THE ASSOCIATION BETWEEN EATING HABITS AND OVERWEIGHT IN 10-15 YEAR OLD SCHOOL CHILDREN IN THE NORTH WEST PROVINCE

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Abstract

The association between eating habits and overweight in 10-15 year old school children in the North West Province

The prevalence of obesity among children and adolescents worldwide appears to be increasing. There are many factors which contribute to the development of overweight and obesity. It is believed that bad eating habits is one of the factors. Investigators believe that eating habits begin in childhood and remain almost unchanged for the rest of a person's life (Roma-Giannikou *et al.*, 1997). There is a lack of information on the association between eating habits and measures of overweight and obesity. The aim of this study was to assess the association between eating habits and measures of overweight in 10-15 year old school children in the North West Province in a cross sectional study. THUSABANA (Transition and Health during Urbanization in South Africa in children) is a follow-up study of the THUSA project (Transition and Health during Urbanization in South Africa).

Schools were selected randomly from a list of schools obtained from North West Department of Education in the North West Province of South Africa. The measurements were done on a random sample of children from the selected schools during school hours. Socio-demographic, eating habits and anthropometric data were obtained by an interviewer administering validated questionnaire. Body weight, height and triceps skinfolds thicknesses were measured using standard methods. Body mass index was calculated.

Results showed that most children were normal weight (85.2%), 12.2% were overweight and only a small percentage of children were obese (2.6%) when using BMI-for-age cut-off points. When triceps skinfold cut-off points were used, nearly the same results were observed, only 5.4% of children were obese and the rest were normal weight (94.6%).

Few children in this study omitted breakfast. A higher percentage of obese than non-obese children did not eat breakfast. The results further showed that a higher percentage of non-obese children had a tendency not to take a lunchbox to school when using BMI cut-off points. Similar practices were seen for both non-obese and obese children when using triceps skinfolds cut-off points, which means there is no association between taking a lunchbox to school and triceps skinfolds measures. Both non-obese and obese children bought food from tuckshops and a greater percentage of obese children reported to consume an afternoon snack than non-obese children. Most of the non-obese and obese children did not consume a late night snack, while a television snack was consumed by both obese and non-obese children. The results also showed a small percentage of children who were on a special diet to lose weight, but most of the children did not follow any special diet.

The findings that most children in this study were normal weight and a small percentage of children were obese, we cannot conclude that eating habits contribute to the development of obesity. However consumption of television snack and buying from the tuckshops or vendors which mostly sell foods high in saturated fat, sugar and refined food may have significant implications for obesity development. Considering the influence of television on children's eating habits, early education efforts on prudent diet and physical activity may be necessary in helping develop good eating habits and leading a healthy lifestyle.

Key words: childhood obesity, schoolchildren, anthropometry, eating habits, breakfast patterns, eating attitudes, parental control,racial differences

Opsomming

Die verband tussen eetgewoontes en oorgewig by 10-15 jarige skoolgaande kinders in die Noordwes Provinsie

Die teenwoordigheid van swaarlywigheid in kinders en adolessente oor die wêreld heen is besig om toe te neem. Daar bestaan verskeie faktore wat aanleiding gee tot die toename van oorgewig en swaarlywigheid. Daar word aangeneem dat swak eetgewoontes een van die oorsake is. Navorser is van mening dat eetgewoontes tydens die kinderjare begin, en bykans onveranderd bly vir die res van die persoon se lewe (Roma-Giannikou *et al.*, 1997). Daar is 'n gebrek aan inligting oor die verband tussen eetgewoontes en die meting van oorgewig en swaarlywigheid. Die doel van hierdie studie was om d.m.v. 'n deursneeproef die verband tussen eetgewoontes en oorgewig en swaarlywigheid, by 10-15 jarige skoolgaande kinders in die Noordwes Provinsie te bepaal. THUSABANA is 'n opvolgstudie van die THUSA-projek. Skole was ewekansig geselekteer na aanleiding van 'n lys wat van die Departement van Onderwys in die Noordwes Provinsie ontvang is. Metings is op kinders van die geselekteerde skole gedurende skoolure gedoen. Sosio-demografiese, eetgewoonte en antropometriese data is deur 'n onderhoudvoerder aan die hand van 'n gestandaardiseerde vraelys verkry. Liggaamsgewig, lengte en die dikte van velvoue van die triseps spier is gemeet d.m.v. standaard metodes. Die liggaamsmassa indeks (LMI) is ook bereken.

Resultate het, deur die aanwending die LMI-ouderdomsafsnypunte, getoon dat die meerderheid kinders (82.2%) se gewig normaal was, 12.2% oorgewig en 'n klein persentasie kinders swaarlywig (2.6%) was. Met die gebruik van die afsnypunte van die velvoue van die triseps spier is min of meer dieselfde resultate waargeneem, slegs 5.4% van die kinders was swaarlywig, terwyl die res (94.6%) se gewig normaal voorgekom het. 'n Paar van die kinders in hierdie studie het nie soggens voor skool ontbyt gehad nie. 'n Groter persentasie van die swaarlywige kinders vergeleke met die nie-swaarlywige kinders het nie ontbyt voor skool gehad nie. Resultate wat verkry is deur die LMI-afsnypunte het ook getoon dat nie-swaarlywige kinders geen middagete skool toe gebring het nie. Soortgelyke resultate is waargeneem by beide swaarlywige en nie-swaarlywige kinders tydens die gebruik van die velvou-afsnypunte van die

triseps spier. Dit beteken dat daar geen verband was tussen die meting van die velvoue van die triseps spier en dat middagete skool toe geneem is nie. Beide die swaarlywige en nie-swaarlywige kinders het eetgoed gekoop by die kioske, en 'n groter persentasie swaarlywige kinders het in teenstelling met nie-swaarlywige kinders nog 'n laatmiddag versnapering genuttig. Alhoewel die swaarlywige en nie-swaarlywige kinders nie 'n laataand versnapering genuttig het nie, het hulle wel 'n versnapering by die televisie genuttig. Die resultate toon ook dat 'n klein persentasie kinders, in teenstelling met ander kinders, 'n spesiale dieet gevolg het om gewig te verloor.

Uit die bevindinge van hierdie studie dat die meeste kinders se gewig normaal was, en 'n klein persentasie swaarlywig was, kan ons nie die gevolgtrekking maak dat eetgewoontes bydra tot die toename van swaarlywigheid nie. Die nuttiging van versnaperings terwyl televisie gekyk word, of die aankoop van eetgoed van kioske en verkopers op straat wat 'n hoë aantal versadigde vette en suiker bevat, en verfynde voedsel kan groot gevolge inhou vir die toename van swaarlywigheid. Teen die agtergrond van die invloed van televisie op kinders se eetgewoontes, sou vroeë opvoeding oor 'n verstandige dieet en fisiese aktiwiteit 'n noodsaaklikheid word om goeie eetgewoontes aan te kweek wat vervolgens tot 'n gesonde lewe kan lei.

Sleutelwoorde Swaarlywigheid gedurende kinderjare, skoolgaande kinders, antropometrie, eetgewoontes, ontbyt gewoontes, eet gesindhede, ouer beheer, rasse verskille.
Key words Childhood obesity, schoolchildren, anthropometry, eating habits, breakfast patterns, eating attitudes, parental control, racial differences

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List of Abbreviations

BMI	**Body Mass Index**
CVD	**Cardiovascular Disease**
DRI	**Dietary Reference Intakes**
ECOG	**European Childhood Obesity Group**
FGP	**Food Guide Pyramid**
NWP	**North West Province**
RDA	**Recommended Dietary Allowance**
SES	**Socio-economic status**
TV	**Television**

Chapter 1

Problem statement and Aim of the study

1.1 Introduction

It is well recognized that nutrition is very important for the normal physical, mental and psychological development of children and of great importance for their future health (Roma-Giannikou *et al.*,1997). Food has an important influence on health and well-being. Many eating habits are established in childhood and remain almost unchanged for the rest of a person's life (Rogers, 1999; Roma-Giannikou *et al.*, 1997). Evidence indicates that children's food choices develop from grade 6 to grade 12 and become habitual. It therefore suggests that health promotion intervention should begin before grade 6, before these habits become resistant to change. Healthful eating habits in childhood prevent chronic undernutrition and growth retardation as well as immediate childhood health problems such as iron deficiency anaemia, dental caries and obesity (ADA report, 1999).

Environmental and personal factors have an important influence on dietary behaviour. Factors other than health concerns, such as taste preference, cultural norms, and food availability influence dietary behaviour when it comes to making food choices. Parents have a major impact on their children's eating habits and behaviour. Children's eating habits are influenced by characteristics within the family unit, such as the number of meals eaten together. An understanding of diet and nutritional habits of children is critical to the development of healthy eating habits early in life and ultimately the reduction of morbidity and mortality from cardiovascular diseases (CVD) (ADA report, 1999). Dietary assessment of children is important because many diet associated chronic diseases of adulthood originate in childhood (Domel, 1997). More information on nutritional or eating habits of children and existing nutritional support systems in operation during school hours, especially in low socio-economic areas, is needed (Jooste *et al.*, 1996).

1.2 Problem statement

The prevalence of childhood overweight has increased dramatically in the past few years worldwide. These trends in overweight differ by age group: increases are relatively minimal for infants and toddlers but become more dramatic as children move through the preschool period (Rolls *et al.*, 2000). Although the long-term effect of overweight and obesity on morbidity and mortality in children has not yet been well documented, several studies suggested that obesity in childhood is followed by serious consequences in adulthood (Guillaume, 1999). Domel (1997) pointed out that many diet associated chronic diseases of adulthood originate in childhood. It is believed that eating habits begin in childhood and remain almost unchanged for the rest of a person's life (Roma- Giannikou *et al.*, 1997). More accurate assessment of children's diet and eating habits could increase the awareness of changes needed to help establish healthful eating habits in children thereby decreasing the risk of chronic diseases in adults. There is a lack of information on the eating habits of 10-15 years old school children in the North West Province.

1.3 The Aim

The main aim of this study was to assess the association between eating habits and overweight in 10-15 year old school children in the North West Province (NWP).

Specific objectives included:

- to determine the prevalence of overweight in 10-15 year old children in the NWP,
- to assess the eating habits of 10-15 year old school children in the NWP,
- to assess the relationship between breakfast consumption and measures of overweight in the subjects, and
- to assess the relationship between snacking and measures of overweight in the subjects.

1.4 Hypothesis

The following hypothesis has been formulated for this study:

There is no relationship between eating habits and overweight of 10-15 year old school children in the NWP.

In the THUSA study done by Vorster *et al.* (2000) in the NWP it was found that rates of obesity in women increased with urbanization. People living in the rural areas as well as those living in densely populated areas are experiencing a high risk of the double burden of disease associated with undernutrition and overnutrition. An important observation was that obesity is one of the risk factors for chronic diseases in most rural areas as well as the towns. Lack of data on the association between eating habits and obesity of school children was the motive for this THUSABANA study.

1.5 Structure of the dissertation

The dissertation will be presented according to the following structure:

Chapter 1

Introduction, problem statement & aim and objectives

Chapter 2

Literature review

Chapter 3

Method, design & statistical analysis

Chapter 4

Results and discussion

Chapter 5

Conclusion and recommendations

Bibliography

Addenda

Chapter 2

2 Literature Review

2.1 Introduction

The prevalence of obesity among children and adolescents worldwide appears to be increasing. The severity of and age at which obesity is present are significant determinants of whether obesity that present in childhood will persist into adulthood (Dietz, 1999). Overweight in childhood is related to higher morbidity and mortality rates in adulthood (Guo & Chunlea, 1999). In addition, children who are overweight are more likely than normal weight children to become obese adults, which increases their lifetime risk of coronary heart diseases, hypertension, type 2 diabetes mellitus,

gall bladder diseases, osteoathritis, and some cancers. Children who are overweight often experience psychological stress, poor body image, and low self esteem (ADA report, 1999).

2.2 The development of eating habits

Eating habits appear to be influenced by the interaction between individuals and their social and physical environments, not simply by the knowledge of the healthfulness of foods. Food choice behaviour has been shown to persist throughout childhood until late adolescence, which means the person will habitually follow the same behaviour. Lifestyles and eating behaviours, which change throughout the life cycle, influence the types of foods consumed (ADA report, 1999). The eating patterns of individuals are influenced by many factors. More proximal ones include considerations of taste, cost and cultural compatibility of foods. Equally important are many other factors including the influence of the government, food industry practices, the educational system and the knowledge and attitudes of health professionals (Carleton *et al.*, 1991).

To influence diet behaviour, it is important to take into account the multitude of factors that also influence a child's food preferences. Identifying these potential influences is important because this information may be used to improve children's current diets. It is also hoped that healthful habits will influence lifestyle choices in adulthood (Byrne & Nitzke, 2000). Many of the attitudes and much of the knowledge about foods are developed in youth under family and peer influences. As young consumers move into adolescence, they may have more freedom to select foods, in accordance with their own individual preferences. Such independence is exhibited within the home, school and social environments and may fuel the apparent lack of nutritionally balanced food behaviour exerted by these consumers (Brown *et al.*, 2000). Food preferences and practices of children are importantly influenced by

childhood experiences. Many believe that early food preferences persist into later life (Carleton *et al.*, 199: 323).

2.3 Factors influencing eating habits

2.3.1 Environmental factors

During the early years of life, eating occurs primarily in response to hunger and satiety cues. By adulthood eating is also influenced by environmental cues such as the presence of palatable food, time of day, and social context. As children develop and make the transition to an adult diet, they take note of social and cultural conversations regarding food and eating and are socialized to adopt adult eating behaviours and attitudes about food (Rolls *et al.*, 2000).

