy besluit om nie deel te neem nie of as jy besluit om op te hou op enige tyd.

### Met wie kan ek praat as ek nie weet wat om te doen nie?



Jy kan die navorsers enige vrae vra oor enige deel van die projek wat jy nie heeltemal verstaan nie. Dit is baie belangrik dat jy verstaan waarvoor die navorsing gaan.

**BAIE DANKIE!**



## APPENDIX H

### PARTICIPANT INFORMATION LEAFLET FOR USE BY PARENTS/LEGAL GUARDIANS

**TITLE OF THE RESEARCH PROJECT:** The influence of socio-demographic factors on the nutritional intake of overweight and obese children in the Stellenbosch area, Western Cape.

**REFERENCE NUMBER:** N08/08/232

**PRINCIPAL INVESTIGATOR:** Mrs AP Kirsten

**ADDRESS:** Stellenbosch and Vergelegen Nutrition Centre  
14B Oewerpark, Die Boord  
Stellenbosch, 7600

**CONTACT NUMBER:** 021 887 5383 or 021 851 6228 or 083 210 1125

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

This study has been approved by the **Committee for Human Research at Stellenbosch University** as well as the **Department of Education** and will be conducted according to the ethical guidelines and principles of the international Declaration of Helsinki, Guidelines for Good Clinical Practice and the Medical Research Council Ethical Guidelines for Research.

#### **What is this research study all about and why has your child been invited to participate?**

All children between the ages of 6 to 13 years, from both genders, are eligible for inclusion in the study. Your child's primary school has been selected to partake in the study. Should you not object to your child participating in the study, he/she will be weighed and measured by the researcher. Normal weight as well as overweight/obese children that comply with the inclusion criteria will then be included in either the sample or the control group and will receive questionnaires to complete.

The aim of the study is to investigate the association between the home environment and socio-economic factors and the occurrence of overweight and childhood obesity in the Stellenbosch area, Western Cape in relation to eating behavior, food composition and sedentary lifestyle.

Overweight and obesity is common in children and adolescents and its prevalence is still increasing. Risk factors for being overweight and childhood obesity are not well established. Existing prevention strategies focusing on late childhood and adolescence are largely unsuccessful. There is however a consistently increasing body of evidence that the early life environment is an important determinant of risk of overweight and obesity in later life. By exploring the impact of the home environment on nutritional and health educational programmes one may be able to help children establish healthy eating patterns and lifestyle that contributes to the prevention or, at least, delay of chronic diseases later in life.

The study is non-invasive, as participants will only need to complete a questionnaire that will help the investigator to meet the aims of the study. A General and Food Frequency Questionnaire will be used to obtain the necessary information.

To ensure an accurate representation of the community, the schools were divided into low-, middle- and high socio-economical background groups, by using the annual school fees as an indicator. Two schools have been randomly selected from each socio-economical group and one class out of each grade was randomly selected from each school.

**What will your responsibilities be?**

If your child is classified as overweight or obese or selected as a match according to age and gender for one of the cases, you would be required to complete the questionnaire provided. The questionnaire asks for some background information about your child, especially what they eat.

**Will your child benefit from taking part in this research?**

There are no immediate benefits to your child; however this study will be able to provide evidence for a possible association between socio-demographic factors and nutritional intake with regards to overweight and childhood obesity in the particular area. Due to the environment being a possible determinant of overweight and obesity risk in later life it therefore suggests that several influences in early life might be suitable targets for future overweight/obesity prevention interventions and treatment of future patients.

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

There is no health risks involved in participating in this study and all questionnaires will be handled confidentially.

**If you do not agree to allow your child to take part, what alternatives does your child have?**

Participation in this study is completely voluntary. Should you not want your child to take part in this study; your decision will neither affect you or your child negatively.

**Who will have access to the information provided?**

Only the principal investigator will have access to the questionnaires and be responsible for the statistical procedures with the assistance of a qualified statistician. All questionnaires and study participants will be kept anonymous throughout the study and thereafter. Patient identification information will be omitted from study-related material to ensure participant confidentiality. All conversations and information provided to the researcher will be regarded as confidential. Information provided to the researcher will only be used for this study, and will not be shared for any other purposes or projects.

**How will the results of research be made available?**

Data will be presented as a thesis, as papers at national and international conferences and submitted for publication in peer-reviewed literature.

**Is there risk of my child getting injured in any way, as a direct result of taking part in this research study?**

Participants will not have any risk of injury due to the nature of this study.

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

You or your child will not be paid to take part in the study. There will be no costs involved for you if your child does take part.

**Is there any thing else that you should know or do?**

If you **DO NOT** want your child to participate, then don't fill in the form and don't return it with him/her to school.

You may contact Anél Kirsten (Dietitian) at 021 887 5383 or 083 210 1125 if you have any further queries or encounter any problems.

You may also contact the Committee for Human Research, Stellenbosch University at 021 938 9207 if you have any concerns or complaints that have not been adequately addressed by the principal investigator.

An information session will be arranged at your child's school on \_\_\_\_\_ to address any concerns or queries and also to assist with the completion of the questionnaire.



## APPENDIX I

### DEELNEMER INLIGTINGS-PAMFLET VIR GEBRUIK DEUR DIE OUIERS/ VOOGDE

**TITEL VAN DIE NAVORSINGS PROJEK:** Die invloed van sosio-demografiese faktore op die nutrisionele inname van oorgewig en vetsugtige kinders in die Stellenbosch area, Wes-Kaap.

**VERWYSINGSNOMMER:** N08/08/232

**HOOFNAVORSER:** Mev AP Kirsten

**ADRES:** Stellenbosch and Vergelegen Nutrition Centre  
14B Oewerpark, Die Boord  
Stellenbosch, 7600

**KONTAK BESONDERHEDE:** 021 887 5383 of 021 851 6228 of 083 210 1125

Jou kind word uitgenooi om deel te neem aan 'n navorsingsprojek. Neem asseblief jou tyd om deur die inligting te gaan, waarin al die nodige besonderhede van die projek verduidelik word. Kontak gerus die hoofnavorser indien jy enige vrae sou hê aangaande die navorsingsprojek of gedeeltes wat jy nie heeltemal verstaan nie. Dit is baie belangrik dat jy volkome tevrede is dat jy 'n goeie begrip het waarvoor hierdie navorsingsprojek gaan asook hoe jou kind daarby betrokke sal wees. Jou kind se deelname is **heeltemal vrywillig** en jul het die volste reg om deelname te weier. Indien jy nie sou sê, sal dit nie jou of jou kind negatief affekteer nie. Jul het ook die volste reg om op enige tydstop gedurende die studie, hom/haar te onttrek selfs al het jul aanvanklik ingestem tot deelname aan die projek.

Die studie is goedgekeur deur die **Komitee vir Menslike Navorsing by die Universiteit van Stellenbosch** asook die **Departement van Onderwys** en sal uitgevoer word volgens die Etiese Riglyne en Beginsels soos bepaal deur Internasionale Deklarasie van Helsinki, Riglyne vir Goeie Kliniese Praktise en die Mediese Navorsings Raad se Etiese Riglyne vir Navorsing.

#### **Wat behels die navorsingsprojek en hoekom word my kind uitgenooi om deel te neem?**

Alle kinders tussen die ouderdomme van 6 tot 13 jaar, van beide geslagte, kwalifiseer vir insluiting in die studie. Jou kind se laerskool is geselekteer om deel te neem aan die studie. Sou jy geen besware aanteken teen die deelname van jou kind aan die studie nie, sal hy/sy geweeg en gemeet word deur die navorser. Kinders met normale gewig asook oorgewig en vetsugtige kinders wat voldoen aan die insluitingskriteria sal dan ingesluit word of in die steekproef of in die kontrole groep en sal vraelyste ontvang wat voltooi moet word.

Die doel met die studie is om die assosiasie tussen die huislike omgewing en sosio-demografiese faktore asook die voorkoms van oorgewig en vetsugtigheid in kinders woonagtig in die Stellenbosch area, Wes-Kaap te ondersoek met betrekking tot eetgedrag, voedselsamestelling en 'n onaktiewe lewenstyl.

Oorgewig en vetsugtigheid is algemeen in kinders en adolessente en tog is die prevalensie daarvan steeds besig om toe te neem. Die risiko faktore verbonde aan oorgewig en vetsugtigheid is nog steeds relatief onbekend. Huidige bestaande voorkomingsstrategieë wat hoofsaaklik fokus op die laat kinderjare en adolessensie is grootliks onsuksesvol. Daar is steeds voortdurende bewyse dat die vroeë lewensomgewing 'n deurslaggewende faktor is in die risiko tot oorgewig en vetsugtigheid in die latere lewe. Deur die impak van die huislike omgewing op die nutrisionele- en gesondheidsopvoedingsprogramme te ondersoek kan mens moontlik kinders help om gesonde eetgewoontes en lewenstyl te ontwikkel en te vestig wat bydra tot die voorkoming of ten minste vertraging van kroniese siektes later in die lewe.

Die studie is nie-indringend en as deelnemer hoef jy bloot die vraelyste te voltooi wat die navorser sal bystaan om die doelwitte van die studie te bereik. 'n Algemene en Voedsel Frekwensie Vraelyste word gebruik om die nodige inligting in versamel.

Om 'n akkurate verteenwoordiging van die gemeenskap te verseker, was die skole verdeel in 3 groepe wat gebaseer was op sosio-ekonomiese agtergrond nl. lae, middel en hoë groepe, deur gebruik te maak van jaarlikse skoolgelde as maatstaf. Twee skole vanuit elke sosio-ekonomiese



groep was ewekansig geselekteer en een klas uit elke graad was ewekansig geselekteer vanuit elke skool .

