CONSUMPTION PATTERNS OF VITAMIN A-RICH FOODS OF 10-13 YEAR OLD CHILDREN LIVING IN A RURAL AREA IN VENDA

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Consumption patterns of vitamin a-rich foods of 10-13 year old children living in a rural area in Venda

byT P Tshihwanambi

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Study Leader: Dr Rozanne Kruger

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Dedicated to the memory of my beloved mother, Vho-Nkhangweni Josephine Tshiwanammbi, who regretfully did not live to see this work, which in no small part resulted from her gift of many years of love to me.

To her: Thank and I love you.

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abstract

CONSUMPTION PATTERNS OF VITAMIN A-RICH FOODS OF 10-13 YEAR OLD CHILDREN LIVING IN A RURAL AREA IN VENDA

By

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Vitamin A deficiency (VAD) continues to be a major health problem in developing countries. In South Africa, in 1999, one out of three children under the age of six years in the country had poor/ marginal vitamin A status. Limpopo Province was one of the provinces that most seriously affected by VAD. The study aim was to explore and describe the consumption patterns of vitamin A-rich foods of 10-13 year old children living in a rural area in Venda, and consequently making recommendations on nutrition education in this regard.

A survey was conducted in Vyeboom Village in Limpopo Province, at Makhado local municipality in the Vhembe District. About 155 school children aged 10-13 years (boys and girls) participated in this study, using convenience, random and stratified sampling to draw the sample from three primary schools (Avhatondwi, Tshirunzanani and Thomas Ntshavheni). Data was collected during winter of 2006 using a socio-demographic questionnaire, the 24-hour recall and non-quantitative food-frequency questionnaires. The data was divided into four subsections regarding the 10-13 year old children that participated in this study, namely: the demographic information, food habits, food consumption patterns, and foods consumed rich in vitamin A. The SAS statistical analysis (version 8.2) software was used to analyze the data from the questionnaire by means of descriptive statistics (percentages, frequencies, means and summary of the tables). Inferential statistics (two way tables and chi-square tests) were used to test the associations between two categorical variables.

Mothers were the caretakers in the families, because she mostly played a major role in the decision-making, preparation and serving of the food that were consumed by these children. Social cultural factors influenced the children's food intake, because some of these foods were especially low in vitamin A and high in sugar content (e.g. sweets), compared to those foods that children were forbidden to eat (e.g. liver) which were high in vitamin A and other nutrients. The foods that children were mostly forced to eat (dark green leafy vegetables) were very nutritious and given in order to prevent hunger and wastage (left-over in the morning).

The general meal pattern of these children was three meals a day with two, one or no snacks in between meals. The mostly consumed foods during these meals were bread, tea, stiff and soft maize meal porridge, dark green leafy vegetables and meat (chicken).

Dark green leafy vegetables played an important role in supplying beta-carotene to these children, while the intake of retinol-rich foods was poor because they are expensive and

labeled as highly allergenic, whilst other foods were forbidden. Intake of fortified foods was very high because porridge was the staple food and commonly consumed during lunch and supper.

The results provided insight regarding the food habits, consumption patterns and the intake of vitamin A rich foods and were used to substantiate recommendations aimed at the improvement of the intake vitamin A rich foods among the children.

KEYWORDS: food habits, availability, socio-cultural environment, individual characteristics, food consumption pattern, beta-carotene, retinol and fortified foods.

Table of Contents

List of Tables

List of Figures

List of Addenda

Chapter 1

BACKGROUND

1.1 THE BACKGROUND OF THE STUDY

South Africa is situated at the southern tip of Africa. It has nine provinces: the Eastern Cape, the Free State, Gauteng, Kwazulu-Natal, Limpopo, Mpumalanga, the Northern Cape, and finally the North-West and Western Cape Provinces. The population is 40.1 million, fifty five percent (55%) of whom live in urban areas. The vast majority of South Africans, who are extremely poor, live in rural areas. South Africa is a middle-income, developing country with an abundant supply of resources. The geography and climate of South Africa vary quite widely, with 65% of South Africa receiving less than 500mm rain per annum, the minimum required for agriculture. Only a small section of the country has an average annual rainfall of over 1,400mm (Whitten, Sanders & Chopra, 2002:1).

According to the SA Ministry of Agriculture and Land Affairs (Hanekom,1998:116), seventy two percent (72%) of poor people in South Africa live in rural areas. The South African National Food Consumption Survey (SANFCS) however found that the majority (74%) of South African households live in poverty, with a limited variety of food available in their homes (Labadarios, Steyn, Maunder, Macintryre, Gericke, Swart, Huskisson, Dannhauser, Vorster, Nesamvuni & Nel, 1999:921). Although South Africa produces and exports enough food for all its inhabitants, many poor households are still facing food insecurity, especially in low-income areas and in informal housing areas inhabited by people in transition (Vorster, Love & Browne, 2001:4). These populations are undergoing dramatic changes in lifestyle

and patterns of health and disease, with uneven socio-economic development (Annual Report, 2004).

1.2 INTRODUCTION AND MOTIVATION OF THE STUDY

Vitamin A deficiency (VAD) continues to constitute a major health problem in developing countries (Faber, Venter & Benade, 2001:1), with a total of 250 million children worldwide suffering from VAD and over 3 million manifesting clinical signs, with a serious risk of blindness and early death, as estimated by the World Health Organisation (WHO) (Reddy, 1999:1; Louw, 2001:3; Department of Health, 2002:1). This is also a serious public health problem in the low-income populations in less-industrialized populations (Haskell, Jamil, Hassan, Peerson, Hossain, Fuchs & Brown, 2004:705).