It is possible that during the preschool period children's increased responsiveness to the environmental cues controlling food intake may emerge as a factor that contributes to increased overweight. For children who have learned to be responsive to environmental cues, very large portion sizes may elicit overeating and thus promote weight gain. Evidence shows that larger portion sizes could contribute to the increasing prevalence of overweight among adults and children. The finding also reveals that by the end of the preschool period, the amount of food offered influences children's food intake. Environmental factors play an important role in shaping children's dietary intake in ways that can either promote or prevent the development of overweight (Rolls *et al.*, 2000). In addition these environmental factors that affect the way dietary intake patterns are established in early childhood may ultimately influence the development of obesity (Hood *et al.*, 2000).

Children are highly responsive to conditions in their environments, particularly during the early stages of physical development. The community is the natural social unit through which investments in child health can be made. As children

progress through their developmental stages, they expand their exploration and experiences by increasing contact with their surroundings (Paknawin-Mock *et al.*, 2000). Brown *et al.* (2000) states that young consumers may seek and develop their own individual food preference behaviour, particularly apparent through the number and styles of meals eaten outside the home and within the school and social environments. During previous decades research has shown that many of the young consumers opted for fast food styled and snacks styled options during lunch purchased within the social environment (Brown *et al.*, 2000).

2.3.2 The role of parents and caregivers in the development of healthy eating behaviors and habits

According to Krebs and Johnson (2000) childhood is a critical time to see, learn, and practice good eating habits. The role of parents in providing such a framework and modelling good eating practices is absolutely crucial. Parents have a major impact on their children's eating behaviours. In families where there is a strong relationship between mothers and their children different nutrients tend to be consumed. In addition children's eating behaviour is influenced by characteristics within the family unit, such as the number of meals eaten together. It is well known that children's food preferences are a major determinant of their food selection, that is children will not eat what they don't like. It is also important to realise that children's food preferences are learned through repeated exposure to foods. Thus parents and caregivers can provide opportunities for children to learn to like a variety of nutritious foods by exposing them to these foods (ADA report, 1999).

According to Brown *et al.* (2000) home environment is identified as one of the most prominent influences on young consumers' development and food behaviour, especially for those of preschool age. If parents hold negative beliefs in relation to nutritionally balanced changes in their own food behaviour, it is likely that such traits will be passed on to their families (Brown *et al.*, 2000). Hood *et al.* (2000) also stated that parental dietary restraint and disinhibition are two factors that may

strongly influence the child's early eating experiences and may be associated with an increased risk of obesity in the child. In addition parents who exhibit these behaviour may unconsciously undermine their child's autonomy in food choices by imposing excessive control over the child's diet while at the same time modelling inappropriate eating behaviour. If, for example, obesity leads the mother to adopt a pattern of alternating restraint and disinhibition, the child may learn to mimic that style and thus to suppress more internal regulatory cues in favour of the external ones patterned by the mother. External parental control of the child's dietary intake may indirectly foster the development of excess adiposity in the child and may have a negative affect on the ability to self-regulate diet at an early age (Hood *et al.*, 2000). In essence, such negativism within the society represents not only the struggle which nutritional education still has to overcome in the future, in convincing these individuals to change but also the knock-on effects which such beliefs may have upon children's food behaviour (Brown *et al.*, 2000).

When parents assume control of meal size or coerce children to eat rather than allowing them to focus on their internal cues of hunger, children's ability to regulate meal size in response to energy density is diminished. This seems problematic among girls with high body mass index (BMI) and may play a substantial role in chronic dieting and dietary restraint. Parents are responsible for presenting a variety of healthful foods to children and for deciding the manner in which these foods are presented while children are responsible for whether and how much they eat (ADA report, 1999). Krebs & Johnson (2000) continued that children can be shown and reminded, ideally in a positive way and in the home of what is appropriate and what is not.

According to Ladzani *et al.* (1992) the family is the prime focus within which dietary behaviour is organised. The most powerful variables predicting dietary behaviour are features of the household structure such as household competition, occupation of the head, income and number of children in the family (Ladzani *et al.*, 1992). Every family has food ways, and every family has a definition of what makes up an

enjoyable and satisfying meal that is rewarding to cook, serve and eat. If these food ways are honoured, many people will naturally and gradually increase the variety in their diets and improve dietary quality. On the other hand barriers will only be raised to an already beleaguered family meal if they restrict the cook by insisting that children can only be fed legitimately according to a plan that consumers in general find too hard, too confusing, too expensive and not good tasting enough (Satter, 2000).

People manage to feed themselves and their children, and they eat the way they do for reasons that grow out of their cultural tradition, preferences and practicalities. Sweeping changes carry the risk of undermining other useful food ways, so it is reasonable to recommend such changes only on an individual basis and, for the public, on the basis of compelling evidence. The family meal must be appealing enough for all family members, and it should offer children flexibility in caloric density so their energy needs are met. In providing food for children, the emphasis must be positive by maintaining and improving nutritional status and moderating fat intakes. Menus are enhanced and real or presumed risk is reduced when parents are encouraged to add to rather than take away from the diet: add fruit and vegetables, add variety of breads and cereals and milk and milk products, add meat and other protein sources. It is important to help families enjoy food and optimize normal eating patterns (Satter, 2000). Better understanding of the relationship between culture and food ways and more household-level analyses that improve our understanding of how families function and define their food ways will strengthen this partership (Bronner, 1996). Parents and caregivers can also be reacquainted with the magic of early childhood development. This can be done by teaching them how to match children's abilities with their nutrition needs and helping them create a positive feeding environment that fits within their time constraints (Krebs & Johnson, 2000).

2.3.3 The role of media

The knowledge children aquire from the media and other sources before attending school has been identified as a force counteracting nutrition education (D'Onofrio & Singer, 1983). Dickinson (2000) stated that television is a major part of young people's daily lives. Television's ubiquity leads one to suspect that it plays an important role in everyone's lives and it seems reasonable to suspect that young people are vulnerable to its influences. Dickinson (2000) further pointed out that for those concerned with the promotion of healthier eating in the population at large, food advertising is often believed to be one of the most obvious, yet is seemingly one of the most difficult, obstacles to surmount. Television is thought to be a powerful medium capable of shaping behaviour by transmitting ideas and beliefs, and giving demonstrations of and recommendations for actions. When it comes to food, the suspicion is that television powerfully undermines the health promoter's healthier eating messages (Dickinson, 2000). Television might be related to increased dietary intake, either during viewing or in response to food advertising (Parson *et al.*, 1999).

A study that was done in the United Kingdom showed that advertisements for food were most common during times when children were most likely to be watching, and those periods were dominated by advertisements for foods which are high in fat, sugar and salt (Dickinson, 2000). In the USA the majority and in the UK half the advertisements during children's television are for food products. Of this 80% in the USA are for foods with low nutritional value, including breakfast cereals high in simple sugars and snack food high in sugar, fat and salt. Furthermore in the UK, 60% of food advertisements were for breakfast cereals, snack food and confectionary. Children exposed to advertisements have been reported to select more sugared food and in Australia teenagers who watch television more extensively have been suggested to eat healthy foods less often and unhealthy food more often (Parson *et al.*, 1999).

2.3.4 School tuck-shops and snacking

When children go to school, parental influence on diet decreases and the food provided in schools and the influence of peers become more important. From a survey that was done in Sheffield about children who used tuck-shops, it was found that many children simply wanted to spend their own money, the types of food items on sale being unimportant (Moore *et al.*, 2000). From another study that was done in Lebowa (South Africa), it was found that 19% of children spent more than R3.00 per week on sweets and cool drinks and only 10% took lunch boxes to school (Steyn *et al.*, 1993). Black children bought their food mainly from vendors who prepared some of the food themselves. Examples of food bought were bread, cool drinks and French fries. On the other hand white children bought their snacks, for example, commercial sweets and cool drinks from the school tuck-shop (Wolmarans *et al.*, 1995). The influence of peers and role models has been shown to change children's food preferences. Foods high in sugar and fat are often consumed as snacks between meals (Moore *et al.*, 2000). A study by Cullen *et al.* (2000) found that the top-selling foods in snack-bars were soda and those higher in fat (for example pizza, chicken nuggets, chips, French fries, candy and ice-cream) and that access to these options might not foster healthful eating practices. Furthermore, the lack of fruit, fruit juice and vegetables in the snack bar or the presence of competing snacks and high-fat and high-sugar dessert foods might be responsible for the consumption of these foods by children (Cullen *et al.*, 2000).

In the study by Moore *et al.* (2000) it was recommended that in addition to school meals and nutrition education in the curriculum, healthy eating could be encouraged in schools via healthy tuck-shops to increase the availability of fruit as a snack. Furthermore it was suggested that classroom nutrition education would be undermined if healthy food choices were not available at school meals or in school tuck-shops. Fruit tuck-shops may be effective as the availability of other snacks will be limited and peers will be seen to be buying and consuming fruit (Moore *et al.*,

2000). School foodservice staff should identify fruits, juices and vegetables that children prefer and increase availability of those items in school cafeterias and snack bars (Cullen *et al.*, 2000). The vendors at predominantly black schools and tuck-shops at predominantly white schools could serve as a vehicle for providing a healthy early morning snack, such as brown bread instead of white bread, milk instead of cool drinks and popcorn instead of potato chips. Nutrition education to these small entrepreneurs is vital in order to ensure the provision of healthy snacks (Wolmarans *et al.*, 1995).

2.3.5 Peer pressure

It may be surmised that young consumers may be more reluctant to eat healthy and nutritional foods, because of the fear of appearing "weird" within a group situation or being different from their friends (Brown *et al.*, 2000). Byrne and Nitzke (2000) pointed out that children commonly characterised vegetables as "dull, bland and nasty" but thought of fruit as "sweet, juicy and fun".

2.3.6 Appeal of food

Neophobia is a personality trait, a continuum along which an individual can be placed according to his or her willingness to try unfamiliar foods. Futhermore, an individual with neophobia avoids novel foods out of the mistaken belief that they will be unpalatable, and because of this avoidance, never has this belief corrected (Falciglia *et al.*, 2000). In addition young consumers appear to have a higher tolerance for repetition than adults, and this can mean an unremitting diet of hamburgers, hot dogs, pizza, chilli, barbecued ribs, and fries" (Brown *et al.*, 2000). This pattern of food consumption based on a narrow set of food choices has been shown to result in intakes below the Recommended Dietary Allowance (RDA) and the Dietary Reference Intakes (DRI) for some nutrients (Falciglia *et al.*, 2000).

2.11 The empowerment of children to develop healthful eating habits

According to Evers (1997) controlling a child's eating habits is counterproductive. By allowing children to make decisions about what and how much to eat, parents empower children to self regulate their eating. It was found that most children were capable of regulating their caloric intake if they were given control of food selection at meals (Evers, 1997). Manifesting those capabilities depends on parents effectively executing feeding tasks. Parents can be helped to execute their feeding tasks if, rather than exhorting them to understand and apply formulas for planning meals and snacks, support can be given to them in attending to their own values, food ways and possibilities for feeding their families (Satter, 2000). Evers (1997) also found that when the food behaviour of a child was dictated by a parent, the child essentially lost internal ability to regulate eating. One of the most difficult challenges is stepping back and allowing the child to make a mistake. To support children's abilities with food regulation, offer some foods that are low in fat (for example fruit and vegetables), some moderate (for example meat, chicken and fish prepared with added fat or fat-containing casserole), and some high (for example whole milk, salad dressing, table spreads). Allow children to pick and choose from the foods available, eating as much or as little as they want. This approach will allow children to apply their considerable abilities with food selection and regulation to eating what they need at any given time to maintain nutritional status and energy balance. Children are good regulators and they eat more or less of all foods, including high fat food depending on their energy needs (Satter, 2000).

Many parents have a hard time accepting that children can control their eating. This is as true for parents who worry about enough food as for those concerned with overeating (Evers, 1997). The parent's role is to offer a variety of healthful foods, oversee the planning and assembly of meals; set the schedule for meals and snacks; maintain the structure of meals and snacks; make eating times pleasant and for providing mastery expectations (Evers,1997; Satter,2000). The child's responsibility

is to decide what, how much and even whether to eat (Evers, 1997). Given parents successful execution of their tasks, children will increasingly gain capability with eating behaviour and food acceptance. Children will also retain the ability to regulate food intake, grow in a constitutionally appropriate way, and maintain positive eating attitudes and behaviour. He continued that for children to learn to like a variety of foods and to regulate their food intake, they depend on adults to choose wholesome food and provide them with regular meals and snacks (Satter, 2000).

Teaching children food rules in the hope that they will achieve nutritional goals on their own, represents a crossing of the lines dividing responsibility and is an exercise in futility. It confuses and alarms children about food (Satter, 2000). In addition young children are not cognitively or developmentally able to select food responsibly. Satter (2000) pointed out that although children can learn about the Food Guide Pyramid (FGP) and may even be able to place food on the pyramid, they are not developmentally ready to apply that learning to making value judgements about food. Rather than teaching food selection, nutrition education can reinforce support for and enhance the capabilities of food acceptance and food regulation that children have learned at home (Satter, 2000).

Within healthy eating the key influences on food preference and behaviour need to be fully considered. Nutritional and marketing gurus both need to be aware of what makes consumers "tick" with regard to the foods consumed, especially in terms of healthy eating. Furthermore it is also anticipated that with the supply of information young consumers may be empowered with nutritional awareness knowledge of both a theoretical and practical nature. This will enable them to make more nutritionally informed decisions based on their own preferences. Young consumers appear to be creatures of habit, fuelled from birth by the guidance and influence of their parents, peers and other societal factors. Once formed such habits are difficult to change. The power of education can be immensely helpful in the pursuit of better

understanding by young consumers regarding healthy eating and may occur within the home, school and social environments (Brown *et al.*, 2000).