**Wat is my verantwoordelikhede en wat word van my verwag?**

Indien jou kind geklassifiseer word as oorgewig of vetsugtig of gekies is as deel van die kontrole groep volgens ouderdom en geslag, sal daar van jou verwag word om die vraelys wat voorsien is, te voltooi. Die vraelys vra agtergrond inligting oor jou kind veral ten opsigte van wat hy/sy eet.

**Sal jou kind daarby baat vind om deel te neem aan die navorsing?**

Die navorsing hou geen onmiddellike voordele in vir jou kind nie, alhoewel die studie as staving kan dien vir 'n moontlike assosiasie tussen sosio-demografiese faktore en nutrisionale inname ten opsigte van oorgewig en vetsugtigheid in kinders in dié spesifieke area. Aangesien die omgewing 'n moontlike deurslaggewende rol speel in die risiko tot die ontwikkeling van oorgewig en vetsugtigheid in die latere lewe van 'n individu dui dit daarop dat verskeie invloede in die vroeë lewe as moontlike teikens kan dien vir toekomstige oorgewig/vetsugtigheids voorkomings intervensies/ ingrypings vir toekomstige pasiente.

**Hou die navorsing enige risiko's in sou my kind aan die studie deelneem?**

Deelname aan die studie hou geen gesondheids risiko's in nie en alle vraelyste sal vertroulik hanteer word.

**Sou ek nie my kind se deelname goedkeur nie, watter alternatiewe sal my kind hê?**

Deelname aan die studie is heeltemal vrywillig. Sou jy nie wou hê dat jou kind moet deelneem nie, sal jou besluit nie jou of jou kind negatief beïnvloed nie.

**Wie sal toegang hê tot die inligting wat verskaf is?**

Slegs die hoofnavorsers sal toegang hê tot die vraelyste en sal ook verantwoordelik wees vir die statistiese prosedures tesame met die bystand van 'n gekwalifiseerde statistikus. Alle vraelyste en kinders wat deelneem aan die studie sal anoniem bly gedurende die studie asook na die tyd wanneer die studie alreeds voltooi is. Deelnemer identifikasie inligting sal weggelaat word van studie-verwante materiaal om deelnemer konfidensialiteit te verseker. Alle gesprekke en inligting wat aan die navorsers voorsien word sal as vertroulik beskou word. Inligting voorsien aan die navorsers sal slegs vir hierdie betrokke studie gebruik word en nie vir ander doeleindes of projekte nie.

**Hoe sal die resultate van die studie bekend gemaak word?**

Data sal aangebied word as 'n tesis, as artikels by nasionale en internasionale konferensies en sal voorgelê word vir publikasie in eweknie ge-evalueerde literatuur.

**Is daar enige risiko dat my kind beseer kan word tydens die deelname aan die navorsingsprojek?**

Deelnemers sal geen risiko tot besering hê nie a.g.v. die aard van die studie.

**Sal jy of jou kind betaal word vir deelname aan die studie en is daar enige kostes verbonde aan deelname?**

Jy en jou kind sal nie betaal word vir deelname aan die studie nie. Daar sal ook geen kostes wees vir jou nie, sou jou kind deelneem aan die studie.

**Is daar enigsins iets anders waarvan jy bewus moet wees of doen?**

Sou jy **NIE** wil hê dat jou kind deelneem aan die studie nie, dan moet jy nie die vorm invul en terugstuur saam met hom/haar skool toe nie.

Jy kan Anél Kirsten (Dieetkundige) kontak by 021 887 5383 of 083 210 1125 sou jy enige verdere vrae hê of enige probleme ervaar.

Jy kan ook die Komitee vir Menslike Navorsing, Universiteit van Stellenbosch kontak by 021 938 9207 indien jy enige klagtes of besorgdhede het wat nie voldoende deur die hoofnavorsers aangespreek is nie.

'n Algemene inligtingsaand sal by jou kind se skool gehou word op \_\_\_\_\_ om enige vrae te beantwoord deur die navorsers en om hulp te bied aangaande die voltooiing van die vraelyste.

## APPENDIX J

### HEALTHY LIFESTYLE FOR CHILDREN

When it comes to eating, South Africans usually eat and cook the way their parents ate and cooked. What we eat and how we prepare our food are to a large extent determined by our traditions and customs, what foods are available, what we can afford and what we like. In this modern age some peoples' lives are ruled by the clock and meeting deadlines. In this rush a variety of freshly prepared food is often replaced by processed or convenience foods that sometimes provide excess energy and fats, but insufficient vitamins and minerals. In other instances, food may be limited in variety and amount by those who have little money.

Too much food intake in total, a diet high in fat and sugar, and/or a more sedentary lifestyle, may lead to overweight and related chronic diseases of lifestyle such as diabetes, cardiovascular heart diseases and hypertension. Micronutrient deficiencies mean that people lack certain nutrients in their diet. This can happen even when people have enough to eat.

South African nutrition experts have developed foodbased dietary guidelines (FBDG's) to promote healthy eating habits among South Africans. These guidelines aim to address the before mentioned common nutrition challenges we face in South Africa. The focus of these dietary guidelines is on healthy eating habits, rather than on individual nutrients. There are no good or bad foods, only good and bad eating habits such as eating too many high-fat foods or skipping meals.

#### The FBDG's for healthy eating are:

##### 1. Encourage children to eat a variety of foods

Healthy eating means eating a variety of foods to supply nutrients our bodies need. Different foods are composed of different nutrients such as proteins, carbohydrates, fats, minerals, vitamins, water and dietary fibre that help the body to function properly. Our bodies need a variety of different nutrients; therefore we need to eat a variety of different foods. No single food or meal can provide us with all the nutrients we need.

Mixed meals are usually eaten three times a day (breakfast, lunch and supper). It is wise to eat regular meals if possible – this will help to maintain blood glucose levels throughout the day and prevent feelings of dizziness, listlessness and poor concentration.

##### 2. Encourage children to play and be active every day

A healthy lifestyle also includes being active on a daily basis. Walking, swimming, cycling, dancing and playing rugby are all good ways of how to be active. Try to do at least 30-45 minutes every day. Encourage your child to be active and limit their time of watching TV, playing on the computer, or playing video games.

Regular physical activity has many benefits e.g. reduces risk of cardiovascular diseases (CVD's), high blood pressure and diabetes and helps with weight control.

##### 3. Offer children lots of clean, safe water

Water makes up 50-70% or about two-thirds of our bodies. Because our body loses water throughout the day, we have to drink water every day. We can go without food for some time, but we cannot go without water.

##### 4. Make starchy foods the basis of a child's main meals

Starchy foods provide the body with energy and other important nutrients. Include starchy foods e.g. bread, pasta, cereals, rice or potatoes at every meal. These foods give you B vitamins, fibre and some iron and zinc.

##### 5. Children need plenty of vegetables and fruits every day

Eat fruit and vegetables daily, we should be aiming for 5 portions a day. Try to have fruit and vegetables with every meal e.g. fruit in the lunchbox and at least 2 vegetables with the evening meal. Fruit and vegetables give you vitamins A and C and fibre which help to strengthen the body's immune system to resist illnesses such as infections, diarrhoea and colds also help to prevent certain types of cancer.

##### 6. Children need milk every day

Have low fat dairy products e.g. low fat cheese, yogurt and include up to 500ml of low fat milk a day. These foods would give your child protein, calcium and B vitamins.

**7. Children can eat chicken, fish, meat, eggs, dried beans, peas, lentils and soya every day.**

Chicken, fish, meat, milk and eggs are all animal-based foods and are all sources of good quality protein. Protein is needed for the growth, maintenance and repair of body tissue.

Eat smaller servings of lean red meat and remove visible fat. These foods give you protein, iron, zinc, magnesium, B vitamins and Vitamin A. Some give you omega 3 fats e.g. oily fish like sardines, pilchards, herring and salmon.

Otherwise choose pulses or legumes e.g. dry beans, baked beans, butter beans, kidney beans, split peas, chick peas, lentils, soya beans and products made from soya, seeds, unsalted nuts and peanut butter - should be eaten two to three times per week.

**8. Eat fats sparingly**

Fats should never be completely excluded from our diet - supply essential fatty acids to the diet that cannot be produced by the body and have to be supplied by the food we eat. However, high fat foods are high in calories and have very few nutrients. Eating too much of these foods may make you overweight and this can cause diabetes and heart disease and certain cancers. Fats are very concentrated sources of energy; therefore it is easy to eat too much fat. Cut down on the amount of high fat foods e.g. potato chips, fatty biltong, dry wors, pastries and pies. One should reduce frequency and quantity. Rather grill, poach or dry roast your food and spread margarine thinly.

Avoid fried foods e.g. fried sausages, burgers and eggs. Choose other methods of cooking such as boiling, stewing, baking or roasting in an oven, steaming, grilling in an oven or on a grid, or over hot coals, instead of frying.

**9. Use salt sparingly**

Most of the salt we eat comes from salt added while preparing and cooking food. Salt is commonly used to add flavour to foods. The rest comes from the salt added at the table and from eating processed foods. Many snack foods and take-away foods are laden with salt. Eating too much salt and salty food increases the risk of both coronary heart disease and stroke.

**10. Use food and drinks containing sugar sparingly and not between meals Children may be offered small amounts of food and drinks containing sugar at mealtimes.**

Cut down on foods and drinks high in sugar e.g. sweets, cakes, biscuits, chocolates and fizzy drinks. Keep them as a special treat after a mixed meal or for special occasions. Snacks are often important to meet the higher energy and nutrient needs of very active people, teenagers and growing children. Unsalted peanuts and raisins, whole-wheat crackers and cheese, any type of fruit, raw carrots or yoghurt are good choices of snack foods.

The key is not to have food and drinks containing sugar between meals, but to reserve them as a treat for special occasions.