In the rural areas of South Africa, people depend on the locally produced foods, while unfortified starchy foods like maize meal and sorghum meal porridges, rice and bread, and only small quantities of vegetables, fruits and animal protein foods are consumed. In comparison, urban people eat a more varied diet consisting of bread, rice, meat, eggs, fruit and vegetables. The rural diet therefore lacks variety and predisposes the children to low micronutrient intakes (Faber *et al*, 2001:13; Kruger, Kruger, Vorster, Jooste & Wolmarans, 2005:366), which increases the risk of multiple micronutrient deficiencies (Kruger *et al*, 2005:372). Micronutrient deficiencies are most prevalent in areas where the diet lacks variety, and when people cannot afford to diversify their diets with adequate amounts of fruit, vegetables or animal source foods that contain large amounts of micronutrients (Kennedy, Nantel & Shetty, 2003:8).

Iron, iodine and vitamin A deficiencies are the three-micronutrient deficiencies of greatest public health significance in the developing world (Kennedy *et al*, 2003:9). Vitamin A deficiency (VAD) occurs when body stores are depleted because too little vitamin A is present in the food, or too little is absorbed. It can also result from the rapid utilization of vitamin A (see Figure 2.1) (Department of Health, 2002:1).

According to Faber *et al* (2001:11), the essential role of vitamin A in vision and eye health has been recognized as a critical factor in child health and survival. It is also critical in supporting the rapid growth and development that occurs during childhood and adolescence. The Recommended Daily Allowance (RDA) of vitamin A is 700 micrograms per day for 7-10 year-old children. Boys aged 11-14 have an allowance of 1000 and 800 micrograms, while girls in the same age group have 800 micrograms (Internet: Health, 2004:4). These individuals can meet these RDAs by consuming at least five (5) servings of vitamin A rich fruit and vegetables each day (Tompson & Manore, 2005:596). Vitamin A also functions in cell differentiation, being responsible for protection against infections, reproductive functioning, embryonic development and sensory functions (Viteri & Gonzalez, 2002:80). Vitamin A deficiency is the leading cause of blindness in children (Solomons, 1999:354).

Although an abundance of plant sources rich in β-carotene is available to most households, children in developing countries still suffer from VAD. This may be caused by lack of knowledge, lack of care and the apparently lower vitamin A activity of the pro-vitamin (β-carotene-rich) foods (Louw, 2001:4). School-aged children are considered to be at the greatest risk of developing VAD because they are preparing for the impending adolescent growth spurt, while some are already experiencing it (Department of Health, 2002:1).

During the early 1960s, the WHO stated that South Africa had a clinical VAD problem. Although progress has been made in eliminating this problem, the deficiency remains a serious public health problem in South Africa. In this country, VAD was suspected of being

responsible for as many as one out of every four-child deaths (Department of Health, 2002:1). A national survey by the South African vitamin A Consultancy Group (SAVACG, 1995) for the Department of Health showed that one out of three children in the country under the age of six years had poor or marginal vitamin A status. The provinces most seriously affected by VAD were Limpopo, KwaZulu/Natal, Mpumalanga, the North West and the Eastern Cape Provinces (Internet: Nicus: 1999:1; Labadarios *et al*, 1999:936).

Children living in low income areas, informal housing and low socio-economic environments, and whose mothers were poorly educated were found to be more severely affected than those living in urban areas and in a better socio-economic environment (Internet: Nicus: 1999:1; South African Department of Health, 2003:9).

The SAVACG also found that VAD was present in 3% of children between 6 and 71 months of age, ranging from 1% in Gauteng to 5% in the Limpopo Province. Vitamin A deficiency (VAD) has doubled in rural areas (4%) compared with urban areas (2%). Symptoms of VAD are apparent among many South African children, twelve percent (12%) being reported night blind, while Bitot's spots (0.4 to 0.8%), corneal xerosis (0.2 to 0.7%) and keratomalacia (0.1%) were also present (Louw, 2001:4). There is no doubt that a high prevalence of vitamin A deficiency among children in developing countries poses a serious public health problem (Vorster, Oosthuizen, Jerling, Veldman & Burger, 1997:2). The NFCS (1999) found that approximately one in two South African children of all ages and in all provinces except the Western Cape had a vitamin A intake of less than two thirds of the RDAs. This indicates that South Africa also still faces a serious public health problem in VAD (Labadarios *et al*, 1999:911).

1.3 CHALLENGES AND RESEARCH AIM

African food habits have been developed over a long period in response to the environment, cultural contact with and migration of groups of people across borders, amongst other factors (Opare-Obisaw, Fianu & Awadzi, 2002:145). Louw (2001:6) states that cultural aspects and food habits must be taken into consideration when planning programmes to encourage vitamin A consumption, because traditional food practices and taboos in some societies may contribute to nutritional deficiencies among particular population groups (Latham, 1997:3). It is important that nutritionists be familiar with people's food customs if they are to improve people's nutritional status through nutrition education and dietary change, or by other means (Louw, 2001:6).

Mackeown, Cleaton-Jones & Norris (2003:187) suggest that scientifically compiled dietary surveys, especially on children, should be carried out regularly. This is particularly important within the context of a changing society, changing food habits, and nutritional problems due to migration and constant nutritional transition. Latham (1997:4) states that certain food habits and practices are poor from a nutritional point of view, because they can prevent consumption of protein and vitamin-rich foods. For instance, some African girls are not allowed to eat eggs and fish on account of cultural taboos. In recent years, there have been a number of studies on the dietary habits of adolescents, but relatively little work has been done on primary schoolchildren and those in early adolescence. The poorer children tend to eat a narrower range of foods than do other children and, in particular, consume significantly less fruit, vegetables, meat and milk (Hunt & Rigley, 1995:6).