2.5 Breakfast patterns

Although evidence is not strong, there are indications in the literature that children are less attentive and more lethargic at school if they don't eat breakfast. Earlier studies showed that if breakfast was omitted, efficiency in physiological performance decreased in late morning and attitude towards schoolwork and scholastic achievement was poorer (Wolmarans *et al.*, 1995).

Lifestyle can contribute to the omission of breakfast, for instance, if both parents work, there may not be enough time to prepare breakfast and children may go to school without breakfast. Other factors, which could lead to the omission of breakfast, are socio-economic status and ignorance of the importance of breakfast and unavailability of food. In South Africa, especially black children often have to leave for school very early due to long distances which they have to travel (Wolmarans *et al.*, 1995).

Breakfast seems to play an important role in daily nutrient intake, since it has been shown in the United State School Breakfast programme that the 24-hour nutrient intakes of children who eat breakfast are better than those who skip breakfast. The omission of breakfast can have a detrimental effect on nutrient intake and it may be an indicator of poor food habits (Wolmarans *et al.*, 1995). Wolmarans *et al.* (1995) continued that the food most frequently consumed before school by the white children was breakfast cereals, while black children consumed bread. The recommendation is that breakfast should provide at least one quarter of daily energy requirement. A healthy snack before the school day starts should be considered for those children who don't eat breakfast in order to increase physiological performance

and scholastic achievement. Vendors and tuck-shops should be considered as possible vehicles for providing this early morning snack (Wolmarans *et al.,* 1995).

2.6 Fat intake & obesity

The striking increase in childhood obesity and associated complications, including type 2 diabetes and hyperinsulinemia and negative psychological impact are all too real right now (Krebs & Johnson, 2000). Overweight is a rising public health concern given its assumed increasing prevalence and its association with excess morbidity and mortality in adulthood. The control of food intake could play an important role in the development of obesity in children and young adults (Zandstra *et al.*, 2000). Obesity and overweight are often used incorrectly as synonymous terms. Richardson *et al.* (2000) defined obesity as an excess body fat in relation to lean body mass. On the other hand, Parson *et al.* (1999) defined obesity as a multifactorial condition with wide ranging causes including genetics, social, cultural and behavioural factors, all of which may interact. More immediate effects of developing obesity include psychosocial outcomes, with social isolation and peer problems more common in fatter children (Parson *et al.*, 1999). Overweight is defined as a body weight above an acceptable weight in relation to height. Evidence is strong that overweight children also tend to be overfat (Richardson *et al.*, 2000). A rise in prevalence of obesity, related to increasing affluence is reported from many developed countries throughout the world. Overweight and obesity in children and adolescence predict adult obesity, which is associated in turn with several chronic diseases, including type 2 diabetes mellitus, coronary heart diseases and hypertension (Bronner, 1996; Hanley *et al.*, 2000).

Several studies showed an increased prevalence and incidence of type 2 diabetes in obese white, African American and Native American children (Hanley *et al.*, 2000). Evidence suggests that taste preferences develop in childhood and that exposure to a lower-fat diet in childhood may persist through adolescence (Lytle, 2000). Lytle

(2000) showed that repeated exposure to food will increase children's acceptance of those foods, they will learn to accept the taste of skim milk, vegetables and other healthful foods. Preference is learned through exposure at young ages (Lytle, 2000).

According to Satter (2000) it is unrealistic and dangerous to try to make children's normal inconsistent eating pattern conform to nutritional prescriptions. With fat restriction as with energy restriction, externally controlling food intake blocks childrens sensitivity to internal regulators, undermines homeostatic mechanisms, interferes with social and emotional development, and ultimately may make children's diets less desirable than they otherwise would be. He continued that such attempts also lead to struggles between parents and children regarding eating attitudes. These struggles can become internalised and create distorted eating attitudes and behaviour that last a lifetime. In the long run these distortions can seriously undermine overall health (Satter, 2000).

According to Dwyer (2000) dietary patterns that target 30% of energy from fat may be desirable for a variety of reasons. Such a diet may be more beneficial than a higher-fat diet in reducing risks for other diseases and may also have different effects on the regulation of food intake than does a diet higher in fat (Dwyer, 2000). According to Lytle (2000) when an overweight child is treated, restricting fat intake may negatively affect the child's ability to self-regulate his or her satiety cues and may lead to unhealthy eating attitudes. The recommended diet offers a family-oriented eating pattern that benefits adults and children alike as a primary prevention strategy for cardiovascular disease and other chronic diseases. Children who consume their food according to such dietary patterns feel neither restricted nor deprived (Van Horn, 2000). Eating patterns that target saturated fat may make a behavioural and social difference and thus help to inculcate more healthful eating habits over one's lifetime. Children eat most of their meals with their families or in school. Therefore it makes sense to adopt dietary guidelines as a guide for family meals and meals in school. Priority needs to be given not only to saturated fat and cholesterol, but also to promoting eating patterns that follow the dietary guidelines,

such as physical activity and food, and eating as being enjoyable and healthful for children and their families (Dwyer, 2000).

2.7 Diagnosing obesity in children

Obesity is an excess of body fat but, the fatness of the population forms a continuous spectrum from undernutrition, through normal fatness, to gross obesity. In childhood the distinction between excessive and normal fatness is made more difficult by natural, age-related, physiological variation. There are many possible methods for measuring body fat, none of which is entirely satisfactory (Poskitt, 1995). The following methods are commonly used to identify obesity in children.

2.7.1 Skinfold measurements

Recently, the measurement of body fat has become widely used and recommended as one of the indicators of health and fitness. However, when body fat is measured certain assumptions and limitations must be understood so that an accurate appraisal of the body fat level can be made (De Ridder, 1998). Skinfolds are deemed as an accurate measurent of body fat as up to 50% of the subcutaneous fat is situated beneath the skin, therefore a skinfold would represent subcutaneous fat, surrounded by two layers of skin (Bray & Gray, 1988:131; Corbin & Lindsey, 1994:150; Heyward & Stolarczyk, 1996:21).

The use of skinfolds to measure obese subjects is considered inaccurate (De Ridder, 1998), as due to the size of the subject certain methodological problems make the taking of the skinfolds impossible, or inaccurate. Problems encountered in measuring obese individuals are that some children are so obese that the identification of the landmarks is difficult, and therefore inaccurate. The lifting of the skinfold is often difficult and skinfolds cannot be raised, or may be too thick for the gape of the caliper. In such a case the measurement of the skinfold is impossible

(Bray & Gray, 1988:131; Poskitt, 1995; Koch *et al.*, 1996:7; De Ridder, 1998). In any case there is no consensus (at any age) on the skinfold thickness, which represents obesity in children. Thus, most epidemiologists and clinicians resort to using some interpretation of weight-for-height and/or age, to define and quantify obesity (Poskitt, 1995).

2.7.2 Height-for-age

Height-for-age is one of the major determinants of weight in childhood. Tall children tend to weigh more than short children. A child who is tall for age also tends to weigh more than a child who is older but of the same height and thus relatively short for age (Poskitt, 1995). Tall-for-age children tend to be classified as overweight, even when approximately growing. Short-for-age children on the other hand are readily classify as underweight or malnourished, when they are just constitutionally small (Poskitt, 1995).

2.7.3 Body mass index (BMI)

For children body mass index (BMI) comes close to presenting the least height bias and is suitable for comparing overweight and obesity in children of the same age. The use of BMI for defining obesity through relative overweight could present a continue of index from childhood to adult life (Poskitt, 1995). Body mass index is widely accepted as a measure of body fatness and has also been recommended for the clinical evaluation of children and adolescents (Bini *et al.*, 2000). Further, BMI represents an index of weight independent of stature, such that at any age, greater relative weight may be attributed to increased body fatness (Wells, 2000). However difficulties are encountered when BMI is used in childhood and adolescence, as its relationship to body composition is influenced by various factors such as age, gender, race, sexual maturity, sitting height, fat distribution and the presence of diseases (Bini *et al.*, 2000; Wells, 2000). BMI is easy to record and is reproducible.

The convenience with which BMI can be measured has understandably made it popular, despite awareness of its shortcomings (Bini *et al.*, 2000; Wells, 2000).

According to Dietz & Bellizzi (1999) a consensus conference proposed the use of a BMI above the 85th percentile as a screening index for overweight, and a BMI above the 95th percentile as an index of excess adiposity in adolescents (Table 2.1 and 2.2). However, the validity of BMI as an index of fatness has not been carefully examined in younger children or adolescents (Dietz & Bellizzi, 1999). Age-dependent reference data for BMI are necessary for children, as changes in body composition occur during growth. However, sexual maturation produces variations of BMI and leads to the opinion that caution is essential when using BMI in adolescence (Bini *et al.*, 2000). In addition current experience with age related standards is insufficient to define normal and abnormal in terms of percentile distribution of BMI. The European Childhood Obesity Group (ECOG) recommends the use of a common indicator of obesity in nutritional studies, regardless of the other criteria being used for diagnosis of obesity, so that the results of the studies can be compared (Poskitt, 1995). Recently Cole *et al.* (2000) developed international cut-off points for BMI for overweight and obesity by sex between 2 and 18 years, defined to pass through BMI of 25 and 30 at age 18 (Table 2.3). This was obtained by averaging data from Brazil, Great Britain, Hong Kong, Netherlands, Singapore, and United States. The cut-off points are recommended for use in international comparisons of prevalence of overweight and obesity. Nevertheless, further research is needed to explore patterns of body mass index in children in Africa (Cole *et al.*, 2000).

Table 2.1 The 85th & 95th percentiles of body mass index for 10-15 year old males (Must *et al.*, 1991)

Age	White		Blacks	
(Yrs)	85thpercentile	95thpercentile	85thpercentile	95th percentile
10	19.67	22.66	18.78	22.41
11	20.47	23.87	19.32	23.42
12	21.28	25.01	19.85	24.39
13	22.12	26.06	20.62	25.26
14	22.97	27.02	21.54	26.13
15	23.82	27.86	22.50	27.05

Table 2.2 The 85th & 95th percentiles of body mass index for 10-15year old females (Must *et al.*, 1991)

Age	White		Blacks	
(Yrs)	85thpercentile	95thpercentile	85thpercentile	95thpercentile
10	20.23	23.15	20.79	23.57
11	21.24	24.48	21.96	25.44
12	22.25	25.53	23.15	27.27
13	23.13	26.46	24.41	28.90
14	23.87	27.31	25.46	30.29
15	24.28	27.89	26.04	31.40

Table 2.3 International cut-off points for overweight and obesity by sex between 10-15 years, defined to pass through body mass index or 25 and 30 at age 18 (Cole *et al.*, 2000)

	Adult body mass index 25kg/m^2		Adult body mass index30kg/m^2	
Age(yrs)	Males	Females	Males	Females
10	19.8	19.9	24.0	24.1
10.5	20.2	20.3	24.6	24.8
11	20.6	20.7	25.1	25.4
11.5	20.9	21.2	25.6	26.1
12	21.2	21.7	26.0	26.7
12.5	21.6	22.1	26.4	27.2
13	21.9	22.6	26.8	27.8
13.5	22.3	23.0	27.2	28.2
14	22.6	23.3	27.6	28.6
14.5	23.0	23.7	28.0	28.9
15	23.3	23.9	28.3	29.1

2.8 Racial differences in the prevalence of obesity

Although the prevalence of overweight is high for black children and adolescents, it is even higher among American Indians and Hispanics in the same age group (Bronner, 1996). McNutt *et al.* (1997) stated that the prevalence of overweight in black girls in infancy and early childhood has been reported to be less than or equal to that among their white counterparts. This suggests that it is during the preadolescent and adolescent years that racial differences in the prevalence of obesity emerge (McNutt *et al.*, 1997). The development of obesity and the racial differences in its prevalence may stem from a variety of factors including eating practices (McNutt *et al.*, 1997). In addition, Mueller (1982) reported that during childhood a stressful environmental situation such as culture change from traditional

rural to urban environment is associated with obesity and redistribution of body fat from extremity to trunk in Polynesians. Other studies in the USA suggest that blacks have a greater trunk to extremity fat ratio as compared to whites (Mueller, 1982).

A study by Bronner (1996) found that black girls spent 30% more hours watching television or videos per week than white girls. This excess occupation with television and videos is consistent with black girls reporting a more sedentary lifestyle (Bronner, 1996). While the black female adolescents appear to be weight conscious, they are less inclined to engage in behaviours likely to control weight gain than their white counterparts. Contrary to that, Bronner (1996) pointed out that black, Hispanic, and American-Indian girls engage in behaviours associated with eating disorders, even though black and American-Indians girls are more likely to be satisfied with their body image than whites. Among ethnic groups, Hispanic girls reported the greatest use of diuretics while blacks were more likely to report vomiting to lose or maintain weight (Bronner, 1996). The racial differences for some eating practices varied by parental income, education or age (McNutt *et al.*, 1997).

Several investigators reported that black women appear to be less concerned about their weight and less influenced by social pressure to be thin. Furthermore, they also appeared more tolerant of obese individuals compared to black males and white females. It was also found that black girls who had a higher desired weight, were more concerned about being underweight, and generally seemed to be more satisfied about their figures than white girls (McNutt *et al.*, 1997). In addition, Bronner (1996) found that overweight black girls were two times more likely to describe themselves as thinner than other girls of their age and seven times more likely to say that they were not overweight. Black girls did not desire to be thin and were more satisfied with their size, while white girls wanted to be smaller than they were and they reported that they were signifantly encouraged others to lose weight or reduce their size (Bronner, 1996). It seems that a larger body size may be more acceptable among black than white females. This suggests that in the black culture there is a

greater tolerance and perhaps acceptance of obesity. Studies also showed that black women demonstrate fewer obesity-inhibiting attitudes than whites. For instance, several investigators have reported that weight control and weight-loss efforts of black females are less successful than those of their white counterparts (McNutt *et al.*, 1997).