**TOP TIPS FOR YOU AND YOUR CHILD**

- Children learn best with example: be a good role model by adopting healthy eating and exercise behaviours for yourself.
- Ask friends and family members to support your child's efforts to have a healthy lifestyle. Everyone should be consistent in their approach to your child's healthy eating plan.
- Avoid calling foods good or bad, offer healthy options. Agree on 1-2 treats a week for the whole family.
- Instead of rewarding your child with food try the following:
  - going to the cinema, ten pin bowling, ice skating
  - A new book or magazine.
  - Having a friend stay overnight.
- Praise efforts made by your child to be healthy instead of dwelling on the bad habits.
- Encourage your child to decide whether they are really hungry when they ask for food.
- Separate eating from other activities such as watching TV or doing homework
- Provide meals and snacks at regular times instead of allowing your child to 'graze' all day long.
- Comfort your child with attention, hugs, listening instead of food.

Should you require more information or individualized dietary advice, you can contact the Association for Dietetics in South Africa (ADSA) to help find a dietitian within your area.

**Telephone:** (011) 789-6621; **Website:** [www.adsa.org.za](http://www.adsa.org.za); **Email:** [info@adsa.org.za](mailto:info@adsa.org.za)

## APPENDIX K

### GESONDE EETGEWOONTES VIR KINDERS

Wanneer dit kom by etes, eet en kook Suid-Afrikaners soos hul ouers geëet en gekook het. Wat ons eet en hoe ons kos voorberei word hoofsaaklik beïnvloed deur tradisies en gewoontes, watter kos beskikbaar en bekostigbaar is asook waarvan ons hou.

In vandag se moderne lewe, word ons lewens beheer deur die horlosie. Tydens hierdie gejaag word 'n verskeidenheid van vars voorbereide kos maklik vervang deur geprosesseerde- of gerieflikheidsvoedsel wat soms oormatige energie en vet verskaf, maar onvoldoende is in vitamienes en minerale. In ander woorde kos kan beperk wees in verskeidenheid en in hoeveelheid in die geval van persone wat nie genoeg geld het nie.

Wanneer mens té veel eet, 'n dieet volg wat hoog is in vet en suiker, asook 'n onaktiewe leefstyl het, kan dit lei tot oorgewig en kroniese siektes soos diabetes, kardiovaskulêre siektes en hoë bloeddruk. Mikronutrient tekorte beteken dat mense 'n tekort het aan sekere nutriente in hul diet. Dit kan gebeur selfs wanneer mense genoeg het om te eet.

Suid-Afrikaanse voedingskenners het voedselgebaseerde dieetriglyne saamgestel om gesonde eetgewoontes te bevorder. Hierdie riglyne spreek die bogenoemde voedingsprobleme aan waarmee ons te doen kry in Suid-Afrika. Die fokus van hierdie dieetriglyne is op gesonde eetgewoontes in plaas van individuele nutriënte. Daar is nie iets soos goeie of slegte kossoorte nie – slegs goeie en slegte eetgewoontes soos té veel hoë vet kosse of om maaltye oor te slaan.

#### **Die Voedselgebaseerde dieetriglyne vir gesonde eetgewoontes sluit in:**

##### **1. Moedig kinders aan om 'n verskeidenheid van kossoorte te eet**

Gesonde eetgewoontes is om 'n verskeidenheid kossoorte te eet wat in ons liggaam se nutrient behoeftes voorsien. Verskillende kosse is saamgestel uit verskillende nutriente soos proteïene, koolhidrate, vette, minerale, vitamins, water en dieetvesel wat die liggaam help om normal te funksioneer. Ons liggaam benodig 'n verskeidenheid van voedselsoorte. Geen enkele voedselsoort of maaltyd kan ons voorsien van al die nodige nutriente nie.

Gemengde maaltye word meestal drie keer per dag geëet (ontbyt, middagete en aandete) Dit is slim om gereeld te eet – sodat bloedsuikervlakke konstant kan bly gedurende die dag en die gevoel van duisligheid, lusteloosheid en swak konsentrasie te voorkom.

##### **4. Moedig kinders aan om te speel en aktief te wees elke dag**

'n Gesonde leefstyl sluit ook in om aktief te wees op 'n daaglikse basis. Stap, swem, fietsry, dans en rygby is goeie maniere om aktief te bly. Mik vir 30-45 minutes elke dag. Moedig jou kind aan om aktief te wees en beperk tyd voor die televisie en rekenaar.

Gereelde fisiese aktiwiteit het verskeie voordele bv. dit verlaag die risiko vir die ontwikkeling van hartsiektes, hoë bloeddruk en diabetes asook help dit met gewigsbeheer.

##### **5. Bied kinders genoeg skoon en veilige water om te drink**

50-70% of twee-derdes van ons liggaam bestaan uit water. Aangesien ons liggaam water op 'n daaglikse basis verloor, moet ons voortdurend deur die loop van die dag water drink. Ons kan sonder kos klaarkom vir 'n ruk, maar kan nie oorleef sonder water nie.

##### **6. Maak stysel kosse die basis van 'n kind se maaltye**

Stysel bevattende kosse voorsien die liggaam van energie en ander belangrike nutriente. Sluit styselbevattende kosse bv. Brood, pasta, graankosse, rys of aartapples in by elke ete. Hierdie kosse voorsien jou van B vitamienes, vesel en sommige yster asook sink.

##### **7. Kinders benodig goenoeë groente en vrugte elke dag**

Eet vrugte en groente daagliks, ons moet mik vir 5 porsies 'n dag. Probeer om vrugte en groente deel te maak van elke maaltyd bv. in kosblik en ten minste 2 soorte groentes saam met die aandete. Vrugte en groente verskaf vitamienes A en C asook vesel wat help om die liggaam se immuunsisteem te versterk en om infeksies, diarree en verkoues weestand te bied asook om te beskerm teen sekere soorte kankers.

##### **8. Kinders benodig melk elke dag**

Maak gebruik van lae vet suiwelprodukte bv. Lae vet kaas, jogurt en sluit in 500ml lae vet melk 'n dag. Dit sal jou kind voorsien van proteïene, kalsium en B-vitamienes.

### **9. Kinders kan hoender, vis, vleis, eiers, droë bone, ertjies, lensies en soja elke dag eet**

Hoender, vis, vleis, melk en eiers is alles voedselsoorte wat van diere afkomstig is en is 'n ryk bron van goeie kwaliteit proteïene. Proteïen is nodig vir groei, onderhoud en herstel van liggaamsweefsel. Eet klein porsies rooivleis en verwyder alle sigbare vet. Hierdie voedsels voorsien jou van proteïen, yster, sink, magnesium, B vitamien en Vitamien A. Sommige verskaf omega 3 vette bv. olierige vis, soos sardiens, pilchards, hering and salm.

Andersins kies peulplante bv. droë bone, 'baked beans', botter bone, kekerertjies, lensies, soja bone en produkte gemaak van soja,sade, ongesoute neute en grondboontjiebotter. Dit kan geëet word twee tot drie keer per week.

### **10. Eet vet spaarsamig**

Vet moet nie heeltemal uit die dieet uitgeskakel word nie – dit voorsien essensiële vetsure wat nie deur die liggaam geproduseer kan word nie en moet kom van kosse wat ons eet. Hoë vet kosse is egter hoog in kalorieë en beskik oor min voedingswaarde. Te veel van hierdie vetkosse kan lei tot oorgewig, diabetes asook hartsiektes en sekere soorte kankers. Vette is gekonsentreerde bronne van energie en is dit dus baie maklik om te veel vet te eet. Beperk hoë vet voedsels bv.aartappelskyfies, vetterige biltong, droë wors en pasteie. Jy moet jou kind se frekwensie en hoeveelheid verminder. Vermy vetterige voedsels soos gebakte wors, burgers en eiers. Kies ander voorbereidingsmetodes soos kook, stoom, bak of rooster in 'n oond of oor die kole in plaas van bak in olie. Smeer ook margarine dun.

### **9. Gebruik sout spaarsamig**

Meeste van die sout wat ons eet word tydens die voorbereiding van kos bygevoeg. Sout word hoofsaaklik gebruik as 'n geurmiddel. Sout is ook afkomstig van sout wat aan tafel bygevoeg word asook wanneer geprosesseerde kosse geëet word. Baie peuselhappies en wegneemetes is hoog in sout. Te veel sout en souterige kosse verhoog die risiko vir beide hartvatsiektes en beroertes.

### **11. Gebruik suikerbevattende kosse spaarsamig en nie tussen maaltye nie . Kinders kan klein hoeveelhede suikerbevattende kosse en drankies aangebied word saam met maaltye.**

Beperk kosse en drankies hoog in suiker bv. Lekkers, koek, koekies en beskuitjies, sjokolade asook gaskoeldranke. Hou dit as 'n spesiale bederf na 'n maaltyd of vir spesiale geleenthede. Peuselhappies is soms nodig om aan die hoër energie behoeftes van baie aktiewe persone, tieners en groeiende kinders te voorsien Ongesoute grondbone en rosyne, volgraan beskuitjies en kaas, enige vrugte, rou wortels of jogurt is goeie keuses as peuselhappies. Die doelwit is om kosse en drankies wat hoog is in suiker tussen maaltye te vermy en eerder te geniet by spesiale geleenthede.