A change in food habits does not occur by chance, and requires considerable input from nutritionists. School-aged children can, however, be important agents for change, because they are still developing their tastes and preferences, so are often more willing to change

their habits (Latham, 1997:4). South African researchers recommended a holistic approach that would include a sound knowledge of the food habits of different population groups for successful nutrition interventions in South Africa. Since these recommendations were made, limited research has been done regarding food habits (Van Eeden & Gericke, 1996:91). Longitudinal nutrition information depicting dietary change over time among pre-adolescent children is lacking in South Africa (Mackeown *et al*, 2003:188).

There are, however, substantial changes in the food consumption patterns of South Africans (Kruger *et al*, 2005:366), with reference to adult Africans. The data from the NFCS has indicated that South African children have lower intakes of vitamin A-rich foods, which shows VAD to be one of the main nutritional problems faced by South African children (Labadarios *et al*, 1999:911). There is therefore a real need to investigate the influence of consumption patterns of vitamin A-rich foods of 10-13 year old children in rural areas. The aim of this study is to explore and describe the consumption patterns of vitamin A-rich foods of 10-13 year old children living in a rural area in Venda, and consequently make recommendations on nutrition education in this regard. This will also aid the planning of interventions aimed at increasing the vitamin A-rich food consumption in this group.

Chapter 2

A REVIEW OF THE LITERATURE

2.1 INTRODUCTION

This chapter reviews various models and other studies that have been conducted in the area of vitamin A, food habits and consumption patterns of children. The review will provide a theoretical background to facilitate the formulation of a conceptual model and approach to this study.

2.2 VITAMIN A - AN ESSENTIAL NUTRIENT FOR HUMAN HEALTH

Promoting dietary change to improve vitamin A intake has been recommended as a feasible long-term strategy in combating VAD among young children (WHO, 1994:4). As suggested by Ramalingaswami (1998:384), children have a right to the best means of improving their vitamin A status, because they are the major repositories of South Africa's potential human capital for the future. Increasing children's consumption of sufficient vitamin A rich foodstuffs is one of the most reliable, readily available and sustainable approaches to controlling vitamin A deficiency among rural children (Hagenimana, Kosambo & Carey, 1998:289).

2.2.1 Theoretical framework focused on vitamin A status

In South Africa, there is a significant problem of marginal VAD among children (Moodley & Jacobs, 2000:21). Children need enough vitamin A in their diet in order to stay healthy, because severe VAD can eventually lead to blindness. Many children with VAD have less resistance to diarrhea and respiratory problems (Faber, 2004:3). To guide the research, the applied UNICEF model is used as a theoretical framework. This conceptual framework (Figure 2.1) focuses more explicitly on children's nutrition. The model shows the different causal factors influencing the vitamin A deficiency among children.