According to McNutt *et al.* (1997) for both young black and white girls, early education efforts may be necessary in helping to develop good eating habits. Since it appears that black girls have a higher risk of developing adverse weight-related eating practices, culturally appropriate education materials may be required. There are certain behaviours that need to be targeted, which include excessive fast-food consumption, irregular eating schedule and meal skipping, situational eating such as eating while watching TV or eating alone, consuming large food portions and snacking when not hungry. Control of these behaviours reflects clinical advice commonly given to children and adults to prevent excessive accumulation of fat (Mc Nutt *et al.*, 1997).

2.9 Abnormal eating attitudes

According to Neumark-Sztainer *et al.* (2000) many adolescent girls and young women express dissatisfaction with their bodies and report that they are dieting for weight control purposes. Furthermore, recent studies show that one-third to two-thirds of girls in the later elementary school grades (grade 4 to 6) express weight concerns or have dieted (Neumark-Sztainer *et al.*, 2000). This may lead to abnormal eating attitudes, which are associated with eating disorders and may reflect the presence of subclinical or preclinical forms of eating disorders. Other factors may include specific individual wishes, perceptions, behaviour and topics of conversation. Family (especially maternal) factors appear to influence and determine eating attitudes (Szabo & Holland, 1997). In this regard the ability of children generally to perceive parental opinion on body shape or weight accuracy may impact

on self-esteem, leading to attempts to address the perceived situation with the consequent onset of eating problems (Szabo & Holland, 1997).

2.10 Consequences of childhood obesity

2.10.1 Cardiovascular disease

Epidemiological research on coronary heart disease indicates that early development and maintainance of a healthful lifestyle in children may be an important precursor for the reduction of heart disease at a later stage (Bronner, 1996). Total blood cholesterol levels increase with age. Blacks have higher levels than whites. Even though black children have the highest levels of total cholesterol they have a lipid profile that is protective from cardiovascular disease due to higher HDL-cholesterol. A diet rich in saturated fat and cholesterol is one of several factors that influence the development of cardiovascular disease. Children in the USA have higher saturated fat intake and blood cholesterol levels than children in many other developed countries. However, given the role of fat in the development of the central nervous system, some concern has been expressed regarding the efficacy of recommending a low-fat diet for growing children (Bronner, 1996).

2.10.2 Blood pressure

Hypertension is generally a silent problem in childhood and adolescence. Bronner (1996) stated that obesity is correlated with blood pressure and white children have a much greater percentage of body fat at higher blood pressure levels than black children. He continued that mild hypertension in black children is highly correlated with excess sodium and decreased potassium, calcium and magnesium intake. Overall, mild hypertension is related to obesity and diet (Bronner, 1996).

2.10.3 Psychosocial effects

The most common consequence of obesity in children in industrialized countries is on psychosocial functioning. Pre-adolescent children associated an overweight body with poor social functioning, impaired academic success and reduced fitness and health (WHO report, 1998). Overweight in adolescence may also be associated with social and economic problems at a later stage. A study from the USA has shown that women who were overweight in late adolescence and early adulthood are more likely to have lower family incomes, higher rates of poverty and lower rates of marriage than women who were not overweight in childhood (WHO report, 1998).

2.10.4 Other complications of childhood obesity

Hepatic steatosis is characterized by raised serum transaminase levels, and abnormal carbohydrate metabolism. Gastro-esophageal reflux and gastro-emptying disturbances which affect a minority of children may be a consequence of raised intra-abdominal pressure due to increased abdominal fat (Rossner, 1998; WHO report, 1998). Furthermore orthopedic problems, obstructive sleep apnea, pseudotumor cerebri, polycytic ovaries, and cholelithiasis are rare complications found in obese children (Rossner, 1998; WHO report, 1998).

2.12 Nutrition education among children and adolescents

Children are good targets for health education messages because their habits are still developing and they are in schools and families that can influence their health behaviour (Bronner, 1996). But when coming to the adolescent stage it is different because adolescence is a vulnerable period of development and personal adjustment, which needs to be recognized and understood when targeting such groups with nutritional education information. Adolescent health education is an area of great concern particularly as this development stage represents a time of experimentation and initiation into adult behaviour patterns (Brown *et al.*, 2000). According to

Bronner (1996) interventions should begin before the sixth grade, a time after which behavioural patterns are resistant to change. To be effective, however health messages should be positive so that they engage and excite children and their families. Better understanding of the relationship between culture and food ways will improve our understanding of how families are functioning. Furthermore, defining the families' food ways and analysing the household will strengthen this relationship (Bronner, 1996).

Basdevant *et al.* (1999) stated that the school could play an important role in encouraging healthy eating practices through training in practical food skills and by adopting healthy nutrition standards for school meals. They continued that a child can be considered as a target of an education program, by playing an active role in the transmission of the message of prevention of overweight. Public health prevention is based on education and behavioural changes in order to promote physical activity and to decrease the energy density of the diet. The child could play an active role in a nutritional prevention program. In other words, the role of a child is not only to be a target receiving the message but also a partner in the promotion of appropriate eating and physical activity in the familial environment (Basdevant *et al.*, 1999).

According to Basdevant *et al.*, (1999) the school seems to be one of the most appropriate fields to develop such a strategy since in most countries all children attend school and many of them eat at school. Children of all socio-economic situations have access to education. The educational system is considered as a credible source of information. The nutrition education in school may improve the nutritional knowledge of children and consequently influence the dietary habits of the whole family (Basdevant *et al.*, 1999). It is anticipated that with the supply of information, young consumers may be empowered with nutritional awareness as well as knowledge of both a theoretical and practical nature which will make more nutritionally informed decisions based on their own preferences possible (Brown *et al.*, 2000).

Nutrition Education

Nutrition education particularly within the young consumer segments, has to battle against the desires for autonomy over food choices and move towards a preference for healthy eating as opposed to the fast food options. Based on the evidence presented current consumption levels for the majority of young consumers don't meet or exceed such levels. This evidence would reinforce the daunting challenge facing nutritional education campaigns as they will need to persuade consumers to change their food preferences to include fruit and vegetables on a regular daily basis (Brown *et al.*, 2000). Nutrition education must extend beyond teaching the four basic food groups to help children recognise how their food choices are affected by environmental influences, inside as well as outside the school (D'Onofrio & Singer, 1983).

There is a significant "gap" between nutritional awareness in theory and putting this knowledge into practice in their daily food behaviour. It may be expressed that many young consumers whilst being aware of nutritional information and potential implementation, may indeed be hesitant in putting the theory into practice. This must not be underestimated in the continued pursuit of a better diet and lifestyle for tomorrow's adult consumers. Within the home environment, nutrition education and the pursuit of a balanced diet relate to the interaction between parents and young consumers from an early age, thus insisting in the development and progression of food behaviour. Brown *et al.*, (2000) stated that the home environment has to struggle with influences from school and social environments, relating to the development of young consumer's food behaviour. Young consumers should be involved in the meal planning, shopping and preparations which will asist them in making effective food decisions in later years (Brown *et al.*, 2000). Brown *et al.* (2000) continued that young consumers must be aware that there are no "good and/or bad foods", but the intake of food must be balance orientated. They should also be educated in the balancing of foods within the food pyramid's five food groups, in accordance with the recommended amounts for each food in these groups. If young consumers are going to implement nutritionally balanced food behaviour anywhere,

it is most likely to be within the home environment and particularly during the evening meal occasion (Brown *et al.*, 2000).

2.13 Summary

It is evident that overweight and obesity in children and adolescents are a rising public concern since they predict adult obesity, which is in turn associated with several chronic diseases caused by lifestyle. It is also clear that eating habits appear to be influenced by many factors such as interaction between individuals, environment, food choice, knowledge of healthy foods and others. Evidence also shows that poor eating habits contribute to the development of overweight and obesity in children.

There appears to be a need for more information on eating habits of school children in order to develop effective interventions that will empower children to develop healthful eating habits.

CHAPTER 3

Methods

3.1 INTRODUCTION

The research formed part of the THUSABANA study. THUSA is a Tswana word which means help. It is also an acronym for "Transition and Health during Urbanisation of South Africans". BANA is also a Tswana name meaning children, so in short THUSABANA means, "help the children". THUSA was a multidisciplinary project in which different schools of Potchefstroom University for Christian Higher Education (PU for CHE) were involved. THUSABANA is a follow-up of the THUSA project which was done in 1996-1998 in the North West Province. These schools comprised the School of Physiology, Nutrition and Consumer Science, the School of Biokinetics, Recreation and Sport Science and the School of Psycho-social Behaviour Science. Each school that was involved in this project provides researchers who are responsible for gathering health-related data in their specific field of expertise. Although a vast amount of data were gathered, each school was only responsible for gathering data in their specific field, and therefore the author of this study was only responsible for gathering the eating habits data.

The THUSABANA study was planned according to the protocol of the international childhood obesity study, by the Childhood and Adolescent Obesity Working Group (Bellizzi, 1999). The THUSABANA study is a long-term study which was intended to obtain baseline data from 1336 subjects and to follow up with appropriate interventions.

3.2 Design

The THUSABANA project was designed to study the problem of overweight and obesity among school children aged 10-15 years in the North West Province of South Africa. This was a cross-sectional study of a random sample of schools selected from a list of schools in the North West Province of South Africa. The measurements were done on a random sample of children from the selected schools during school hours in their respective schools.

3.3 Sampling

The 10-15 year old boys and girls were included, 100 children per age group were included, thus 2(gender) x 6 (age groups) x 100 = 1200 subjects. To compare effect of ethnicity the random sample was planned to include a proportionate number of children of each ethnic group. A list of all schools was obtained from the North West Department of Education, grouped into five regions and 12 school districts. Each district represents 4-7 circuits, with approximately 20 schools (minimum 14, maximum 47) per circuit. The total number of learners in the Province was calculated and the statistician recommended that a minimum of 60 children per ethnic group should be selected to allow for comparisons. Of the minimum of 1200 subjects, about 75% should be black children. Since an equal number of subjects had to be selected from each age group, the total number of subjects planned to be included was 1336, comprising 960 Blacks, 240 Whites, 68 Indians and 68 Coloureds. Schools were selected randomly from each region to include two high schools and four primary schools from predominantly black schools, one high school

and one primary school from predominantly white schools. From regions 3 and 4 one high school and two primary schools with predominantly coloured and Indian children were also included. The sample included subjects from high, middle and low socio-economic status (SES). A random sample of children was selected from class lists from the selected schools. The design of the study is shown in Figure 3.1.

3.3.1 Number of subjects

The sample in this part of the study comprised 725 children from 29 schools visited during 2000 only. The following table shows the distribution of children according to their ethnic groups. The final number of children represented a response rate of 85%. Some of the children selected did not participate in the study due to the following reasons:

- two schools could not be reached in the year 2000
- some parents refused to give their consent
- some children were participating in sports activities that took place simultaneously with the study

Table 3.1 The distribution of children according to ethnic group

ETHNIC GROUP	NUMBER OF SCHOOL CHILDREN
Black	387
White	191
Indian	78
Coloured	69
TOTAL	725

African population

North West Province

725 School children

Informed consent

Stratification

Gender: Boys & Girls

Age range: 10-15 years

Strata: 1. Black schools

2. Predominantly White schools

3. Predominantly Indian schools

4. Predominantly Coloured schools

Data

Demographics

Anthropometry: Weight, Height, Skinfolds

- **Body circumferences,WHR**

Dietary intakes: (24-hour recall with repeat)

Eating habits

Attitude towards eating /Psychological behavior

Motor development

Determination of blood pressure

Physical activity

Family circumstances & HIV

Figure: 3.1 Design of the THUSABANA study

3.3.2 Ethical considerations

The Ethics Committee of Potchefstroom University for CHE approved this study, according to project number 00M-10. The Department of Education in the North West Province gave permission to do the study during school hours. Since the subjects were still minors, the parents and guardians were required to sign an informed consent form, to grant permission for the children's participation in the study (***See addendum no. 1***).

3.3.3 Stratification

Subjects were stratified according to gender (male and female), age (10-15 years) in their respective schools and stratum of urbanisation. Criteria for each stratum were as follows:

3.3.3.1 Schools

Stratum 1: Black schools

These were public schools with subjects mostly coming from urban middle class areas, townships, rural areas and some from informal settlements. Subjects from these schools belonged to different socio-economic levels.

Stratum 2: White schools

These were schools situated in predominantly white areas, where mostly Afrikaans speaking white people lived. Subjects in this stratum came from the middle and upper class.

Stratum 3: Indian schools

These were schools situated in predominantly Indian areas. Subjects from these schools belonged to different socio-economic levels. Subjects from these schools came from different religions such as Hindu and Moslem.

Stratum 4: Coloured schools

These schools were in predominantly Coloured residential areas. Most subjects in these schools were from low to middle socio-economic status.

The geographical regions from which the children were selected are shown in table 3.2

3.3.3.2 Stratum of urbanisation

South Africa is experiencing rapid urbanization, especially of Africans leaving underdeveloped rural areas to seek a better life in transition. About 48.3% of the South African population was urbanized during 1993 as compared to 53.7% in 1996. During this period the percentage of urbanized Africans increased from 35.8% to 43.3%, while there was a slight decrease in the figures for whites and only small increases in those for coloureds (mixed races) and Indians (Anonymous, 1998).