### **TOP WENKE VIR JOU EN JOU KIND**

- Kinders leer die beste deur 'n voorbeeld: wees 'n goeie rolmodel deur gesonde eetgewoontes toe te pas en gereeld te oefening.
- Vra vriende en familie om jou kind te ondersteun in hy/sy se poging tot 'n gesonde lewenstyl. Almal moet konsekwent wees in hul optrede teenoor jou kind se eetplan.
- Vermy dit om kosse as goed of sleg te klassifiseer, bide eerder gesonde opsies. Besluit op 1-2 bederwe 'n week vir die hele gesin.
- In plaas daarvan dat jou kind beloon word met kos, kies eerder die volgende:
  - gaan na die cinema, ten pen bowling, ysskaats
  - 'n nuwe boek of tydskrif
  - Laat 'n maat oorslaap
- Prys pogings deur jou kind in plaas daarvan om te fokus op die negatiewe of slegte gewoontes.
- Moedig jou kind aan om self te besluit of hy/sy regtig honger is wanneer daar gevra word vir kos.
- Hou etes onafhanklik van ander aktiwiteite soos TV kyk of huiswerk doen.
- Versien etes en peuselhappies teen gereelde tye in plaas daarvan om jou kind toe te laat om heel dag te peusel.
- Toon liefde en aanvaarding teenoor jou kind eerder deur aandag, drukkies en te luister in plaas van deur kos.

Indien u meer inligting of individuele dieetadvies benodig kan die Assosiasie vir Dieetkunde in Suid-Afrika (ADSA) gekontak word om 'n dieetkundige in u area te vind.

**Telefoon:** (011) 789-6621; **Webwerf:** [www.adsa.org.za](http://www.adsa.org.za); **Epos:** [info@adsa.org.za](mailto:info@adsa.org.za)

**APPENDIX L**

**CONFIDENTIAL**

Study number:

**GENERAL QUESTIONNAIRE  
and  
FOOD FREQUENCY QUESTIONNAIRE**

**By completing the questionnaire you agree to your child's participation in the study.**

**This questionnaire asks for some background information about your child, especially what they eat.**

**Please answer every question. If you are uncertain about how to answer a question then do the best you can, but please do not leave a question blank.**

**Your answers will be treated as strictly confidential and will be used only for medical research.**

**PLEASE COMPLETE USING BLACK INK/PEN**

**Date of birth:    /    /**

**Please enter M if Male and F if Female:**

**1. THEIR DIET LAST YEAR/SIX MONTHS**

For each food there is an amount shown, either a 'medium serving' or a common household unit such as a slice or teaspoon. Please put a tick (✓) in the box to indicate how often, **on average** they have eaten the specified amount of food **during the past year/six months**.

**EXAMPLES:**

For white bread the amount is one slice, so if they ate 4 or 5 slices a day, you should put a tick in the column headed '4-5 per day'.

FOOD AND AMOUNTS	AVERAGE USE LAST YEAR/SIX MONTHS									
	Never or Less than Once/month	1-3 per month	Once a week	2-4 per week	5-6 per week	Once a day	2-3 per day	4-5 per day	6+ per day	
<b>BREAD AND SAVOURY BISCUITS</b> (one slice or biscuit)										
White bread and rolls								✓		

For chips, the amount is a 'medium serving', so if you had a helping of chips twice a week you should put a tick in the column headed '2-4 per week'.

FOOD AND AMOUNTS	AVERAGE USE LAST YEAR/SIX MONTHS									
	Never or Less than Once/month	1-3 per month	Once a week	2-4 per week	5-6 per week	Once a day	2-3 per day	4-5 per day	6+ per day	
<b>POTATOES, RICE AND PASTA</b> (medium serving)										
Chips				✓						

For every seasonal fruits such as strawberries and raspberries you should estimate the average use when the fruits are in season, so if they ate strawberries or raspberries about once a week when they were in season you should put a tick in the column headed 'once a week'.

FOOD AND AMOUNTS	AVERAGE USE LAST YEAR/SIX MONTHS									
	Never or Less than Once/month	1-3 per month	Once a week	2-4 per week	5-6 per week	Once a day	2-3 per day	4-5 per day	6+ per day	
<b>FRUIT</b> (1 fruit or medium serving)										
Strawberries, raspberries, kiwi fruit			✓							



Please estimate average food use as best you can, and please answer every question – do not leave ANY lines blank. PLEASE PUT A TICK (✓) ON EVERY LINE.

FOOD AND AMOUNTS	AVERAGE USE LAST YEAR/SIX MONTHS									
	Never or Less than Once/month	1-3 per month	Once a week	2-4 per week	5-6 per week	Once a day	2-3 per day	4-5 per day	6+	per day
<b>MEAT AND FISH</b> (medium serving)										
Beef: roast, mince, stew or casserole										
Pork: roast, chops or stew										
Chicken or other poultry e.g. turkey										
Bacon, Ham, Canned meats e.g. Bully Beef, Corned beef, Spam, Processed meat e.g. polony, viennas										
Sausages/Wors/Beef burgers										
Savoury pies eg. meat pie, pork pie, pasties, steak and kidney pie, sausage rolls										
Liver,liver paté, liver sausage										
Offal/Tripe										
Fish fingers, fish cakes										
Other white fish, fresh or frozen, e.g. cod, haddock, plaice, sole, halibut										
Oily fish, fresh or canned, e.g. mackerel, kippers, tuna, salmon, sardines, herring, snoek										
Shellfish, e.g. crab, shrimps, prawns, mussels										
	Never or Less than Once/month	1-3 per month	Once a week	2-4 per week	5-6 per week	Once a day	2-3 per day	4-5 per day	6+	per day

**Please check that you have a tick (✓) on EVERY line**



**PLEASE PUT A TICK (✓) ON EVERY LINE**

<b>FOOD AND AMOUNTS</b>	<b>AVERAGE USE LAST YEAR/SIX MONTHS</b>								
<b>BREAD AND SAVOURY BISCUITS</b> (one slice or biscuit)	Never or Less than Once/month	1-3 per month	Once a week	2-4 per week	5-6 per week	Once a day	2-3 per day	4-5 per day	6+ per day
White bread and rolls									
Brown bread and rolls									
Wholemeal bread and rolls									
Cream crackers, cheese biscuits e.g. Tuc									
Provita or Ryvita									
<b>CEREALS (one bowl)</b>									
Porridge e.g. Oats, Mieliepap, Mabella									
Breakfast cereal e.g. cornflakes, muesli etc.									
<b>POTATOES, RICE AND PASTA (medium serving)</b>									
Boiled, mashed, instant or whole potatoes									
Chips/French fries									
Roast potatoes									
Potato salad									
Boiled, mashed, baked Sweet potatoes									
White rice									
Boiled, mashed, baked Pumpkin									
Brown rice									
White or green pasta e.g. spaghetti, macaroni, noodles									
Wholemeal pasta									
Lasagne, moussaka									
Pizza, hamburgers, hot dogs									
	Never or Less than Once/month	1-3 per month	Once a week	2-4 per week	5-6 per week	Once a day	2-3 per day	4-5 per day	6+ per day

**Please check that you have a tick (✓) on EVERY line**

PLEASE PUT A TICK (✓) ON EVERY LINE

FOOD AND AMOUNTS	AVERAGE USE LAST YEAR/SIX MONTHS								
	Never or Less than Once/month	1-3 per month	Once a week	2-4 per week	5-6 per week	Once a day	2-3 per day	4-5 per day	6+ per day
Dairy Products AND FATS									
Cream, Sour cream (tablespoon)									
Low fat yogurt (125g carton)									
Fat-free yogurt									
Full fat or Greek yogurt (125g carton)									
Dairy dessert (125g carton)									
Cheese, eg. Cheddar, Brie, Edam (medium serving)									
Cottage cheese, low fat soft cheese (medium serving)									
Eggs as boiled, fried, scrambled, etc. (one)									
Quiche (medium serving)									
Low calorie, low fat salad cream (tablespoon)									
Salad cream, mayonnaise (tablespoon)									
Other salad dressing (tablespoon)									
<b>The following on bread or vegetables</b>									
Butter (teaspoon)									
Hard Block margarine, eg. Stork, Rama (teaspoon)									
Polyunsaturated margarine (tub), eg. Flora, sunflower (teaspoon)									
Other soft margarine, dairy spreads (tub), eg., Clover (teaspoon)									
Canola/Olive based margarine (tub) (teaspoon)									
	Never or Less than Once/month	1-3 per month	Once a week	2-4 per week	5-6 per week	Once a day	2-3 per day	4-5 per day	6+ per day

Please check that you have a tick (✓) on EVERY line

PLEASE PUT A TICK (✓) ON EVERY LINE

FOOD AND AMOUNTS	AVERAGE USE LAST YEAR/SIX MONTHS								
	Never or Less than Once/month	1-3 per month	Once a week	2-4 per week	5-6 per week	Once a day	2-3 per day	4-5 per day	6+ per day
<b>SWEETS AND SNACKS</b> (medium serving)									
Cakes eg. fruit, sponge or baked sponge puddings									
Scones/Muffins									
Pancakes/crumpets									
Rusks/Beskuit/Sweet biscuits/cookies (one)									
Croissants, Koeksisters, doughnuts, Vetkoek, dumpling									
Fruit pies, tarts, crumbles									
Jelly									
Milk puddings, eg rice, custard, trifle									
Ice cream, choc ices lollies									
Chocolates, single or squares, Chocolate snack bars eg. Mars, Crunchie									
Sweets, toffees, mints									
Sugar added to tea, coffee, cereal (teaspoon)									
Popcorn									
Potato Crisps or other packet snacks, eg. Nik Naks									
Peanuts or other nuts									
<b>SOUPS, SAUCES AND SPREADS</b>									
Vegetable soups (bowl)									
Meat soups (bowl)									
Sauces, eg white sauce, cheese sauce, gravy (tablespoon)									
Tomato Sauce, Pickles, chutney (tablespoon)									
Marmite, Bovril (teaspoon)									
Jam, marmalade, honey, syrup (teaspoon)									
Peanut butter (teaspoon)									
	Never or Less than Once/month	1-3 per month	Once a week	2-4 per week	5-6 per week	Once a day	2-3 per day	4-5 per day	6+ per day