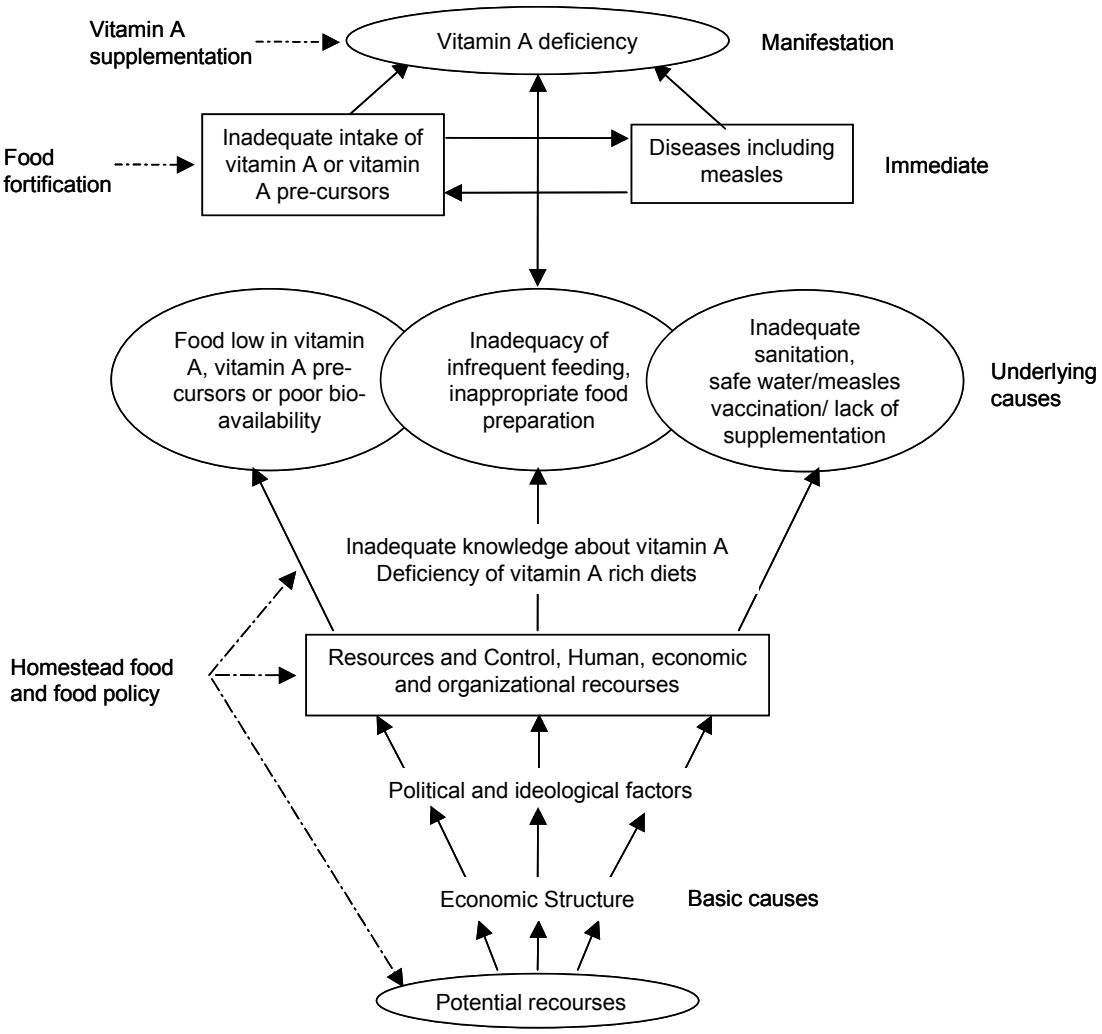


FIGURE 2.1: CONCEPTUAL FRAMEWORK OF CAUSES OF VITAMIN A DEFICIENCY

(Van Lieshout, Scott, Chopra & Sanders, 2004:6)

- The basic causes of vitamin A deficiency include potential resources, economic structure, political and ideological factors, resources and control (human, economic and organizational resources), inadequate knowledge and care about vitamin A and deficiency of vitamin A-rich diets (Van Lieshout *et al*, 2004:12).

- The underlying causes refer to different factors, such as intake of food low in vitamin A, vitamin A precursors or poor bio-availability; inadequate or infrequent feeding and inappropriate food preparation; inadequate sanitation/ safe water/ vaccination/ lack of supplementation and measles. All these causes, on the other hand, are influenced by homestead food production and food policy (Van Lieshout *et al*, 2004:8).

- The immediate causes of vitamin A deficiency have been cited as the increased requirements for vitamin A during infections like diarrhea, measles, respiratory infections, chickenpox and inadequate intake and absorption of vitamin A or vitamin A pre-cursors (Louw, 2001:8; Van Lieshout *et al*, 2004:7). A high intake of vitamin A as a pro-vitamin, poor bio-availability and increased requirements of vitamin A during certain stages of the life cycle have an influence on the prevalence of VAD (Louw, 2001:4).

It is therefore important to address the underlying causes. To do this it is imperative to describe children's consumption patterns.

2.2.2 Vitamin A (Retinoids, carotenoids and fortification)

Vitamin A is a fat-soluble vitamin and an essential micronutrient for humans, because the body cannot produce it (Department of Health, 2002:1; Tompson *et al*, 2005:279). It comprises a large family of fat-soluble compounds, including retinoids (animal foods) and carotenoids (plant foods) (Hands, 2000). There are three active forms of vitamin A in the body, namely retinol, retinal and retinoic acid. These are collectively known as retinoids (see Figure. 2.2). The six carotenoids most commonly found in human blood are: alpha-carotene, beta-carotene, cryptoxanthin, lutein, lycopene and zeaxanthin, but beta-carotene is the most active vitamin A precursor (Department of Health, 2002:1; Tompson *et al*, 2005:279; Hands, 2000).

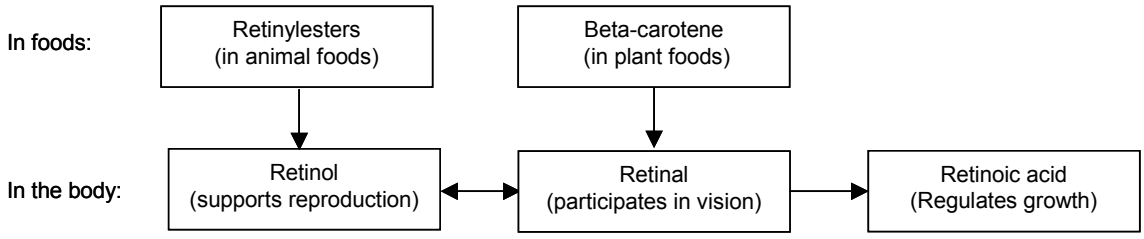


FIGURE 2.2: CONVERSION OF VITAMIN A COMPOUNDS

(Whitney & Rolfes, 2005:368)

Vitamin A is essential for the health and well-being of an individual and performs many essential functions in the human body. It helps to keep all the cells on the inner and outer surface of the body healthy, so that it is difficult for microorganisms to enter the body. Vitamin A also plays a major overall role in the body's immune system. The eyes need vitamin A in order to function properly, to maintain their health, and to see in dim light. Thus, vitamin A plays an important role in maintaining good eyesight (Tompson *et al*, 2005:280-281; Internet: Nicus: 1999:2; Ensminger, Ensminger, Konlande & Robson, 1995; Hands, 2000; Reddy, 1999:1). Vitamin A can be obtained from foods naturally rich in vitamin A, pro-vitamin A, vitamin A supplements and foods fortified with vitamin A (WHO, 1994:4; Faber *et al*, 2001:1).

Few foods are rich in retinol, but animal foods like fish oils, animal milk, butter, beef liver, chicken liver, kidney, fish and egg yolk contain vitamin A in its active form (retinol) which can be used directly and easily by the human body (Low, Walker & Hijmans, 2001:4; King & Burges, 1993:33; Tompson *et al*, 2005:280-281). Poor rural children in developing countries have only limited access to these expensive vitamin A-rich animal foods, including milk, meat and eggs (Low *et al*, 2001:4; King *et al*, 1993:258; Tompson *et al*, 2005:280). Retinol has the most prominent role in maintaining the body's physiological functions (Tompson *et al*, 2005:280-281) and supports sexual reproduction, bone health and the immune function (Tompson *et al*, 2005:280-281). It is a major transport and storage form of vitamin (Whitney *et al*, 2005:369).