Urbanization in developing countries is not necessarily accompanied by industrialization and improved economic circumstances, but is also associated with a health transition, with both detrimental and beneficial effects. It can lead to urban poverty and situations where behaviour which increases the risk of chronic diseases of lifestyle co-exist with raised exposure to infectious diseases, resulting in a double burden of disease (Vorster *et al.*, 2000).

Subjects were grouped into three strata of urbanization using criteria based mainly on where the schools were situated. Stratum one consisted of mainly rural people living in traditional African villages with a tribal head or on a farm. Some of these

villages were part of the former Bophuthatswana homeland. Stratum two consisted of subjects living in informal housing areas also known as "squatter camps" found adjacent to all major towns and cities. Most subjects living in these areas had moved from rural areas and farms, and therefore represented people in the most rapid phase of transition. Stratum three were subjects from the established urban townships (previously known as black locations). It also represented the upper-class urban subjects living in affluent westernized circumstances.

Table 3.2: Locations of recruitment for the THUSABANA study

District	Number of Schools	Stratum	Ethnic group
Brits	2	Urban	White
Delareyville	1	Urban	Black
Dinokana	1	Rural	Black
Garankuwa	1	Urban	Black
Ikageng	2	Urban	Black
Klerksdorp	2	Urban	Black & White
Letlhabile	2	Urban	Black
Lichtenburg	1	Rural	White
Ottosdal	1	Rural	Black
Potchefstroom	1	Urban	White & Indian
Rustenburg	4	Urban	Black, White, Coloured & Indian
Sannieshof	1	Urban	Black
Schweizer-Reneke	2	Rural	Black & Whites
Stella	1	Rural	Whites
Ventersdorp	1	Informal settlement	Black
Promosa	1	Urban	Coloured
Vryburg	1	Urban	Black, Coloured & Whites
Zeerust	2	Urban	Whites
Total	27		

3.4 ORGANISATIONAL PROCEDURES

Prior to the commencement of the study, permission to conduct a study was gained from the Deputy Director General of the Department of Education of North West Province. Letters were sent to all selected schools and two research assistants visited the schools. They then explained to the principal what the research entailed and to submit the informed consent forms to the principal so that she/he could distribute them to the selected subjects. The eating habits questionnaire was designed based on the scientific literature and it was tested on children during the pilot study to see if they could understand the questions. The questionnaire was planned in collaboration with a statistician to facilitate coding of the data.

Having received approval from all the parties involved, a specific day and time were chosen for the study. On the morning of each visit, consent forms were collected from subjects whose parents gave permission for their children to participate in the study. The study was explained in detail to the subjects (***See addendum no. 6***). As mentioned earlier about the multi-disciplinary nature of the study, each subject then received a green card (***See addendum no. 3)***. The subject number, age and gender were entered on the green card. The test person then proceeded to each station where all the relevant data were collected. The reseacher who collected data in each station had to attach his or her signature on the relevant space provided on the green card. This was done to make sure that the subject has been to all the stations.

3.5 Measuring procedures

3.5.1 Demographic information

Demographic data were collected using a demographic questionnaire. The questionnaire included questions about the age, gender, grade at school, stratum, access to facilities such as water, electricity, computer, television and radio.

Questions about educational level of the family members and occupation of the father were also asked in order to get an idea of the available family income ***(See addedum no. 2)***.

3.5.2 Eating habits

The eating habit questionnaire was used to collect data on eating habits of these children. It took about 5-8 minutes to complete the eating habit questionnaire, which was administered by a trained interviewer according to the language of instruction in the school or the language spoken by the subject. The interviewer was the researcher who developed the questionnaire and she could speak more than one language so there was no need to translate the questionnaire to other languages. The questionaire was formulated with reference to the scientific literature (Evers,1997; Dwyer, *et al.*,2001). A pilot study was done to test the questionnaire to see if the children would understand the questions. No changes had to be made. The questionnaire contained questions regarding the number of meals the subject ate per day, whether they ate breakfast or not and if not why. The other questions were about feeding schemes in their respective schools, television, lunch-box, bringing money to buy from tuck-shops, snacking, lunch and supper and about special diets (***See addendum no. 4***). All these factors were considered as important in influencing eating habits (Steyn & Badenhorst, 1993; Bronner, 1996; McNutt *et al.*, 1997; Kromeyer-Hauschild et al., 1999).

3.5.3 Anthropometric measurements

Anthropometric measurements were taken by trained biokinetics. The following measurements were taken (***See addendum 5***)

3.5.3.1 Height

Height was measured using a stadiometer. The subjects were required to stand in an upright position without shoes, with feet together and heels against the wall. The top

of the ear and the outer corner of the eye were in a line parallel to the floor, this position is called the Frankfort plane. The recorder lowered the top of the stadiometer to rest flat on top of the head and the measurement was taken and recorded immediately (Norton & Olds, 1996).

3.5.3.2 Weight

A calibrated electronic scale was used to measure the weight of the subjects (Precision Health Scale, A & D Company, Japan). Body weight was measured to the nearest 0.1kg. Subjects were weighed in light underwear without shoes. The observed weight was recorded immediately.

3.5.3.3 Skinfold measurements

Skinfold measurements were done using a spring loaded Harpenden skinfold caliper. More skinfolds were measured but for this research only the triceps skinfold measurements were used. The caliper measures the thickness of the subcutaneous fat. The tester identified certain landmarks on the body of the subject by palpation and made a mark on the subject's body. Then the tester lifted the two layers of the skin and subcutaneous fat with the thumb and the index finger of the left hand and the caliper was then placed over the lifted skinfold approximately 1cm below the thumb and index finger and the measurement was taken. Skinfolds were taken in this manner at all the necessary sites (Harrison *et al.*, 1988:56; Norton & Olds, 1996:44).

3.6 Statistical analysis

All data were computerised and descriptive statistics were used to present the eating habits data. Children were classified as obese or non-obese by using the 95th percentile of body mass index and triceps skinfolds for age, gender and ethnic group

(whites and non-whites) (NCHS, 1971-1974). The Chi-square test was used to assess the association between:

- breakfast consumption and measures of obesity
- taking a lunchbox to school and measures of obesity
- buying from tuck-shop and measures of obesity
- snacking and measures of obesity
- special diet and measures of obesity
- P- values of <0.05 were taken as being statistically significant.

The SAS system for Windows Release 8 (2000) was used for statistical analysis.

3.7 Summary

The above mentioned methods helped providing the results which will be reported in the next chapter. The discussion of these results will also be handled in the next chapter.

Chapter 4

Results, Discussion and conclusions

4.1 Introduction

In this chapter the results of 725 school children will be reported. The descriptive statistics of demographic data, anthropometric data and the relationship between eating habits and measures of obesity will also be presented.

4.2 Demographic and anthropometric information

Table 4.1 indicates the demographic information of school children. These school children are grouped according to age, gender, stratum of urbanisation and ethnic groups. The frequency and percentages are also indicated in this table. In this study only 26% white children, 10% coloured children, and 11% Indian children were included. The rest of the sample group was black children (53.4%). The sample was not really representative of the North West Province. Most of these children were

from the urban area, and small percentages of children (11%) were living in the informal settlements. Only 20% of the children were from the rural areas. There was about the same number of female subjects (50.5%) as male subjects (49.5%).

Table 4.1 Frequency distribution of selected socio-demographic characteristics of schoolchildren (n=725)

Demographic variables	
AGE (years)	**FREQUENCY (PERCENTAGES)**
10	**123 (17%)**
11	**120 (16.6%)**
12	**139 (19.2%)**
13	**101 (14%)**
14	**104 (14.3%)**
15	**138 (19%)**
GENDER:	
Male	**359 (49.5%)**
Female	**366 (50.5%)**
STRATA OF URBANISATION	
Rural	**145 (20%)**
Informal settlements	**82 (11.3%)**
Urban	**498 (69%)**
ETHNIC GROUP	
Black	**387 (53.4%)**
White	**191 (26%)**
Coloured	**69 (10%)**
Indian	**78 (11%)**

Table 4.2 Number of black and white children distributed according to age, gender, strata and ethnic group (n=578)

Stratum	Black Rural		Black Informal settlement		Black Urban		Whites Rural		White Urban		Total
Age	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female	
10	4	5	6	5	17	29	8	8	8	9	99
11	4	3	5	6	27	24	10	7	4	5	95
12	4	8	7	9	27	22	8	12	8	6	111
13	1	2	6	6	13	15	8	6	6	9	72
14	1	-	5	7	15	18	7	2	12	12	75
15	9	13	8	6	29	21	4	7	16	8	114
Total	23	31	37	39	128	129	45	42	54	50	578

Table 4.3 Number of Coloured and Indian children distributed according to age, gender, strata and ethnic group (n=147)

Stratum	Coloured Rural		Coloured Informal settlement		Coloured Urban		Indian Urban		Total
Age	Male	Female	Male	Female	Male	Female	Male	Female	
10	-	-	-	-	7	4	6	7	24
11	-	-	-	1	7	6	5	6	25
12	-	-	2	1	6	5	5	9	28
13	-	-	1	1	3	5	13	6	29
14	1	-	-	-	4	7	7	6	25
15	-	-	-	-	2	6	3	5	16
Total	1	0	3	3	29	33	39	39	147

Tables 4.2 and 4.3 represent the number of black, white, coloured and Indian children distributed according to age, gender, ethnic group and strata.

The prevalence of obesity and overweight in children according to BMI-for-age and triceps skinfolds using the cut-off of the 95th percentile and 85th percentile (Must *et al.*,1991) is presented in table 4.4. According to BMI-for-age most children were of normal weight (85.2%), 12.2% were overweight and only a small percentage of children were obese (2.6%). Most of the obese children were white males from urban areas (Table 4.5). When using triceps skinfold measurements nearly the same results were observed. Only 5.4% of children were obese and the rest were non-obese (94.6%). The results also show that a higher number of these obese children were 10 year old (Table 4.5).

Table 4.4 Prevalence of obesity and overweight according to BMI-for-age and triceps skinfolds (n=725)

GROUP	BMI-for-age	Triceps skinfolds
Normal weght (<85th percentile)	618 (85.2%)	686 (94.6%)
Overweight (>85th percentile)	88 (12.2%)	-
Obese (>=95th percentile)	19 (2.6%)	39 (5.4%)

Table 4.5 Distribution of obese children according to age, gender, strata and ethnic group when using BMI-for-age (n=656)

Age	Black Rural	Black Urban		White Urban		Indian Urban		Total
	Male	Male	Female	Male	Female	Male	Female	
10	-	-	3	2	1	-	1	7
11	-	-	-	2	-	-	-	2
12	-	1	-	2	1	-	-	4
13	-	-	-	2	-	1	-	3
14	1	1	-	1	-	-	-	3
15	-	-	-	-	-	-	-	-
Total	1	2	3	9	2	1	1	19

4.3 Eating patterns of school children

Table 4.6 indicates the frequency and the percentage of children who practised the specific eating pattern and those who did not practise that eating pattern.

Table 4.6 Frequency of eating habits of schoolchildren (n=725)

	YES	NO
	Frequency & percentage	Frequency & percentage
Eating breakfast	589 (81.2%)	136 (18.8%)
Taking lunch-box to school	260 (36%)	465 (64%)
Buying from tuck-shop	567 (78.2%)	158 (22%)
Receiving feeding scheme	397 (55%)	328 (45.2%)
Eating lunch after school	642 (89%)	83 (11.4%)
Eating afternoon snack	445 (61.4%)	280 (39%)
Eating supper	692 (95.5%)	33 (4.6%)
Eating late night snack	193 (27%)	532 (73.4%)
Eating in front of TV	587 (81%)	138 (19%)
Following special diet	37 (5.1%)	688 (95%)
Kind of diet: -allergies	32 (4.4%)	–
-diabetes	3 (0.41%)	–
-ulcers	2 (0.28%)	–
Following cultural diet	59 (8.1%)	666 (92%)
Type: -Muslem	56 (8%)	–
-Hindu	3 (0.41%)	–
Following diet for weight loss	48 (6.6%)	677 (93.4%)

Table 4.7 Number of black children who skipped breakfast according to age, gender and stratum (n= 387)

Stratum	Rural Black		Black Informal settlement		Black Urban		Total
Age	Male	Female	Male	Female	Male	Female	
10	2	1	0	1	2	8	14
11	2	1	1	1	4	3	12
12	2	2	0	2	6	2	14
13	1	0	1	0	1	3	6
14	0	0	0	2	8	5	15
15	5	2	2	2	8	7	26
Total	12	6	4	8	29	28	87(22.4%)

Table 4.8 Number of white children who skipped breakfast according to age, gender and stratum (n= 191)

Stratum	White Rural		White Urban		Total
Age	Male	Female	Male	Female	
10	1	1	2	2	6
11	1	1	0	0	2
12	1	3	1	1	6
13	1	2	0	3	6
14	0	0	2	3	5
15	0	1	4	2	7
Total	4	8	9	8	29 (15%)

Table 4.7 presents the number of black children who skipped breakfast according to age, gender and stratum. A higher number (57) of children who omitted breakfast were children from urban areas. It also indicates that the older children (15years) had a tendency to skip breakfast more than other age groups. Table 4.8 shows that only 29 white children omitted breakfast and more of these children were from urban

areas. Only 12 coloured children skipped breakfast and 11 of these children were from urban areas (Table 4.9). Table 4.10 indicates the number of Indian children who omitted breakfast according to age, gender and stratum. It shows that a small number of Indian children from urban areas (8) omitted breakfast.