Please check that you have a tick (✓) on EVERY line

**PLEASE PUT A TICK (✓) ON EVERY LINE**

FOOD AND AMOUNTS	AVERAGE USE LAST YEAR/SIX MONTHS								
	Never or Less than Once/month	1-3 per month	Once a week	2-4 per week	5-6 per week	Once a day	2-3 per day	4-5 per day	6+ per day
<b>DRINKS</b>									
Ceylon Tea (cup)									
Rooibos Tea (cup)									
Coffee, instant or ground (cup)									
Coffee, decaffeinated (cup)									
Coffee whitener, eg Coffee-mate, Cremora (teaspoon)									
Cocoa, hot chocolate Horlicks, Ovaltine (cup)									
Low calorie or diet fizzy soft drinks e.g. Tab or Coke Lite (glass)									
Fizzy soft drinks, eg Coca cola, Fanta, lemonade (glass)									
Pure fruit juice (100%) eg Ceres orange, apple juice (glass)									
Fruit syrup e.g. Hall's, Cedar Fruit squash or cordial e.g. Oros, Sweeto (glass)									
<b>FRUIT</b>									
<b>For seasonal fruits marked *, please estimate your average use when the fruit is in season</b>									
Apples (1 fruit)									
Pears (1 fruit)									
Oranges, naartjies(1 fruit)									
Grapefruit (1 fruit)									
Banana (1 fruit)									
Grapes (medium serving)									
Watermelon/Melon (1 slice)									
Mangoes, paw-paw, pineapple									
*Peaches, plums, apricots (1 fruit)									
* Strawberries, berries, kiwi fruit (medium serving)									
Tinned fruit (medium serving)									
Dried fruit, eg raisins, prunes (medium serving)									
	Never or Less than Once/month	1-3 per month	Once a week	2-4 per week	5-6 per week	Once a day	2-3 per day	4-5 per day	6+ per day

**Please check that that you have a tick (✓) on EVERY line**

PLEASE PUT A TICK (✓) ON EVERY LINE

FOOD AND AMOUNTS	AVERAGE USE LAST YEAR/SIX MONTHS									
VEGETABLES	Never or Less than Once/month	1-3 per month	Once a week	2-4 per week	5-6 per week	Once a day	2-3 per day	4-5 per day	6+	per day
Fresh, frozen or tinned (medium serving)										
Carrots										
Spinach										
Broccoli										
Brussels sprouts										
Cabbage/coleslaw										
Green beans, broad beans, runner beans										
Marrow, courgettes										
Cauliflower										
Onions										
Garlic										
Mushrooms										
Sweet peppers e.g. green etc										
Green salad, lettuce, cucumber, celery										
Tomatoes										
Sweetcorn/Mealies										
Beetroot										
Avocado										
Baked beans, lentils, beans, peas										
Tofu, soya meat, Vegeburger e.g. Imana/Toppers										
	Never or Less than Once/month	1-3 per month	Once a week	2-4 per week	5-6 per week	Once a day	2-3 per day	4-5 per day	6+	per day

Please check that that you have a tick (✓) on EVERY line

**YOUR DIET LAST YEAR/SIX MONTHS, continued**

2. Are there any **OTHER** foods, which your child eats more than once a week?  Yes  No

If **yes**, please list below

Food	Usual serving size	Number of times eaten each week

3. What type of milk is most often used?

**Select one only**

- Full cream, blue
- Fat-free, green
- Dried milk powder
- 2% Milk, red
- Evaporated Milk
- Soya
- None

Other, specify \_\_\_\_\_

4. How much milk did they drink each day, including with tea, coffee, cereals etc?

- None
- 125ml
- 250ml
- 375ml
- 500ml
- more than 500ml

5. Did they usually eat breakfast cereal (excluding porridge mentioned earlier)

Yes  No

If **yes**, which brand and type of breakfast cereal, including muesli, did your child usually eat?

**List the one or two types most often used**

Brand e.g. Kellogg's

Type e.g. cornflakes


6. What kind of fat did you most often use for frying, roasting, grilling etc?

**Select one only**

- Butter
- Lard/dripping
- Vegetable oil
- Solid vegetable fat
- Margarine
- None

If you used **vegetable oil**, please give type e.g. canola, sunflower \_\_\_\_\_

7. What kind of fat did you most often use for baking cakes etc?

**Select one only**

- Butter
- Lard/dripping
- Vegetable oil
- Solid vegetable fat
- Margarine
- None

If you used **margarine**, please give name or type e.g. Flora, Stork \_\_\_\_\_

8. How often did your child eat food that was fried at home?

- Daily
- 3 times a week
- 4-6 times a week
- Less than once a week
- Never

9. How often did your child eat fried food away from home?

- Daily                       3 times a week                       4-6 times a week  
 Less than once a week                       Never

10. What did your child do with the visible fat on their meat?

- Ate most of the fat                       Ate as little as possible  
 Ate some of the fat                       Did not eat meat

11. How often did they eat grilled or roast meat?

- times a week                       times a month

12. How well cooked did they usually have grilled or roast meat?

- Well done/dark brown                       Lightly cooked/rare  
 Medium                       Did not eat meat

13. How often did you add salt to food while cooking?

- Always                       Rarely  
 Usually                       Never  
 Sometimes

14. How often did you/they add salt to any food at the table?

- Always                       Rarely  
 Usually                       Never  
 Sometimes

15. During the course of last year, on average, how many times a week did your child eat the following foods?

Food type	Times/week	Portion size
Vegetables (not including potatoes)	<input type="text"/>	medium serving
Salads	<input type="text"/>	medium serving
Fruit and fruit products (not including fruit juice)	<input type="text"/>	medium serving or 1 fruit
Fish and fish products	<input type="text"/>	medium serving
Meat, meat products and meat dishes (including bacon, ham and chicken)	<input type="text"/>	medium serving

**The child's primary caregiver should answer the next few questions**

16. What is your marital status?

- Married                       Divorced, living alone                       Single/living alone  
 Divorced or single, living with partner                       Separated/living alone  
 Widowed

17. What is your age?

- Younger than 16yrs     16-18yrs     18-20yrs     20-25yrs  
 25-30yrs                       35-40yrs     Older than 40yrs

18. Your highest Qualifications/Education level?

- None       Primary school       Std 6-8 (Gr.8-10)       Std 9-10(Gr.11-12)  
 College       University       Other

If other, please specify. \_\_\_\_\_

19. Father's highest Qualification/Education level?

- None       Primary school       Std 6-8 (Gr.8-10)       Std 9-10(Gr.11-12)  
 College       University       Other

If other, please specify. \_\_\_\_\_

20. Are you employed/working at present?       Yes       No

21. Number of hours per week that you are away from home if working?

- Less than 16 hours per week       16-36 hours per week  
 36-40hours per week       More than 40 hours per week

22. Father's employment status

- Unemployed       Self-employed       Wage-Earner  
 Retired by choice       Other

If other, please specify. \_\_\_\_\_

23. Yearly or monthly Household Income? Choose one or the other

- Monthly**, please specify amount \_\_\_\_\_ or  
 **Yearly**, please specify amount \_\_\_\_\_

24. Number of people living in your Household?

- 1-3 people       4-6 people       7-10 people  
 More than 10 people

25. Number of Children living within your household? \_\_\_\_\_

26. Number of people working within the household contributing to total income? \_\_\_\_\_

27. Income Generators In the household?

- 1 Parent       Both parents       Government benefits/Grants

If other, please specify. \_\_\_\_\_

28. How much money is spent on food weekly?

- R0-R100       R100-R200       R200-R300  
 R300-R400       R400-R500       more than R500

If other, please specify. \_\_\_\_\_

29. Was your child breastfed?       Yes       No

30. If Breastfed, up until what age were they given breast milk only (exclusively breastfed)?

- Less than 4months (17weeks)       4-5 months       6 months  
 7-12 months       More than 1 year



31. Are there set mealtimes in a day within the family?  Yes  No

32. Who does the food preparation at home? \_\_\_\_\_

33. How many days **within a week** is one meal a day eaten together as family?

- 1-2 days per week  3-4 days per week  
 5-6 days per week  All days of the week

34. Where are meals consumed most of the time?

- In front of the TV  Dining room  Kitchen  Other  
If other, please specify \_\_\_\_\_

35. Total amount of 'screen time' i.e. Television, computer, games, cell phone games/sms/mxit at home on a school day?

- Less than 1 hour a day  1-2 hours a day  2-3 hours a day  
 3-4 hours a day  4-5 hours a day  More than 5 hours a day

36. Total amount of 'screen time' i.e. Television, computer, games, cell phone games/sms/mxit at home on a weekend day?

- Less than 1 hour a day  1-2 hours a day  2-3 hours a day  
 3-4 hours a day  4-5 hours a day  More than 5 hours a day

37. How do you perceive your child's level of activity on a scale of 1-10?

Not active Very active  
1      2      3      4      5      6      7      8      9      10

38. Does your child participate in sports activities?  Yes  No

39. How much time does your child spend participating in sports activities?

- Less than 1 hour a day  1-2 hours a day  2-3 hours a day  
 3-4 hours a day  4-5 hours a day  More than 5 hours a day

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**Thank you very much for your time and co-operation!**

APPENDIX M

VERTROULIK

Studienommer:

**ALGEMENE VRAELYS  
en  
VOEDSEL FREKWENSIE VRAELYS**

Deur die vraelys te voltooi gee jy toestemming dat  
Jou kind aan die studie mag deelneem.

Die vraelys vra vir agtergrond inligting oor jou kind,  
veral ten opsigte van wat hy/sy eet.

Beantwoord asseblief elke vraag. Indien jy onseker  
is oor hoe om die vraag te beantwoord probeer die  
beste wat jy kan, maar moet asseblief nie enige van  
die vrae uitlaat nie.