Carotenoids are one of the precursors of vitamin A (pro-vitamins). Although plant foods and vegetables do not contain vitamin A as such, they do contain precursors, or pro-vitamin A, β-carotene and other carotenoids that the human body can convert to active vitamin A form (Low *et al*, 2001:4). Beta-carotene as an active precursor is responsible for the rich, yellow-

orange-red pigment of fruits and vegetables, whereas carotenoids that are plentiful in dark green vegetables are not as visible, because chlorophyll masks the orange color (Hands, 2000; Louw, 2001:2). Vegetables and fruit are the only affordable source of micronutrients in the diet of poor households (*Special Issue*, 2003:2), and they provide 70-90% of total vitamin A intake owing to their high content of pro-vitamin A carotenoids (De Pee, West, Muhilal, Karyadi & Hautvast, 1995:75).

Fortification is the addition of the nutrients that do not naturally occur in food (Lee & Nieman, 2003:557). Fortification does not require changes in the dietary habits of the population, but is implemented relatively quickly, and can be sustainable over long periods of time. However, this increases the price of food products (FAO, 1997). People in rural areas often fail to benefit from clinic-based nutritional programs because of the lack of health facilities in their areas. These people have limited access to commercially available fortified foods (Faber, Phungula, Venter, Dhansay & Benade, 2002:1053). But it was indicated in Limpopo Province, where the highest prevalence of vitamin A deficiency occurs among children, that fortification of maize meal with vitamin A achieved a high degree of intake by rural children, because they ate porridge as a staple food (Hendricks, Saitowitz, Fiedler, Sanghvi, Le Roux, Makan, Hussey, Maglagang & Dary, 2001:6).

2.3 FOOD HABITS

Food habits are among the oldest and strongest aspects of many cultures and exert great influence on people's behavior. Williams (1993: 296) describes food habits as 'a study of the way in which individuals or groups of individuals select, consume and utilize portions of available food supply in response to social, cultural and psychological pressures'. Food habits are determined by the interplay between different factors including climate, economy, beliefs, attitude, values, education, advertisement and some environmental religious circumstances, all of which are the products of tradition and culture (Opare-Obisaw *et al,*

2002:145; Onuorah & Ayo, 2003:238). Everyone has likes, dislikes and beliefs about food and many are conservative in their food habits (Latham, 1997:4). Food habits are based primarily on economics, personal food meanings and beliefs as well as on food availability (Williams, 1993:296).

The model in Figure 2.3 depicts the linkages from external to internal environmental factors (Sims & Smiciklas-Wright, 1978:174). In this model, the external environment (food production, food availability and food habits) influences the internal environment, which encompasses the knowledge, attitudes, beliefs and values that determine an individual's food consumption decision. On the other hand, this consumption decision may influence the nutrient intake leading to nutritional and health status, as depicted in Figure 2.3.

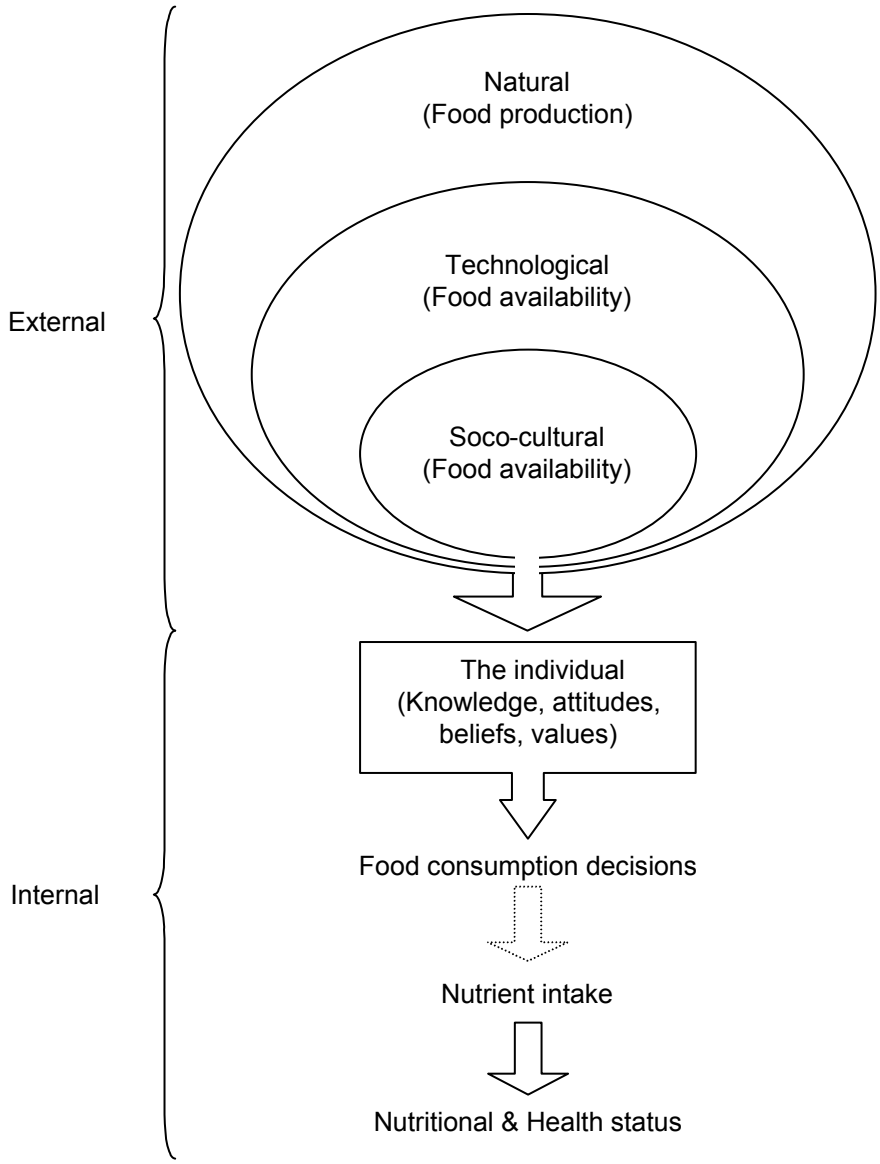


FIGURE 2.3: MODEL DEPICTING THE ECOLOGICAL SYSTEMS PERSPECTIVE (Sims & Smiciklas-Wright, 1978:174)