Table 4.9 Number of Coloured children who skipped breakfast according to age, gender and stratum (n= 69)

Stratum	Coloured Informal settlement		Coloured Urban		Total
Age	Male	Female	Male	Female	
10	0	0	2	0	2
11	0	0	1	0	1
12	0	0	1	0	1
13	0	1	0	1	2
14	0	0	1	3	4
15	0	0	0	2	2
Total	0	1	5	6	12(17.3%)

Table 4.10 Number of Indian children who skipped breakfast according to age gender and stratum (n= 78)

Stratum	Indian Urban		Total
Age	Male	Female	
10	1	0	1
11	0	0	0
12	0	2	2
13	2	0	2
14	0	2	2
15	0	1	1
Total	3	5	8 (10%)

Table 4.11 Number of Black children who took a lunch-box to school according to age, gender and stratum (n= 387)

Stratum	Black Rural		Black Informal settlement		Black Urban		Total
Age	Male	Female	Male	Female	Male	Female	
10	1	1	1	2	7	6	18
11	0	0	1	2	7	9	19
12	0	0	2	3	3	9	17
13	0	0	1	1	1	5	8
14	0	0	0	0	0	0	0
15	1	5	0	0	2	1	9
Total	2	6	5	8	20	30	71(18.3%)

Table 4.11 presents the number of black children taking a lunch-box to school according to age, gender and stratum. Only 71 children took a lunch-box to school and most of these children (50) were from urban areas. It also indicates that more female children from all age groups took a lunch-box than male children. A higher number of white children (59) from urban areas than from rural areas took a lunch-box to school, more male children (54.3%) from both rural and urban areas than female children (45.6%). The results also showed that more young children (10-12years) took a lunch-box to school than the older age groups (Table 4.12). About half of coloured children from urban areas (33) took a lunch-box to school and most of them were females. Most Indian children (64) from urban areas took a lunch-box to school (Table 4.13 & Table 4.14).

Table 4.12 Number of White children who took a lunch-box to school according to age, gender and stratum (n= 191)

Stratum	White Rural		White Urban		Total
Age	Male	Female	Male	Female	
10	5	3	8	7	23
11	9	4	4	5	22
12	1	7	6	5	19
13	2	0	5	6	13
14	2	0	2	4	8
15	0	0	6	1	7
Total	19	14	31	28	92(48%)

Table 4.13 Number of Coloured children who took a lunch-box to school according to age, gender and stratum (n= 69)

Stratum	Coloured Informal settlement		Coloured Urban		Total
Age	Male	Female	Male	Female	
10	0	0	3	3	6
11	0	0	5	3	8
12	0	0	4	5	9
13	1	0	1	2	4
14	0	0	1	4	5
15	0	0	0	1	1
Total	1	0	14	18	33(18%)

Table 4.14 Number of Indian children who took a lunch-box to school according to age, gender and stratum (n= 78)

Stratum	Indian Urban		Total
Age	Male	Female	
10	3	7	10
11	5	5	10
12	5	8	13
13	10	5	15
14	6	3	9
15	2	5	7
Total	31	33	64(82%)

Table 4.15 Number of black children who bought from the tuck-shop according to age, gender and ethnic group (n= 387)

Stratum	Black Rural		Black Informal settlement		Black Urban		Total
Age	Male	Female	Male	Female	Male	Female	
10	2	3	4	5	14	24	52
11	3	0	5	5	19	21	53
12	1	6	7	7	24	18	63
13	1	1	2	6	9	13	32
14	1	0	5	4	11	15	36
15	9	13	7	4	21	15	69
Total	17	23	30	31	98	106	305(79%)

Table 4.16 Number of white children who bought from the tuck-shop according to age, gender and stratum (n= 191)

Stratum	Rural White		Urban White		Total
Age	Male	Female	Male	Female	
10	8	8	6	6	28
11	8	7	1	5	21
12	7	12	6	4	29
13	8	3	5	5	21
14	5	1	11	8	25
15	3	2	12	5	22
Total	39	33	41	33	146(76.4%)

Table 4.15 indicates the number of black children who bought from the tuck-shop according to age, gender and stratum. Most children (305, 79%) from all strata bought from the tuck-shop and most of these children (204) were from urban areas. In all strata more female subjects bought from the tuck-shop than male subjects. Table 4.16 shows that 146 (76.4%) white children from both rural and urban areas bought from tuck-shop. It also shows that white children from all age groups bought from tuck-shops. Table 4.17 indicates that 57 (83%) coloured children from all strata bought from the tuck-shop. Most of these children (51) were from the urban areas and more female subjects than male subjects bought from the tuck-shop. The number of Indian children who bought from the tuck-shop was 59 and these were children from urban areas. More female subjects (31) bought from the tuck-shop than male subjects (28) (Table 4.18).

Table 4.17 Number of Coloured children who bought from the tuck-shop according to age, gender and stratum (n= 69)

Stratum	Coloured Rural		Coloured informal settlement		Coloured Urban		Total
Age	Male	Female	Male	Female	Male	Female	
10	0	0	0	0	6	4	10
11	0	0	0	1	5	6	12
12	0	0	2	1	4	5	13
13	0	0	1	0	2	4	6
14	1	0	0	0	4	6	11
15	0	0	0	0	0	5	5
Total	1	0	3	2	21	30	57(83%)

Table 4.18 Number of Indian children who bought from the tuck-shop according to age, gender and stratum (n= 78)

Stratum	Indian Urban		Total
Age	Male	Female	
10	6	5	11
11	5	4	8
12	1	7	8
13	7	6	13
14	6	5	11
15	3	4	7
Total	28	31	59(76%)

Table 4.19 Number of Black children who consumed a TV snack according to age, gender and stratum (n= 387)

Stratum	Rural Black		Black Informal settlement		Black Urban		Total
Age	Male	Female	Male	Female	Male	Female	
10	4	3	3	1	16	28	55
11	3	2	2	6	26	23	62
12	4	6	5	9	25	21	70
13	1	1	5	4	12	13	36
14	1	0	3	4	12	12	32
15	7	9	5	5	20	18	64
Total	20	21	23	29	111	115	319(82.4%)

Table 4.20 Number of White children who consumed a TV snack according to age, gender and stratum (n= 191)

Stratum	Rural White		Urban White		Total
Age	Male	Female	Male	Female	
10	3	6	5	6	20
11	5	6	3	3	17
12	7	10	8	5	30
13	8	5	5	5	23
14	6	1	12	10	29
15	4	4	14	4	26
Total	33	32	47	33	145(76%)

Tables 4.19 and 4.20 indicate the number of black and white children who consumed a television snack. Most black children (319,82.4%) from all strata consumed a TV snack. A higher number (226) of these children were from urban areas. The results also showed that in all strata more female subjects of the age groups 11,12 and 15 consumed a TV snack than male subjects. Table 4.20 shows that, 145 (76%) white children from all strata consumed a TV snack. A higher number (80) of these

children were from urban areas. In all the strata more male subjects consumed a TV snack than female subjects. The number of coloured children from all the strata consuming a TV snack was 58 (84%) and a high number (51) of these children were from the urban areas. More female subjects from urban areas consumed a TV snack than male subjects (Table 4.21). Table 4.22 shows that 64 (82%) Indian children from urban areas consumed a TV snack. Almost the same number of male (34) and female (30) subjects consumed a TV snack.

Table 4.21 Number of Coloured children who consumed a TV snack according to age, gender and stratum (n= 69)

Stratum	Coloured Informal settlement		Coloured Urban		Total
Age	Male	Female	Male	Female	
10	0	0	5	3	8
11	0	1	4	6	11
12	2	1	4	4	11
13	1	1	2	5	9
14	1	0	4	6	11
15	0	0	2	6	8
Total	4	3	21	30	58(84%)

Table 4.22 Number of Indian children who consumed a TV snack according to age, gender and stratum (n = 78)

Stratum	Indian Urban		Total
Age	Male	Female	
10	6	3	9
11	5	5	10
12	4	7	11
13	11	6	17
14	5	5	10
15	3	4	7
Total	34	30	64(82%)

4.4 The association between eating habits and obesity

The breakfast patttern of these children indicate that according to BMI a higher percentage of obese children skipped breakfast (32%) than non-obese children (18%). There is however, no significant association as the p-value is 0.1469 (Table 4.23). According to triceps skinfolds a higher proportion of obese children (28.2%) omitted breakfast. This is more than for their non-obese counterparts (18.2%) with a p-value of 0.12 but not significant (Table 4.23). Table 4.24 summarises the proportion of children who took a lunch-box to school and those who did not. More non-obese children (65%) had a tendency not to take a lunch-box to school (P= 0.1225) when using BMI cut-off points to compare non-obese and obese children. When comparing with triceps skinfolds similar practices were seen for both non-obese (65%) and obese children (64%) which means there is no significant association between taking a lunch-box to school and triceps skinfolds measurements (p= 0.9962).

Table 4.23 Frequency of breakfast consumption according to BMI and triceps skin fold cut-off points for obesity

Classification according to BMI			
	NON- OBESE	OBESE	P- value
Eating breakfast	576 (81.6%)	13 (68.4%)	P= 0.1469
Skipping breakfast	130 (18.41%)	6 (31.6%)	
Classification by Triceps skinfolds			
Eating breakfast	561 (82%)	28 (72%)	
Skipping breakfast	125 (18.2%)	11 (28.2%)	P= 0.120

BMI=Body mass index

Table 4.24 Frequency of taking a lunch-box to school according to classification of obesity by BMI or triceps skinfolds cut-off points

Classification by BMI			
Take lunchbox	NON- OBESE	OBESE	P-value
YES	250 (35.4%)	10 (53%)	P= 0.1225
NO	456 (65%)	9 (47.4%)	
Classification by Triceps skinfolds			
YES	246 (36%)	14 (36%)	P= 0.9962
NO	440 (64.1%)	25 (64.1%)	

BMI=Body mass index

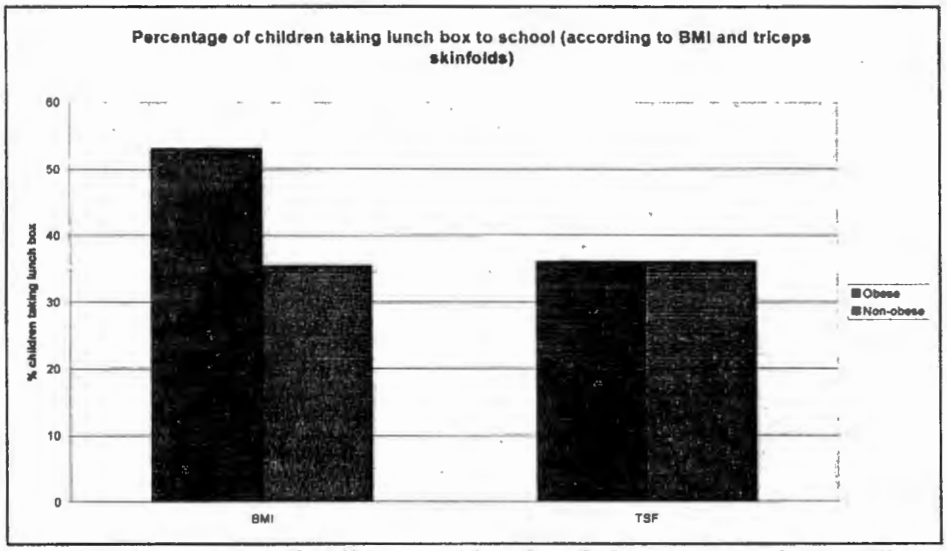

Figure 4.1 Percentage of children taking lunch-box to school according to BMI and Triceps skinfolds

Table 4.25 shows the frequency of buying from the tuck-shop of obese and non-obese children. Both non-obese (78.2%) and obese (79%) children bought food from the tuck-shop when using BMI cut-off points to compare non-obese and obese children. When triceps skinfolds cut-off points are used, more obese children (90%) bought at the tuck-shop (p=0.073) than non-obese children (77%) but the association was not significant.

Table 4.25 Prevalence of buying from the tuck-shop according to BMI or triceps skinfold cut-off points

Tuck-shop and BMI	NON- OBESE	OBESE	P- value
YES	552 (78.2%)	15 (79%)	P=0.937
NO	154 (22%)	4 (21%)	
Tuck-shop and Triceps skinfolds			
YES	532 (77.5%)	35 (90%)	P=0.073
NO	154 (22.5%)	4 (10.3%)	

Most foods that were reported to be bought were high in fat or sugar such as crisps, soft drinks, sweets, biscuits, fat cakes, chocolate, bread sandwich with French fries and polony, and meat pie. Fat cakes, biscuits and bread sandwich with French fries and French polony were found mostly in black schools.

Table 4.26 presents the frequency of snack consumption and measures of obesity between non-obese and obese children. A greater percentage of obese children (74%) reported consuming an afternoon snack than non-obese children (61%) when using BMI cut-off points. When triceps skinfolds were used there was a tendency for more obese children (72%) to consume an afternoon snack ($p= 0.17$) than non-obese children (61%). The frequency for not consuming a late night snack for non-obese children (73.4%) and obese children (74%) was almost the same when using BMI and triceps skinfolds cut-off points. The frequency for consumption of a television snack was also almost similar for both non-obese (81%) and obese children (79%) when using BMI or triceps skinfolds cut-off points ($p=0.86$) which means that there was no significant association.