Jou antwoorde sal as streng vertroulik hanteer  
word en sal slegs gebruik word vir mediese  
navorsing.

**VOLTOOI ASSEBLIEF VOLLEDIG DEUR GEBRUIK  
TE MAAK VAN SWART INK/PEN**

Geboortedatum: \_\_\_\_ / \_\_\_\_ / \_\_\_\_

Skryf asseblief M vir Manlik en V vir Vroulik: \_\_\_\_\_

### 1. HUL DIEET OOR DIE AFGELOPE JAAR/SES MAANDE

Vir elke voedselsoort is daar 'n hoeveelheid aangedui, of as 'medium porsie' of as 'n algemene huishoudelike eenheid soos bv. 'n sny of 'n teelepel. Plaas asseblief 'n merkie (✓) in die blok om aan te dui hoe gereeld, **per gemiddelde** hy/sy die spesifieke hoeveelheid voedselsoort geëet het oor die **afgelope jaar/ses maande**.

#### VOORBEELD:

Vir wit brood is die hoeveelheid een sny brood, dus as hy/sy 4 of 5 snye geëet het 'n dag dan moet jy 'n merkie maak in die kolom wat getitel is '4-5 per dag'.

VOEDSELSOORT EN HOEVEELHEID	GEMIDDELDE GEBRUIK OOR DIE AFGELOPE JAAR/SES MAANDE								
BROOD EN SOUT BESKUITJIES (een sny of beskuitjie)	Nooit of minder as een/maand	1-3 per maand	Een per week	2-4 per week	5-6 per week	Een 'n dag	2-3 per dag	4-5 per dag	6+ per dag
Wit brood en rolletjies								✓	

Vir 'chips', die hoeveelheid is 'n 'medium porsie', dus as sy/hy 'n porsie 'chips' twee keer 'n week geëet het dan moet jy 'n merkie maak in die kolom wat getitel is '2-4 per week'.

VOEDSELSOORT EN HOEVEELHEID	GEMIDDELDE GEBRUIK OOR DIE AFGELOPE JAAR/SES MAANDE								
AARTAPPELS, RYS EN PASTA (medium porsie)	Nooit of minder as een/maand	1-3 per maand	Een per week	2-4 per week	5-6 per week	Een 'n dag	2-3 per dag	4-5 per dag	6+ per dag
'Chips'				✓					

Vir elke seisonale vrugte soos bv. aarbeie en frambose moet jy die gemiddelde gebruik skat soos wanneer daardie spesifieke vrugte in seisoen is, dus as hy/sy aarbeie/raspberries ongeveer 1 keer per week geëet het terwyl dit in seisoen was dan moet jy 'n merkie maak in die kolom wat getitel is headed 'een ' week'.

VOEDSELSOORT EN HOEVEELHEID	GEMIDDELDE GEBRUIK OOR DIE AFGELOPE JAAR/SES MAANDE								
VRUGTE (1 vrug of medium porsie)	Nooit of minder as een/maand	1-3 per maand	Een per week	2-4 per week	5-6 per week	Een 'n dag	2-3 per dag	4-5 per dag	6+ per dag
Aarbeie, frambose, kiwi vrugte			✓						

**Bereken gemiddelde voedsel gebruik tot die beste van jou vermoëns en beantwoord asseblief elke vraag – moet asseblief nie ENIGE rye oop los nie.**

**PLAAS ASSEBLIEF 'N MERKIE (✓) IN ELKE RY**

VOEDSELSOORT EN HOEVEELHEID	GEMIDDELDE GEBRUIK OOR DIE AFGELOPE JAAR/SES MAANDE								
	Nooit of minder as een/maand	1-3 per maand	Een per week	2-4 per week	5-6 per Week	Een 'n dag	2-3 per dag	4-5 per dag	6+ per dag
<b>VLEIS EN VIS</b> (medium porsie)									
Bees: gerooster, maalvleis, bredie or gereg									
Bees burgers									
Vark: rooster, tjops of bredie									
Hoender of ander pluimvee bv. kalkoen									
Spek									
Ham									
Geblikte vleise bv. 'Bully Beef', 'Corned beef', 'Spam'									
Geproseseerde vleis bv. polonie, weense worsies/'viennas'									
Wors									
Sout pasteie bv. vleispastei, varkpastei, pasteitjies, worsrolletjies									
Lewer, lewerpatee, lewerwors									
Afval									
Visvingers, viskoekies									
Ander wit vis, vars of gevries, bv. stokvis, skelvis, tongvis									
Oilerige vis, vars of geblik, bv. makriel, bokkoms, kippers, tuna, salm, sardiens, haring, snoek									
Skulpvis, bv. krap, garnale, steurgarnale, mossels									
	Nooit of minder as een/maand	1-3 per maand	Een per week	2-4 per week	5-6 per week	Een 'n dag	2-3 per dag	4-5 per dag	6+ per dag

**Maak asseblief seker dat jy 'n merkjie (✓) gemaak het in elke ry**

**PLAAS ASSEBLIEF 'N MERKIE (✓) IN ELKE RY**

VOEDSELSOORT EN HOEVEELHEID	GEMIDDELDE GEBRUIK OOR DIE AFGELOPE JAAR/SES MAANDE								
	Nooit of minder as een/maand	1-3 per maand	Een per week	2-4 per week	5-6 per week	Een 'n dag	2-3 per dag	4-5 per dag	6+ per dag
<b>BROOD EN SOUT BESKUITJIES</b> (een sny of beskuitjie)									
Wit brood en rolletjies									
Bruin brood en rolletjies									
Volgraan brood en rolletjies									
Cream crackers, kaas beskuitjies bv. Tuc									
Provita of Ryvita									
<b>GRANE</b> (een bak)									
Gekookte pap bv. Oats, Mieliepap ,Mabella									
Ontbytgraanvlokkies bv. cornflakes, muesli ens.									
<b>AARTAPPES, RYS EN PASTA</b> (meduim porsie)									
Gekook, kapok, kits of heel aartappels									
Chips/French fries									
Gebakte aartappels									
Aartappel slaai									
Gekook, sagte , gebakte soetpatat									
Wit rys									
Gekook, sagte, gebakte pampoen									
Bruin rys									
Wit of groen pasta bv. spaghetti, macaroni, noedels									
Volgraan pasta									
Lasagne, moussaka									
Pizza, hamburgers, hot dogs									
	Nooit of minder as een/maand	1-3 per maand	Een per week	2-4 per week	5-6 per week	Een 'n dag	2-3 per dag	4-5 per dag	6+ per dag

**Maak asseblief seker dat jy 'n merkier (✓) gemaak het in elke ry**

**PLAAS ASSEBLIEF 'N MERKIE (✓) IN ELKE RY**

VOEDSELSOORT EN HOEVEELHEID	GEMIDDELDE GEBRUIK OOR DIE AFGELOPE JAAR/SES MAANDE								
	Nooit of minder as een/maand	1-3 per maand	Een per week	2-4 per week	5-6 per week	Een 'n dag	2-3 per dag	4-5 per dag	6+ per dag
Room of suurroom (eetlepel)									
Lae vet jogurt (125g houertjie)									
Vet vrye jogurt									
Volroom of Griekse jogurt (125g houertjie)									
Suiwel gebaseerde nagereg (125g houertjie)									
Kaas, bv. Cheddar, Brie, Edam (medium porsie)									
Maaskaas, lae vet sagte kaas (medium porsie)									
Eiers, gekook, gebak, roer, ens. (een)									
Souttert, Quiche (medium porsie)									
Lae kalorie, lae vet slaaisous (eetlepel)									
Slaaisous, mayonnaise (eetlepel)									
Ander slaaisouse (eetlepel)									
<b>Die volgende op brood of groentes</b>									
Botter (teelepel)									
Harde Blok margarine, bv. Stork, Rama (teelepel)									
Poli-onversadigde margarine (houer),bv. Flora, sonneblom (teelepel)									
Ander sagte margarine, suiwel smere (houer), bv., Clover (teelepel)									
Lae vet smeer (houer), (teelepel)									
Canola/olyfolie gebaseerde margarine (houer) (teelepel)									
	Nooit of minder as een/maand	1-3 per maand	Een per week	2-4 per week	5-6 per week	Een 'n dag	2-3 per dag	4-5 per dag	6+ per dag

**Maak asseblief seker dat jy 'n merk (✓) gemaak het in elke ry**

**PLAAS ASSEBLIEF 'N MERKIE (✓) IN ELKE RY**

<b>VOEDSELSOORT EN HOEVEELHEID</b>	<b>GEMIDDELDE GEBRUIK OOR DIE AFGELOPE JAAR/SES MAANDE</b>								
<b>LEKKERS EN PEUSELHAPPIES</b>	Nooit of minder as een/maand	1-3 per maand	Een per week	2-4 per week	5-6 per week	Een 'n dag	2-3 per dag	4-5 per dag	6+ per dag
Koek bv. vrugte, spons of gebakte spons poedings									
Skons/Muffins									
Pannekoek/plaatkoekie									
Beskuit/soet koekies/beskuitjies (een)									
Croissants, koeksisters, oliebolle									
Vetkoek, kluitjies									
Vrugte terte, 'crumbles'									
Jellie									
Melk poeding, bv rys, vla, koekstruif									
Roomys, sjokolade ys lollies									
Sjokolade, enkel of blokkies									
Sjokolade stafies bv. Mars, Crunchie									
Lekkers, toffies, mints									
Suiker bygevoeg by tee, koffie, pap (teelepel)									
Springmielies									
Aartappelskyfies of ander pakkies peuselhappies, bv. Nik Naks									
Grondbone of ander neute									
<b>SOPPE, SOUSE EN SMERE</b>									
Groentesop (bak)									
Vleis sop (bak)									
Souse, bv witsous, kaassous, vleissous (eetlepel)									
Tamatiesous (eetlepel)									
Pekels, chutney (eetlepel)									
Marmite, Bovril (teelepel)									
Konfyt, marmalade, heuning (teelepel)									
Grondboontjiesbotter (teelepel)									
	Nooit of minder as een/maand	1-3 per maand	Een per week	2-4 per week	5-6 per week	Een 'n dag	2-3 per dag	4-5 per dag	6+ per dag