The natural environment (including things like climate, topography and soil condition) determines the food that can be produced. The 'man-made' or technological environment (including technological developments for the processing, storing and distribution of food) affects what food will be made available for consumption. The behavioral or socio-cultural environment (including such things as religion, ethnicity, economics and socio-cultural traditions) determines what specific foods will be chosen from the varieties available,

because they are acceptable for consumption in the particular cultural group to which the children belong. Certain endogenous factors co-exist to influence an individual's own personal food choices. These include values, attitudes, beliefs and knowledge's. Children use these individual variables to choose their food for consumption from among what is available as well as culturally acceptable (Sims *et al*, 1978:174), resulting in specific food consumption patterns.

2.4 CONSUMPTION PATTERN

Globally, food consumption patterns have changed over time because daily diets are very different from those consumed by parents or grandparents. Further, diets have been influenced by increases in household income (Regmi, 2001:1). Over the past decades, there have been substantial changes in the food habits and consumption patterns of South Africans because of the acculturation after urbanization and improved transport and communication (Kruger *et al*, 2005:366; Viljoen & Gericke, 2001:100).

Mullins, Rey, Nokoe & Shapiro (1994) define a consumption pattern as a combination of products consumed, the frequency of consumption, and the quantities consumed. Consumption depends on several factors, such as personal preferences, habit, availability, economy, convenience, ethnicity, heritage, religion, tradition, nutrition and cultural requirements (Gerbens-Leenes & Nonhebel, 2002:189). Even though the biological, ecological and socio-cultural environments also influence human food consumption, the most pervasive influence is culture (Parraga, 1990:662). Individual consumption is also influenced by the food distribution within the food-sharing unit. Preferences for a certain kind of food also influence individual consumption and this is sometimes hard to change (Blijham, De Kan & Niehof, 2006:3).

The second model, shown in Figure 2.4, focuses more explicitly on the important factors impacting on a household's food intake (Blijham *et al*, 2006:6). This model depicts three interacting levels of influence, which have an impact on people's food consumption pattern: the environmental, household and individual levels. The food environment is referred to as the sources for buying food in the area, including the market, supermarkets and small neighborhood stores. Household level indicates a co-residential unit, usually family-based in some way, which takes care of resource management and the primary needs of its members (Blijham *et al*, 2006:2). The individual level is the degree of efficiency with which the body utilizes the food consumed and is the key determinant of nutritional status (Chevassus-Agnès, 1999:2).