Table 4.26 Frequency of consumption of afternoon snack, latenight snack and TV snack according to BMI and triceps skinfold cut-off points

Afternoon snack & BMI	NON- OBESE	OBESE	P- value
YES	431 (61.1%)	14 (74%)	P= 0.264
NO	275 (39%)	5 (26.3%)	
Afternoon snack and triceps skinfolds			
YES	417 (61%)	28 (72%)	P= 0.17
NO	269 (39.2%)	11 (28.2%)	
Latenight snack & BMI			
YES	188 (27%)	5 (26.3%)	P= 0.976
NO	518 (73.4%)	14 (74%)	
Latenight snack and triceps skinfolds			
YES	183 (27%)	10 (26%)	P= 0.887
NO	503 (73.3%)	29 (74.4%)	
TV snack and BMI			
YES	572 (81%)	15 (79%)	P= 0.82
NO	134 (19%)	4 (21%)	
TV snack and triceps skinfolds			
YES	555 (81%)	32 (82%)	P= 0.86
NO	131 (19.1%)	7 (18%)	

Table 4.27 indicates the frequency of being on a special diet of non-obese and obese children. A greater percentage of non-obese children (95.3%) reported not to be on any special diet than obese children (79%) when comparing BMI (p= 0.0014). When comparing triceps skinfolds there was a significant association between being obese (85%) and being on a special diet (p=0.003). The association between being obese and being on a special diet was significant when both BMI and triceps skinfold cut-off points were used (p=0.0014 and p=0.003 respectively).

Table 4.27 Frequency of a special diet for health reasons according to BMI and triceps skinfold cut-off point for obesity

Special diet & BMI	NON- OBESE	OBESE	P- value
YES	33 (5%)	4 (21%)	P= 0.001
NO	673 (95.3%)	15 (79%)	
Special diet and triceps skinfolds			
YES	31 (5%)	6 (15.4%)	P= 0.003
NO	655 (95.4%)	33 (85%)	

4.5 Discussion of the results

4.5.1 Demographic information

In this study more blacks than other ethnic groups were included because there are more black schools than white, coloured and Indian dominated schools. There were less children from rural and informal settlement areas and a higher percentage of the children were from the urban areas. This could have influenced the results in a sense that most of the obese children were from urban areas. The fact that the study sample was not representative of the school population of the province is due to the inclusion of only the first 725 subjects recruited in 2000 in this part of the study.

4.5.2 Anthropometric information

The analysis shows that very few children were found to be obese when using BMI (>95th percentile) and triceps skinfold cut-off points as indicators of obesity (NCHS, 1971-1974). The results also showed that a higher number of obese children were the 10 year old children (Table 4.5). Difficulties are encountered when BMI is used

in childhood and adolescence as its relationship to body composition is influenced by various factors such as age, gender, race, sexual maturity, sitting height, fat distribution and disease state (Bini *et al.*, 2000; Wells, 2000). Skinfold measurements may be better anthropometric assessments of fat, but there is no consensus at any age on the skinfold thickness which represents obesity. Results of different studies of childhood obesity can rarely be compared directly because different methods of relating weight and height have been used, or no definition of relative weight-for-height or relative weight-for-age is given (Poskitt, 1995). However, the European Childhood Obesity Group (ECOG) recommends the use of a common indicator of obesity in nutritional studies, regardless of the other criteria being used for diagnosis of obesity, so that the results of the studies can be compared (Poskitt, 1995). From the currently available data on the global prevalence of obesity during childhood compiled by the WHO program of nutrition, children were classified as obese when they exceeded the NCHS median weight-for-height plus two standard deviations or z-scores. However some obese children under this criteria may actually have a higher relative weight due to stunting rather than as a result of excess adiposity (Popkin *et al.*, 1996).

Lack of consistency between studies in children and adolescents has been attributed to methodological reasons and classification criteria, but also to genetic and societal factors (Bray *et al.*, 1998). Nevertheless, whatever method is used to classify obesity, studies investigating obesity during childhood and adolescence have reported a high prevalence of obesity which is on the increase (Martinez, 2000). In Japan, the rates of obesity among school children aged 6-14 years increased from 5% to 10% between 1974 and 1993. Moreover, childhood and adolescence obesity are already evident in some developing countries. In Saudi-Arabia, the prevalence of obesity was found to be 15.8% in male school children between 6-8 years, while the prevalence of obesity among school chidren aged 6-12 years in Thailand was about 15.6% (Mosuvan *et al.*, 1993; Al-Nuam *et al.*, 1996).

Martorell *et al.* (2000) found that obesity in young children is not a public health problem in most developing countries. Because South Africa is also a developing country, this could probably be an explanation of our results. However many changes are taking place in developing countries which are of concern. These changes include the adoption of "Western diets" which are high in saturated fat, sugar, and refined foods and reduced levels of physical activity. Undoubtedly children are exposed to these influences as well, but perhaps the impact of these exposure increases with age (Martorell *et al.*, 2000).

4.5.3 Eating pattern

Few children (18.8%) in this study omitted breakfast. Of the 19 obese children, 13 (68.4%) ate breakfast regularly (Table 4.23). Dwyer *et al.* (2001) in the study done in California found that fewer students ate breakfast and that overweight students were more likely to omit breakfast than those who were not overweight. This could imply that eating breakfast is not necessarily associated with increased overweight (Dwyer *et al.*, 2001). They also found that 86% of breakfast was eaten at home. Walker *et al.* (1982) reported that a higher percentage of urban blacks (19%) than whites (14%) had no solid breakfast.

Approximately the same percentage (20%) of children from Pretoria and Mohlakeng had either nothing to eat or only something to drink before they went to school (Wolmarans *et al.*, 1995). This is the same as what was found in this study. A similar percentage (18.8%) of children in this study had no breakfast before they went to school. Most children who omitted breakfast were black children from urban areas as compared to white, coloured and Indian children from the same stratum. A larger percentage of children in this study were from urban areas where we found mostly people from the middle and upper class. Some children were attending a day school that only started at 12:00, so they had time to eat their breakfast.

Our analysis (Table 4.11 to 4.14) shows that more than one third of the children (36%) took a lunch-box to school. Most of these children who took a lunch box to school were children from urban areas in all ethnic groups. We also found that a higher percentage of Indian children from urban areas took a lunch-box as compared to other ethnic groups. Many obese children (Table 4.24) did not take a lunch-box to school, which could mean that more of them (90%; p= 0,073) bought food from tuck-shops or from vendors (Table 4.25). On the other hand, non-obese children also did not take a lunch-box to school and many of them (77.5%) also spent money at tuckshops. More black urban children bought from the tuck-shop as compared to other ethnic groups. More female subjects from almost all the strata bought from the tuck-shops than male subjects. We also found that some children went home at break period or after school for a meal. This situation was made possible by virtue of the fact that some schools are within walking distance of most homes. In a study in Lebowa, Steyn *et al.* (1993) found the same results whereby few children usually took a lunch-box to school and many spent money on sweets and cool drink. More children went home for a meal during the break period (Steyn *et al.*, 1993). Dwyer *et al.* (2001) found that 20% of the students ate lunch and 79% of lunches were eaten at school. The reasons for some children not carrying a lunch-box might be that certain schools shared the school. The first school started very early in the morning at 7:00 and ended at 12:00, and the other school started at 12:00 and ended at 17:00. Some children had their lunch when they arrived at home after school or before they left for school. Because they had lunch before they came to school, they brought money to spend on snacks. School feeding schemes were available in most primary schools and about 55% of children received food from the scheme (Table 4.6).

In this study, snacking patterns of both obese and non-obese children were found to be similar, except for the afternoon snack. Dwyer *et al.* (2001) found that most students ate snacks which were high in sugar and fat and those who ate fewer meals ate more snacks. Television snack consumption was high in both non-obese and obese children (Table 4.26). We found that most children who consumed a TV snack were from the urban areas and a high number of them were black female

children. A small number of both black and white rural children and coloured children from the informal settlement areas consumed a TV snack (Table 4.19 to 4.22). This could be because of their socio-economic standard such as availability of electricity, televisions and money to buy the snacks. Children often snack while watching television and consume food advertised on television (Kromeyer-Hauschild *et al.*, 1999). It has been proposed that television viewing may both reduce spontaneous activity levels and promote food intake. Food intake tends to increase because television viewing stimulates snacking (Rossner, 1998). This might be due to the influence of television on children. In the UK and the USA most advertisements during children's television were for food products, especially with low nutritional value, including snack foods high in sugar, fat and salt. Children who were exposed to advertisements have been reported to select more sugared food (Dickinson, 2000; Parson *et al.*, 1999).

It was found that black children bought bread, cool drink and French fries as their snacks, while white children bought sweets and cool drinks (Wolmarans *et al.*, 1995). In this study similar types of foods were also bought from the tuck-shop. In the Western Cape it was found that urban black and white participants consumed about one third of their mean energy intake as snacks. Rural coloured and rural black children consumed the least food between meals (Steyn *et al.*, 1993). In this study intake of afternoon snacks were relatively higher in obese children compared to non-obese children (Table 4.26). Easy access to food high in fat and sugar from vendors and school tuck-shops contributed to children's high consumption of snacks during school and after school. Most children did not consume a latenight snack (Table 4.26).

Most of the children were not on special diets (Table 4.27), except for those children whose eating habits were influenced by religion, beliefs or culture such as Hindu and Muslim children. We found a small percentage (6.6%) of children who were on a special diet to lose weight (Table 4.6) from both non-obese (5%) and obese (21%) subjects. This might be due to peer pressure or for health reasons. It was reported

that in black culture there is a greater tolerance, and perhaps acceptance of obesity (Kumanyika *et al.*, 1993). Studies also showed that black women demonstrate fewer obesity-inhibiting attitudes or behaviour than whites.

4.6 Conlusions

In this study a small percentage of children were found to be obese and these children had a tendency to skip breakfast. More obese than non- obese children snacked in the afternoons. Most of the children were not engaged in any form of special diet, except for those who were influenced by culture, beliefs or religious reasons. A small percentage of children were on a weight loss diet. Associations between other eating habits and obesity were not significant except for special diets. Although the percentages were higher, definite conclusions cannot be drawn. The number of obese children was small, which makes it difficult to draw conclusions.

CHAPTER 5

Limitations and Recommendations

5.1 Introduction

5.2 Limitations of the study

5.3 Recommendations

5.1 Introduction

According to the available literature, few studies have been done on eating habits of children and their association with obesity. Environmental factors affect the establishment of dietary or eating patterns in early childhood and may ultimately influence the development of obesity (Hood *et al.*, 2000). Several studies have shown that a child's eating behaviour is strongly influenced by the family environment, school environment. peer group and many more factors.

5.2 Limitations of the study

There were some limitations to getting wanted information, which included relying on an eating habit questionnaire instead of observation of the children's eating habits and looking at eating habits only and not the total diet limited the information. The results showed that a higher number of male subjects from urban areas bought from the tuck-shop and consumed a TV snack. We also found that a higher number of

obese children were males from urban areas. This could mean that buying from the tuck-shop and consumption of TV snack contributed to the development of obesity.

5.3 Recommendations

On the basis of the findings from this study, the following recommendations were made:

A great deal of education is necessary to improve the eating habits of children. Urgent attention should be given to implementing nutrition education programs at schools. These programs should highlight certain aspects such as encouraging children to bring a lunch-box to school and to increase their consumption of fruits and vegetables where possible. Tuck-shops at school should sell healthy and nutritious snacks for those children who bring money to school.

Even though the prevalence of obesity was low, parents can play a role to promote a healthy body weight in their children by encouraging their children to be active in order to prevent the problem of obesity from aggravating. This can take the form of active play, organized sports or family bike rides and walks. In bad weather, they can put on some upbeat music and dance together. They could limit television and video time. Long hours spent in front of the tube do little to develop body and mind.

A variety of healthful foods should be offered and children should be allowed to help in shopping and meal preparation. Practise moderation and do not totally restrict treats and desserts. Labelling food as "forbidden" makes them all the more tempting.

Recognize that children grow and develop at their own rates and that individual body shape and type are determined at birth. If parents are concerned about a child's weight, he or she can be evaluated by a qualified health practitioner.

Respect and trust a child's judgement of how much to eat. Accept it as final when a child states that he or she is satiated. Parents should set a good example by practising what they preach.

To create a more healthful nutrition environment, the sale of foods that compete with the school meals programme could be decreased, and the selection of healthful alternatives affected by vendors and tuck-shops could be increased.

Establishment of a school nutrition committee or addition of a nutrition subcommittee to an existing school health committee might also be helpful. The committee would include representatives from the school food service staff, parents, teachers and pupils. Ongoing training and support will enable and motivate teachers to integrate nutrition messages into lesson plans.

The dietitians or nutritionists and physical education teachers can collaborate on integrating nutrition into the physical education curriculum or could coordinate a nutrition and fitness club. The nutritionists can also encourage teachers and parents to participate in the healthful, tasty school meals, an activity that could provide role models for pupils.

In light of the observations in this study it shows that nutrition education is needed in the family and at school. The benefits of carrying lunch-box to school and consumption of a healthy snack should be emphasized in order to encourage proper eating habits. For further studies, researchers could investigate the physical activity level of the school children, and the types of food sold in the tuckshops or vending machines in order to get enough information regarding what is available for the children to buy at schools.