**Maak asseblief seker dat jy 'n merk (✓) gemaak het in elke ry**

**PLAAS ASSEBLIEF 'N MERKIE (✓) IN ELKE RY**

VOEDSELSOORT EN HOEVEELHEID	GEMIDDELDE GEBRUIK OOR DIE AFGELOPE JAAR/SES MAANDE								
	Nooit of minder as een/maand	1-3 per maand	Een per week	2-4 per week	5-6 per week	Een 'n dag	2-3 per dag	4-5 per dag	6+ per dag
Ceylon Tee (koppie)									
Rooibos Tee (koppie)									
Koffie, kits of gemaalde (koppie)									
Koffie, ontkafeïneerd (koppie)									
Koffie verrooier, bv Coffee-mate, Cremora (teelepel)									
Kakao, warm sjokolade (koppie)									
Horlicks, Ovaltine (koppie)									
Lae kalorie of dieët gaskoeldrank bv. Tab of Coke Lite (glas)									
Gaskoeldrank, bv. Coke, cola, Fanta, lemonade (glas)									
Suiwer vrugtesap(100%) bv. Ceres lemoen, appelsap (glas)									
Vrugtestrope bv. Hall's, Cedar (glas)									
Vrugte aanmaak-koeldrank, cordial bv. Oros, Sweeto (glas)									
<b>VRUGTE</b>									
<b>Vir seisoenale vrugte gemerk*, skat die gemiddelde inname vir wanneer die vrugte in seisoen is</b>									
Appels (1 vrug)									
Pere (1 vrug)									
Lemoene, naartjies (1 vrug)									
Pomelo (1 vrug)									
Piesang (1 vrug)									
Druwe (medium porsie)									
Waatlemoen/spanspek (1 sny)									
Mangoes, papaja, pynapples									
*Perskes, pruime, Appelkose (1 vrug)									
* Aarbeie, bessievrugte kiwi vrugte (medium porsie)									
Geblikte vrugte (medium serving)									
Gedroogte vrugte, bv. rosyne, pruime (medium porsie)									
	Nooit of minder as een/maand	1-3 per maand	Een per week	2-4 per week	5-6 per week	Een 'n dag	2-3 per dag	4-5 per dag	6+ per dag

**Maak asseblief seker dat jy 'n merk (✓) gemaak het in elke ry**



**PLAAS ASSEBLIEF 'N MERKIE (✓) IN ELKE RY**

VOEDSELSOORT EN HOEVEELHEID	GEMIDDELDE GEBRUIK OOR DIE AFGELOPE JAAR/SES MAANDE								
	Nooit of minder as een/maand	1-3 per maand	Een per week	2-4 per week	5-6 per week	Een 'n dag	2-3 per dag	4-5 per dag	6+ per dag
GROENTE									
Vars, gevries of geblik (medium porsie)									
Wortels									
Spinasie									
Brokkolie									
Brusselse spruite									
Kool									
Groen bone									
Murgpampoentjies									
Blomkool									
Uie									
Knoffel									
Sampioene									
Soetrissies bv. rooi, groen ens.									
Groen slaai, blaarslaai, komkommer, seldery									
Tamaties									
Mielies/'Sweetcorn'									
Beet									
Koolslai									
Avokado									
Geblikte bone/'Baked beans', lensies, bone, ertjies									
Tofu, soja vleis, Vegeburger bv. Imana/Toppers									
	Nooit of minder as een/maand	1-3 per maand	Een per week	2-4 per week	5-6 per week	Een 'n dag	2-3 per dag	4-5 per dag	6+ per dag

**Maak asseblief seker dat jy 'n merk (✓) gemaak het in elke ry**

**DIEET OOR DIE AFGELOPE JAAR/SES MAANDE, vervolg**

2. Is daar enige **ANDER** voedselsoorte, wat jou kind meer as een keer 'n week geëet het?  
 Ja  Nee

Indien ja, lys die voedselsoorte in die tabel onderaan

Voedselsoort	Gewoonlike porsiegrootte	Aantal kere geëet gedurende week

3. Watter tipe melk was meestal gebruik?

**Kies slegs een**

<input type="checkbox"/> Volroom, blou	<input type="checkbox"/> 2% Melk, rooi
<input type="checkbox"/> Vet-vry, groen	<input type="checkbox"/> Ingedampte melk
<input type="checkbox"/> Gedroogde melk poeier	<input type="checkbox"/> Soja
Ander, spesifiseer _____	<input type="checkbox"/> Geen

4. Hoeveel melk was daar gedrink elke dag, insluitend tee, koffie, ontbytgraankos ens?

<input type="checkbox"/> Geen	<input type="checkbox"/> 375ml
<input type="checkbox"/> 125ml	<input type="checkbox"/> 500ml
<input type="checkbox"/> 250ml	<input type="checkbox"/> meer as 500ml

5. Het jou kind gewoonlik ontbytgraankos geëet (uitsluitend pap wat voorheen genoem is)  
 Ja  Nee

Indien ja, watter maak en tipe ontbytgraankos, insluitend muesli, het jou kind gereeld geëet?  
**Lys die een of twee tipes wat meestal gebruik was.**

Handelsnaam bv. Kellogg's	Tipe bv. cornflakes

6. Watter tipe vet was meestal gebruik vir bak, rooster, braai ens?

**Kies slegs een**

<input type="checkbox"/> Botter	<input type="checkbox"/> Harde/Soliede plantaardige vet
<input type="checkbox"/> Vet	<input type="checkbox"/> Sagte Margarine
<input type="checkbox"/> Plantaardige olie	<input type="checkbox"/> Geen

Indien plantaardige olie gebruik was, dui asseblief aan die tipe bv canola,sonneblom \_\_\_\_\_

7. Watter tipe vet was meestal gebruik vir die bak van koeke ens?

**Kies slegs een**

<input type="checkbox"/> Botter	<input type="checkbox"/> Harde/Soliede plantaardige vet
<input type="checkbox"/> Vet	<input type="checkbox"/> Sagte Margarine
<input type="checkbox"/> Plantaardige olie	<input type="checkbox"/> Geen

Indien margarine gebruik was, dui asseblief aan die tipe bv Flora, Stork \_\_\_\_\_

8. Hoe gereeld het jou kind kos geëet by die huis wat in olie gebraai was?

<input type="checkbox"/> Daaglik	<input type="checkbox"/> 3 keer 'n week	<input type="checkbox"/> 4-6 keer 'n week
	<input type="checkbox"/> Minder as een keer 'n week	<input type="checkbox"/> Nooit

9. Hoe gereeld het jou kind kos geëet wat in olie gebraai was weg van die huis?

- Daaglik  3 keer 'n week  4-6 keer 'nweek  
 Minder as een keer 'n week  Nooit

10. Wat het jou kind gedoen met die sigbare vet op sy/haar vleis?

- Meeste van die vet geëet  So min as moontlik van die vet geëet  
 Sommige van die vet geëet  Het nie vleis geëet nie

11. Hoe gereeld het jou kind oondgebraaide of geroosterde vleis geëet?

- keer 'n week   keer 'n maand

12. Hoe gaar het jou kind sy/haar oondgebraaide of geroosterde vleis geëet?

- Goed gaar/donker bruin  Effens gaar/rou  
 Medium  Eet nie vleis nie

13. Hoe gereeld was daar sout by die kos gevoeg tydens gaarmaak?

- Altyd  Skaars  
 Gewoonlik  Nooit  
 Somtyds

14. Hoe gereeld was daar sout by die kos gevoeg aan tafel?

- Altyd  Skaars  
 Gewoonlik  Nooit  
 Somtyds

15. Gedurende die afgelope jaar – dui asseblief die gemiddelde aantal kere per week aan wat jou kind die volgende voedselsoorte geëet het?

**Voedselsoort**

Groentes (uitsluitend aartappels)

Slaaie

Vrugte en vrugte produkte(uitsluitend vrugtesap)

Vis en vis produkte

Vleis, vleis produkte en vleis geregte

(insluitend spek, ham en hoender)

**Keer/week**


**Porsiegrootte**

medium porsie

medium porsie

medium porsie of 1 vrug

medium porsie

medium porsie

**Die kind se primêre versorger moet die volgende paar vrae beantwoord**

16. Wat is jou huweliksstatus?

- Getroud  Geskei, bly alleen  Enkel, bly alleen  
 Geskei of enkel, woon saam met maat  Uitmekaar/bly alleen  
 Wewenaar/Weduwee

17. Wat is jou ouderdom?

- Jonger as 16jr  16-18jr  18-20jr  20-25jr  
 25-30jr  35-40jr  Ouer as 40jr

18. Jou hoogste Kwalifikasie/Opvoedingsvlak?

- Geen       Primere skool       Std 6-8 (Gr.8-10)       Std 9-10(Gr.11-12)  
 College       Universiteit       Ander  
 Indien ander, spesifiseer asseblief. \_\_\_\_\_

19. Vader se hoogste Kwalifikasie/Opvoedingsvlak?

- Geen       Laerskool       Std 6-8 (Gr.8-10)       Std 9-10(Gr.11-12)  
 Kollege       Universiteit       Ander  
 Indien ander, spesifiseer asseblief. \_\_\_\_\_

20. Is jy huidiglik in diens/werk tans?  Ja  Nee

21. Aantal ure per week wat jy van die huis af weg is agv. werk?

- Minder as 16 ure per week       16-36 ure per week  
 36-40 ure per week       Meer as 40 ure per week