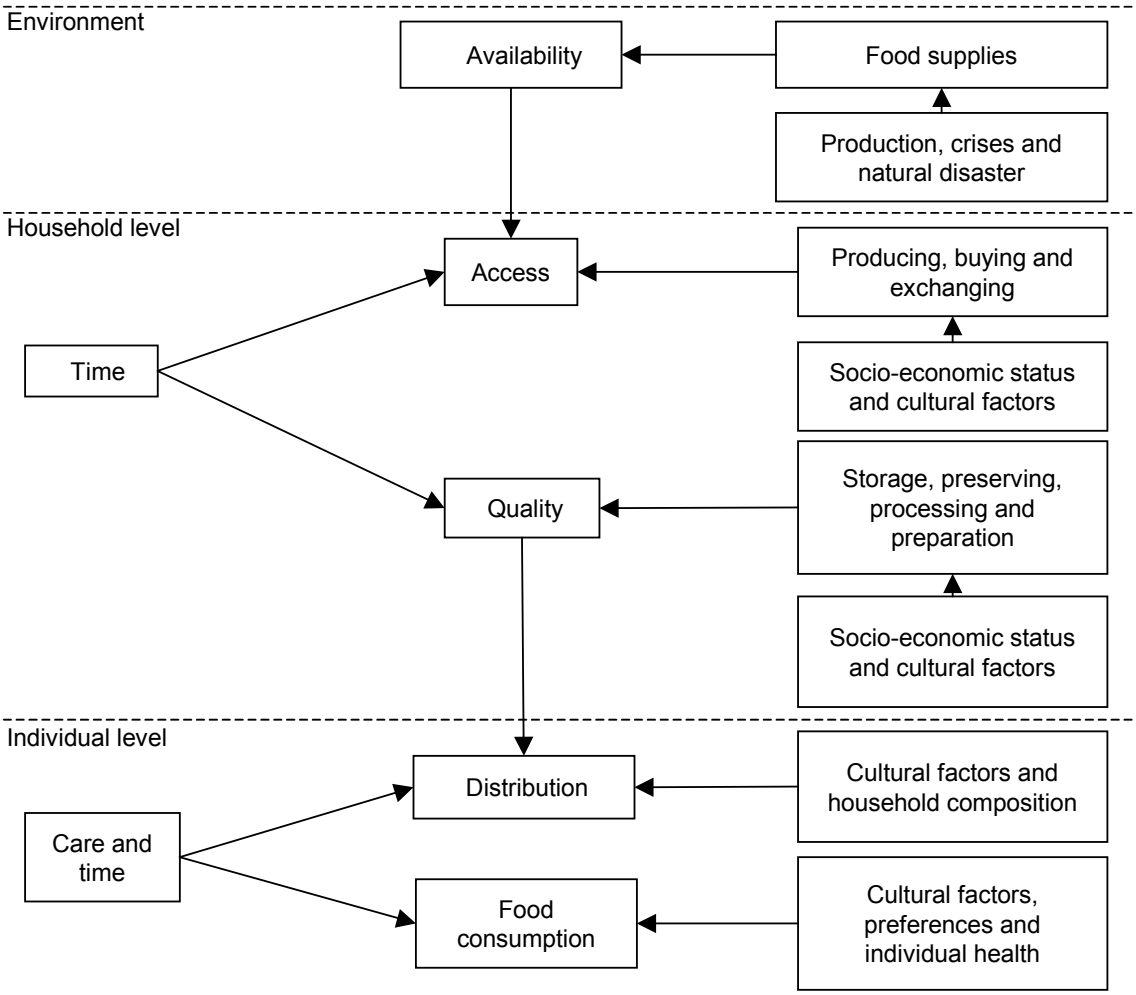


FIGURE 2.4: IMPORTANT FACTORS IN FOOD INTAKE OF HOUSEHOLDS (Blijham, De Kan & Niehof, 2006:6)

The model also consists of four factors influencing food consumption, which lead to the nutritional status of the members of a food-sharing unit including: availability, access, quality and distribution of food. These factors are, in their turn, influenced by structural and cultural factors. Structural factors refer to household composition, socio-economic status and relevant food practices. Such practices include producing, buying, exchanging, processing, storing and preparing food. Cultural factors refer to customs, knowledge, attitudes or certain beliefs about food (Blijham *et al*, 2006:3).

The model demonstrates that the key determinants of food consumption are food availability (whether from local production or other sources) and people's access to that food (i.e. their capacity to produce or purchase) (Chevassus-Agnès, 1999:2). Quality of food (nutritional value and calories) also influences food consumption, depending on household practices relating to processing, storage, preservation and preparation, as well as food safety (Blijham *et al*, 2006:3). In addition, aspects related to the stability of supplies over time (obtaining a steady flow of food from an inherently irregular production) are essential. Educational levels and cultural values play a role in shaping food habits, consumption patterns and food supply systems in general (Chevassus-Agnès, 1999:2).

Environmental factors that most influence fruit and vegetable consumption are lack of availability and peer support. Most teenagers believe that their peers are not supportive in terms of fruit and vegetable consumption because most of them eat 'junk' foods, but others disagree with them, believing that friends encourage them to eat fruit and vegetables (Molaison, Connell, Stuff, Yadrick & Bogle, 2005:249). Children's food preferences and consumption patterns are also largely influenced by repeated exposure to food and the social context in which food is offered. It is found that, when preferences increase, consumption also increases (Baxter, Thompson & Davis, 2000:441).

The VAD of children is influenced by several factors, as indicated in Figure 2.1, but food habits (culture) also play a major role in modeling the consumption patterns of a particular group of people and determine their nutritional status. As indicated in Figures 2.3 and 2.4, the external environment influences the internal environment, which leads to the individual environment. This in turn affects an individual's nutrient intake and determines the nutritional and health status of the individual.

Chapter 3

RESEARCH METHODOLOGY

3.1 INTRODUCTION

This chapter will indicate the dimensions, conceptual framework, research and sub-questions and, more importantly, the measurement, data collection and analysis used in order to reach the study goal.

3.2 RESEARCH APPROACH

The research approach to this study is explorative and descriptive in nature. As indicated by Babbie & Mouton (2001:79-80), exploratory research is undertaken for several reasons. Firstly (1) when a researcher examines a new interest or when the subject of the study itself is relatively new, (2) to satisfy the researcher's curiosity and desire for better understanding and (3) to explicate the central concepts and constructs of a study. However, a descriptive study tends to focus on behaviors, inclinations, situations and events. The approach is very common when the researcher is trying to detail the particular culture of some preliterate society. It can emphasize the frequency with which a specific characteristic or variable occurs in a sample (Babbie *et al*, 2001:80-81). Babbie *et al* (2001:92) indicate that exploratory and descriptive studies are often cross-sectional. This study is therefore descriptive, as it aims to describe the consumption patterns regarding children's vitamin A-rich foods. Secondly, it is explorative in that it explores the factors influencing the consumption patterns and it is a cross-sectional in nature.

After a thorough study of the literature on food habits, consumption patterns and vitamin A, it was decided to use a quantitative research paradigm for the purposes of this research. This paradigm concerns the central role of variables in describing and analyzing human behavior (Babbie *et al*, 2001:49). The study is empirical. The research problem was solved by collecting new data or primary data (data collected by the researcher) (Babbie *et al*, 2001:76).

3.3 DIMENSIONS OF THE RESEARCH AIM

Food habits

- Food availability
- Socio-cultural environment
- Endogenous/individual characteristics

Consumption patterns

- Meal patterns
- Types of foods
- Frequency of intake

Food rich in vitamin A

- Retinol rich foods
- Carotenoid rich foods
- Fortified foods

Children

- 10-13 years (both genders)

3.4 RESEARCH AIM

To explore and describe the consumption patterns of vitamin A-rich foods of 10-13 year old children living in a rural area in Venda.