ADDENDA

Addendum 1: Control form

ADDENDUM 1

THUSA BANA PROJECT

Subject name:_____No:_____Gender:_____

STATION	ACTIVITY	CHECK CONTROL
STATION 1	RECRUITMENT, DEMOGRAPHIC QUESTRIONNAIRE	
STATION 2	BLOOD PRESSURE	
STATION 3	ANTHROPOMETRY	
STATION 4	ANTHROPOMETRY: CLOTHING	
STATION 5	PSYCHOLOGICAL QUESTIONNAIRE A	
STATION 6	DIETARY QUESTIONNAIRE	
STATION 7	MOTOR DEVELOPMENT A	
STATION 8	PSYCHOLOGICAL QUESTIONNAIRE B	
STATION 9	EATING HABITS	
STATION 10	FAMILY CIRCUMSTANCES + HIV TRANSMISSION	
STATION 11	PHYSICAL ACTIVITY	
STATION 12	MOTOR DEVELOPMENT B	SIGNATURE
BACK TO STATION 1		

THUSA BANA PROJECT

Subject name:_____No:_____Gender:_____

STATION	ACTIVITY	CHECK CONTROL
STATION 1	RECRUITMENT, DEMOGRAPHIC QUESTRIONNAIRE	
STATION 2	BLOOD PRESSURE	
STATION 3	ANTHROPOMETRY	
STATION 4	ANTHROPOMETRY: CLOTHING	
STATION 5	PSYCHOLOGICAL QUESTIONNAIRE A	
STATION 6	DIETARY QUESTIONNAIRE	
STATION 7	MOTOR DEVELOPMENT A	
STATION 8	PSYCHOLOGICAL QUESTIONNAIRE B	
STATION 9	EATING HABITS	
STATION 10	FAMILY CIRCUMSTANCES + HIV TRANSMISSION	
STATION 11	PHYSICAL ACTIVITY	
STATION 12	MOTOR DEVELOPMENT B	SIGNATURE
BACK TO STATION 1		

ADDENDA

Addendum 2: Demographic Questionnaire

Potchefstroomse Universiteit
vir Christelike Hoër Onderwys

1 Subject number			
2 Date	D	M	Y
3 Place and region			
Interviewer			

Home address _____

4 Stratum of urbanisation:	Rural *	1
	Informal town	2
(Classify stratum of urbanisation)	Urban	3

*Rural = tribal land, farm schools; informal town = corrugated iron house; urban = formal town/city

5 Gender	Male	1
	Female	2

6 Age				
Date of birth (for control purposes, do not code)	D	M	Y	

7 First Language	Setswana	1
	Afrikaans	2
	English	3
	Xhosa	4
	Zulu	5
	Other:	6

8 Second Language	Setswana	1
	Afrikaans	2
	English	3
	Xhosa	4
	Zulu	5
	Other:	6

9 Do you receive treatment for any chronic disease?	Yes	1
	No	2

10 If yes - what disease?			
11 Girls only: Have you started menstruating (seeing periods) yet?	Yes 1	No 2	
If yes, at what age (year)?			

12 Do you take snuff?	Yes	1
	No	2
13 Do you smoke?	Yes	1
	No	2
14 If no – have you smoked regularly before?	Yes	1
	No	2
15 If yes – what do you smoke?	Cigarettes	1
	Tobacco/pipe	2
	Other:	3

If other – describe

16 How much do you smoke?	per day	
	per week	
17 For how long have you been smoking (years)		
18 Calculate pack years		

19 In which grade are you this year?	Grade 1-3	1
	Grade 4	2
	Grade 5	3
	Grade 6	4
	Grade 7	5
	Grade 8	6
	Grade 9	7

20 Does any member of your household have the Right to use any property (house/flat/room) as his/her own?	Yes	1
	No	2

21 What type of property?	

22 Please name the members of your household

Member	Age	Education (grade passed)	Present job

23 Who is the breadwinner in your home?	

24 Does he/she have a job at the moment?	Yes	1
	No	2

25 If yes – what kind of job?	Doctor/nurse/teacher/professional	1
	Business/taxi/self employed formal	2
	Typist/assistant/office work	3
	Domestic worker/garden/contract	4
	Hawker/car washer/informal sector	5

26 On which days of the week does he/she work?	Irregular (piece work)	1
	Part time (1-4 days/week)	2
	Full time (5-6 days/week)	3

27 Does someone in your household receive any additional pensions?	Yes	1
	No	2

28 What type of house do you live in?	Traditional hut	1
	Mokuku	2
	Brick house	3
	Other	4
Specify other		

29 Do you share a toilet with other households?	Yes	1
	No	2

30 What type of toilet do you have?	None	1
	Communal	2
	Bucket system	3
	Outside pit toilet	4
	Outside chemical	5
	Outside water flush	6
	Inside water flush	7

31 Where do you get your drinking water from?	Fountain, river	1
	Communal tap	2
	Tap on premises	3
	Tap in house	4
	Other	5
If other specify		

	No	2

33 What type of stove do you have?	None	1
	Coal/wood	2
	Gas or parrafin	3
	Electric	4

34 What type of fridge do you have?	None	1
	Parraffin	2
	Gas	3
	Electric	4

35 Do you watch television every week?	Yes	1
	No	2

36 Do you listen to the radio every week?	Yes	1
	No	2

37 Do you have a computer in your home?	Yes	1
	No	2
38 If yes, do you play/work on the computer on most days?	Yes	1
	No	2
39 If yes, how many hours do you play/work on the computer on most days?	.....hour	

40 Does your school week include a physical activity/training period ?	Yes	1
	No	2

ADDENDA

Addendum 3: Eating Habits Questionnaire

ADDENDUM 3

EATING HABITS OF 10-15 YEAR OLD SCHOOL CHILDREN IN THE NORTH WEST PROVINCE

1	Subject number									1-4
2	Date									5-10
3	How many meals (sitting down at a table) do you eat on most days?									11
4	Do you eat before you go to school?						Always		1	
							Most days		2	
							Weekdays		3	
							Seldom		4	
							Never		5	12
5	If you do not eat breakfast, why?	5.1	Do not have time to eat							13
		5.2	Mother does not have time to cook							14
		5.3	No food available							15
		5.4	I want to lose weight							16
		5.5	I am stressed/ in a hurry							17
		5.6	Other							18
				7d	4-6d	1-3d		Never		
				3	2	1		0		
6	If yes, what do you eat?	6.1	Ready-to-eat cereal							19
		6.2	Cooked porridge							20
		6.3	Milk with cereal/porr.							21
		6.4	Sugar with cereal/por							22
		6.5	White bread/toast							23
		6.6	Brown bread/toast							24
		6.7	Egg/ protein food							25
		6.8	Fruit/fruit juice							26
		6.9	Other:							27
										28
										29
										30
7	Is there a school feeding scheme at your school?							Y 1	N 2	31
8	If yes, which food items do you receive?			5d	4d	3d		1-2d	0	
				5	4	3		2	1	
			8.1 Cool drink							32
			8.2 Peanut-butter bread							33
			8.3 Vitamin biscuit							34
			8.4 Porridge (Morvite)							35
			8.5 Soup							36
			8.6 Other:							37
9	Do you take a lunch-box to school?							Y 1	N 2	38
10	If yes, which foods do you take?		10.1 Brown bread sandwiches							39
			10.2 White bread sandwiches							40
			10.3 Fresh fruit/juice							41
			10.4 Cold drink/squash							42
			10.5 Sweets							43
			10.6 Crisps							44
			10.7 Porridge							45
			10.8 Other							46
10	Do you buy food at/after school? (tuck shop or hawkers)							Y 1	N 2	47

11	If yes, what do you buy?	11.1 Crisps			Y	1	N	2	48
		11.2 Sweets			Y	1	N	2	49
		11.3 Cold drink			Y	1	N	2	50
		11.4 Ice lollies			Y	1	N	2	51
		11.5 Ice cream			Y	1	N	2	52
		11.6 Meat pie			Y	1	N	2	53
		11.7 Bread/sandwich			Y	1	N	2	54
		11.8 Vetkoek			Y	1	N	2	55
		11.0 Other							56
12	Do you sit down to a meal after school (lunch)?				Y	1	N	2	57
13	Do you eat between meals in the afternoon?				Y	1	N	2	58
14	If yes, what do you eat as a snack?	14.1 Crisps			Y	1	N	2	59
		14.2 Sweets			Y	1	N	2	60
		14.3 Cold drink			Y	1	N	2	61
		14.4 Ice lollies			Y	1	N	2	62
		14.5 Ice cream			Y	1	N	2	63
		14.6 Tea/coffee			Y	1	N	2	64
		14.7 Bread/sandwiches			Y	1	N	2	65
		14.8 Milk			Y	1	N	2	66
		14.9 Fresh or dried fruit			Y	1	N	2	67
		14.10 Other							68
15	Do you sit down to a meal in the evening?				Y	1	N	2	69
16	Do you eat a late night snack?				Y	1	N	2	70
17	Do you eat/drink while watching TV?				Y	1	N	2	71
18	Name your most favourite food item		pizza				1		72-3
			ice-cream				2		
			hamburgers				3		
			crisps				4		
			chocolate				5		
			carrots				6		
			french fries				7		
19	Name the food item that you dislike most?		pumpkin				1		74-5
			peas				2		
			milk				3		
			grean beans				4		
			pasta				5		
			broccoli				6		
			cabbage				7		
			morogo				8		
20	Do you follow a special diet for health reseons?		Y	1	N		2		76
21	If yes, what kind of diet?		21.1 allergies						77
			21.2 diebetes						78
			21.3 other						79
22	Do you follow a special diet for cultural reasons?		Y	1	N		2		80
23	If yes, what kind of diet?		23.1 Muslem diet						81
			23.2 Hindu diet						82
			23.3 other						83
24	Do you follow a diet to lose weight?		Y	1	N		2		84

ADDENDA

Addendum 4: Dietary Questionnaire

ADDENDUM 4

24-HOUR RECALL

Subject number: _____ Interviewer: _____

School: _____ Date: ____/ _____/ 200___

Tick what the day was yesterday:

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday

Would you describe the food that you ate yesterday as typical of your habitual food intake?

Yes	1	No	2

I want to find out about everything you ate or drank yesterday, including water or food you pick from the veld. Please tell me everything you ate from the time you woke up to the time you went to sleep. I will also ask you where you ate the food and how much you ate.

Time (approximately)	Place (Home, school, etc)	Description of food and preparation method	Amount	Amount in g (office use only)	Code (office use only)
From waking up to going to school, or starting day's activities					
During the morning at school or at home					

Time (approximately)	Place (Home, school, etc)	Description of food and preparation method	Amount	Amount in g (office use only)	Code (office use only)
Middle of the day (Lunch time)					
During the afternoon					
At night (dinner time)					
After dinner, before going to sleep					
Do you take any vitamins (tablets or syrup)?			Yes	1	No 2
Give the brand name and dose of the vitamin/tonic:					

ADDENDA

Addendum 5: Anthropometry

ADDENDUM 5

ANTHROPOMETRY

THUSA PROJECT – SOUTH AFRICA 1998
ANTHROPOMETRY

Subject ID#

Gender (1 = M, 2 = F)

Projection box + constant

		.	

Skinfolds

Triceps			.				.				.				
Subscapular			.				.				.				
Illiac Crest			.				.				.				
Supraspinale			.				.				.				
Abdominal			.				.				.				
Front Thigh			.				.				.				
Medial Calf			.				.				.				

Girths

Arm - Relaxed			.				.				.				
Arm - Fully flexed/Tensed			.				.				.				
Forearm - Maximum			.				.				.				
Waist - Minimum			.				.				.				
Hip (Gluteal) - Maximum			.				.				.				
Thigh - 1cm below gluteal fold			.				.				.				
Thigh - Mid trio-tib lat			.				.				.				
Calf - Maximum			.				.				.				

Breadths

Humerus (cm)			.				.							
Wrist (cm)			.				.					.		
Femur (cm)			.				.					.		
Ankle (cm)			.				.					.		

Other

Mass (kg)				.	
Stature - Stretched (cm)				.	

ADDENDA

Addendum 6: Informed consent Form

THUSA BANA PROJECT: INFORMATION ON THE STUDY

THE PRPOJECT HAS BEEN APPROVED BY THE ETHICS COMMITTEE OF THE PU FOR CHE. ETHICS COMMITTEE NUMBER (XXXXXXXX)

I CONFIRM THAT:

It has been explained to me, that:

1. The purpose of the research study is to collect information on the problem of overweight and obesity among schoolchildren aged 10-15 years in the North West Province of South Africa.
2. I have been told that the researchers will obtain anthropometric variables of a random sample of children aged 10-15 years
3. The participant will be weighed and his/her height as well as circumferences and skinfolds of his/her arm will be measured without causing any pain to the child. For those measurements boys and girls in separate groups will be asked to undress in privacy of a class-room, because some measurements must be taken with the children dressed in underwear only. The different age groups will be measured separately. The researchers and fieldworkers will work in a professional way, not to embarrass the children.
4. Appropriate methodology to classify overweight and obesity in these age groups will be developed
5. The prevalence of obesity in children in the North West Province will be determined
6. The anthropometry of the different ethnic groups will be compared
7. The relationship between body mass index and adiposity in stunted children (low-height-for-age) will be determined
8. The role of dietary practices in the development of overweight and obesity will be determined
9. The role of physical activity levels and patterns in the development of obesity
10. Influences of ethnicity and urbanisation on the causative factors of overweight and obesity will be determined
11. Knowledge regarding overweight and obesity in these age groups will be measured
12. The general health status of obese children with controls, regarding absence from school due to illness will be compared
13. Guidelines for appropriate, culture sensitive, practical and sustainable intervention programmes for these age groups will be developed
14. I have also been told that this research is being done for the benefit of the children, and that 1200 children will take part in this study
15. It was also explained to me that the information I will give shall be kept confidential, but that it will be used anonymously for making known the findings to other scientist
16. It was also clearly explained to me that I can refuse to participate in this research study or I can stop answering the questions at any time during the interview

The information in this consent form was explained to me by_____(name of interviewer) in_____(language) and I confirm that I have a good command in this language and understood the explanations, OR it was translated to me by_____(Name of translator) in my language_____. I was also given the opportunity to ask questions on things I did not understand clearly.

I the participant (child) hereby agree voluntarily to take part in this research survey.

Signed/confirmed at_____on_____2000

Witness_____

Participant's/representative of participant (parent)_____

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