22. Vader se werksstatus?

- Werkloos       Selfwerkzaam       Loontrekker  
 Afgetree deur keuse       Ander  
 Indien ander, spesifiseer asseblief. \_\_\_\_\_

23. Jaarlikse of maandelikse huishoudelike inkomste? **Kies een van die volgende**

- Maandeliks**, dui asseblief die bedrag aan \_\_\_\_\_ of  
 **Jaarliks**, dui asseblief die bedrag aan \_\_\_\_\_

24. Aantal persone wat deel uitmaak van die Huishouding?

- 1-3 persone       4-6 persone       7-10 persone  
 Meer as 10 persone

25. Aantal kinders wat deel uitmaak van die huishouding? \_\_\_\_\_

26. Aantal persone wat werk in die huishouding en bydra tot die totale huishoudelike inkomste? \_\_\_\_\_

27. Inkomste genereerders in the huishouding?

- 1 Ouer       Beide ouers       Regerings bystandsfonds/subsidies  
 Indien ander, spesifiseer asseblief. \_\_\_\_\_

28. Hoeveel geld word weekliks op kos gespandeer?

- R0-R100       R100-R200       R200-R300  
 R300-R400       R400-R500       meer as R500  
 Indien ander, spesifiseer sseblief. \_\_\_\_\_

29. Was jou kind geborsvoed?

- Ja       Nee

30. Indien wel geborsvoed, tot en met watter ouderdom het jou kind alleenlik borsmelk gekry (eksklusief geborsvoed)?

- Minder as 4maande (17weke)       4-5 maande       6 maande  
 7-12 maande       Meer as 1 jaar

31. Is daar vasgestelde tye van die dag vir maaltye in die gesin?

- Ja       Nee



## APPENDIX N



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12 March 2009

**MAILED**

Mrs AP Kirsten  
Department of Human Nutrition  
Faculty of Health Sciences  
P O Box 19063  
7501

Dear Mrs Kirsten

**"The influence of socio-demographic factors on the nutritional intake of overweight and obese children in the Stellenbosch area, Western Cape"**

**ETHICS REFERENCE NO: N08/08/232**

**RE : FINAL APPROVAL**

A review panel for the Committee for Human research reviewed the above-mentioned project on 09 February 2009 and it was approved on condition that further information that was required, be submitted.

This information was supplied and the project was finally approved on 12 March 2009 for a period of one year from this date. This project is therefore now registered and you can proceed with the work.

Please quote the above-mentioned project number in ALL future correspondence.

Please note that a progress report (obtainable on the website of our Division: [www.sun.ac.za/knowledgepartner/committees\\_CHR.htm](http://www.sun.ac.za/knowledgepartner/committees_CHR.htm)) should be submitted to the Committee before the year has expired. The Committee will then consider the continuation of the project for a further year (if necessary). Annually a number of projects may be selected randomly and subjected to an external audit. Translations of the consent document in the languages applicable to the study participants should be submitted.

Federal Wide Assurance Number: 00001372

Institutional Review Board (IRB) Number: IRB0005239

The Committee for Human Research complies with the SA National Health Act No.61 2003 as it pertains to health research and the United States Code of Federal Regulations Title 45 Part 46. This committee abides by the ethical norms and principles for research, established by the Declaration of Helsinki, the South African Medical Research Council Guidelines as well as the Guidelines for Ethical Research: Principles Structures and Processes 2004 (Department of Health).

11 August 2011 15:26

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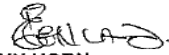
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Yours faithfully

PP. 

**DR LYN HORN**

**RESEARCH DEVELOPMENT AND SUPPORT**

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## APPENDIX O

Food Groups	Foods	P*	N	Comparison group	Overweight/obese group
<b>Protein</b>	Beef	0.8371	44	20	24
	Lamb	0.5515	44	20	24
	<b>Pork</b>	<b>*0.0143</b>	<b>44</b>	<b>20</b>	<b>24</b>
	Chicken	0.8122	44	20	24
	Canned meat	0.6423	44	20	24
	Bacon/Ham	0.2356	44	20	24
	Processed meat	0.2028	44	20	24
	Sausage/Wors/Burgers	0.3604	44	20	24
	Meat pies/pastries	0.5105	44	20	24
	Liver	0.9047	44	20	24
	Offal/Tripe	0.5834	44	20	24
	Fishfingers/cakes	0.4322	44	20	24
	White fish	0.7446	44	20	24
	Oily fish	0.7214	44	20	24
Shell fish	0.4390	44	20	24	
<b>Starch</b>	White bread/rolls	0.2474	44	0	24
	Brown bread/rolls	0.4489	44	20	24
	Wholewheat bread/rolls	0.0933	43	20	23
	White crackers	0.2827	44	20	24
	Wholewheat crackers	0.0956	44	20	24
	Porridge	0.3659	44	20	24
	Instant cereal	0.3596	44	20	24
	Potatoes	0.1966	44	20	24
	Chips	0.2699	44	20	24
	Sweet potatoes	0.9336	44	20	24
	Rice	0.3410	44	20	24
	Pumpkin	0.1674	44	20	24
	<b>Brown rice</b>	<b>*0.0371</b>	<b>44</b>	<b>20</b>	<b>24</b>
	White pasta	0.6269	44	20	24
	Wholemeal pasta	0.3399	44	20	24
Moussaka/Lasagne	0.5624	44	20	24	
Pizza/hot dogs/burgers	0.3291	44	20	24	
<b>Dairy and fats</b>	Cream	0.2820	43	20	23
	Low fat yogurt	0.1500	43	20	23
	Fat free yogurt	0.3550	43	20	23
	Full fat yogurt	0.1526	43	20	23
	Dairy dessert	0.9230	43	20	23
	Fat cheese	0.8730	43	20	23
	Cottage cheese	0.1353	43	20	23
	Eggs	0.1779	42	20	22
	Quiche	0.2104	43	20	23
	Low fat salad cream	0.4973	43	20	23
	Salad cream/mayonnaise	0.5819	43	20	23
	Other salad dressings	0.9925	43	20	23
	Butter	0.9051	43	20	23
	Hard block margarine	0.5999	43	20	23
	<b>Poly-unsaturated margarine</b>	<b>*0.0481</b>	<b>43</b>	<b>20</b>	<b>23</b>
	Other soft margarines	0.1889	43	20	23
<b>Canola/olive margarine</b>	<b>*0.0398</b>	<b>43</b>	<b>20</b>	<b>23</b>	
<b>Sweets and snacks</b>	Cake	0.1700	44	20	24
	Muffins/scons	0.2344	44	20	24
	Pancakes	0.0834	44	20	24
	Rusks	0.0736	44	20	24
	<b>Doughnuts</b>	<b>*0.0280</b>	<b>44</b>	<b>20</b>	<b>24</b>
	Tarts	0.9459	44	20	24



	Jelly	0.9450	44	20	24
	Milk puddings	0.2777	44	20	24
	Ice cream	0.6103	44	20	24
	Chocolate	0.6105	44	20	24
	Sweets	0.4715	44	20	24
	Added sugar	0.5729	44	20	24
	Popcorn	0.1887	44	20	24
	Crisps	0.3653	44	20	24
	Nuts	0.6437	44	20	24
<b>Soups, sauces, spreads</b>	Vegetable soup	0.1579	44	20	24
	Meat soup	0.5339	44	20	24
	Sauces	0.8213	44	20	24
	Tomato soup	0.1924	44	20	24
	Marmite	0.4605	44	20	24
	Jam	0.2028	44	20	24
	Peanutbutter	0.1407	44	20	24
<b>Drinks</b>	Tea	0.6229	44	20	24
	Rooibostea	0.4358	44	20	24
	Coffee	0.2623	44	20	24
	Decaf coffee	0.5015	43	20	23
	Whitener	0.8203	43	20	23
	<b>Hot chocolate</b>	<b>*0.0602</b>	<b>44</b>	<b>20</b>	<b>24</b>
	Horlicks	0.7415	44	20	24
	Diet cooldrinks	0.3713	44	20	24
	Fizzy drinks	0.2141	44	20	24
	Juice	0.2068	44	20	24
Juice concentrate/squash	0.3367	44	20	24	
<b>Fruit</b>	Apples	0.4891	44	20	24
	Pears	0.5140	44	20	24
	Oranges	0.2849	44	20	24
	Grapefruit	0.0763	44	20	24
	Bananas	0.3326	44	20	24
	Grapes	0.2324	43	20	23
	Melon	0.0891	43	20	23
	Tropical fruit	0.1633	43	20	23
	Stone fruit	0.4509	43	20	23
	Berries	0.1423	42	20	22
	Tinned fruit	0.2739	44	20	24
	Dried fruit	0.1353	43	20	23
<b>Vegetables</b>	Carrots	0.1029	43	20	23
	Spinach	0.4552	44	20	24
	Broccoli	0.4086	44	20	24
	Brussel sprouts	0.3589	44	20	24
	Cabbage	0.8146	44	20	24
	Beans	0.7212	43	20	23
	Marrows	0.0680	43	20	23
	Cauliflower	0.4075	44	20	24
	Onions	0.1296	42	20	22
	Garlic	0.2533	44	20	24
	Mushrooms	0.6742	44	20	24
	Peppers	0.5551	44	20	24
	Salad	0.3045	44	20	24
	Tomatoes	0.5879	43	20	23
	Mealies	0.3059	44	20	24
	Beetroot	0.4265	44	20	24
	Avocado	0.2036	44	20	24
	Pulses	0.7232	44	20	24
	Soya/Tofu	0.3121	44	20	24

***Not all of the questions in the questionnaire were answered by the total study population and due to the missing data was there a difference in N totals.***

\*p-value calculated by Kruskal-Wallis p test