3.5 OBJECTIVES

1. To explore and describe the availability of foods as it affects the consumption of vitamin A- rich foods by 10-13 year old children living in a rural area in Venda

2. To explore and describe the socio-cultural environment as it affects consumption of vitamin A- rich foods by 10-13 year old children living in a rural area in Venda

3. To explore and describe endogenous/individual characteristics in terms of knowledge and beliefs as they affect the consumption of vitamin A-rich food by 10-13 year old children living in a rural area in Venda

4. To explore and describe the food habits seen in the consumption patterns of vitamin A-rich foods by 10-13 year old children living in a rural area in Venda

5. To explore and describe food consumption patterns in respect of meal patterns including vitamin A -rich foods of 10-13 year old children living in a rural area in Venda

6. To explore and describe the food consumption patterns regarding the types of vitamin A-rich foods consumed by 10-13 year old children living in a rural area in Venda
7. To explore and describe the food consumption patterns regarding the frequency of intake of vitamin A rich foods by 10-13 year old children living in a rural area in Venda

8. To explore and describe the types of foods rich in vitamin A, including the retinol-rich, carotene-rich and fortified foods typically consumed by 10-13 year old children living in a rural area in Venda

9. To explore and describe how the food habits of 10-13 year old children living in a rural area in Venda influence the type of vitamin A-rich foods they consume

10. To explore and describe how the food habits of 10-13 year old children living in a rural area in Venda influence the consumption patterns of foods rich in vitamin A

3.6 CONCEPTUAL FRAMEWORK

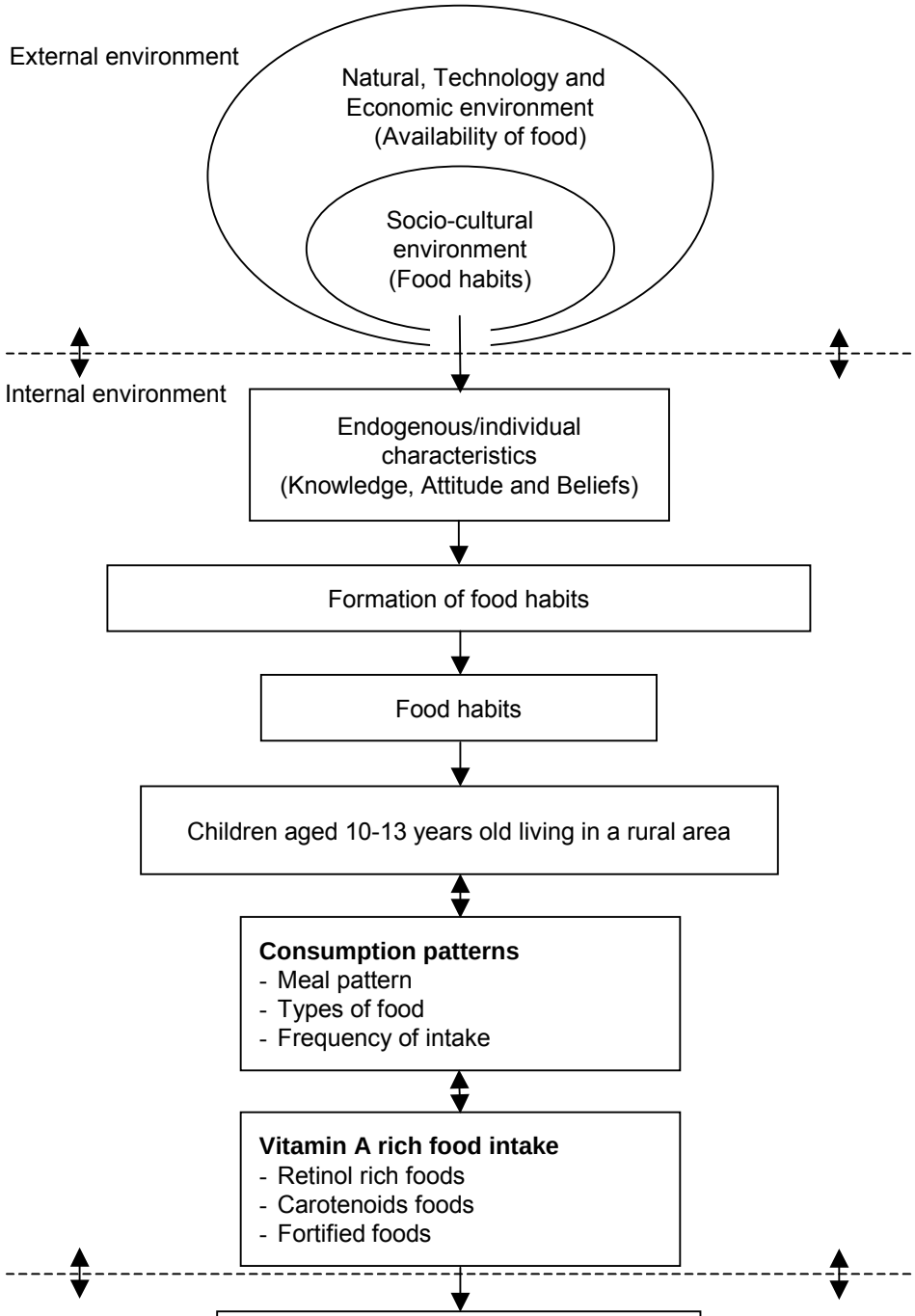

External environment
Natural, Technology and Economic environment (Availability of food)
Socio-cultural environment (Food habits)
Internal environment
Endogenous/individual characteristics (Knowledge, Attitude and Beliefs)
Formation of food habits
Food habits
Children aged 10-13 years old living in a rural area
Consumption patterns
- Meal pattern
- Types of food
- Frequency of intake
Vitamin A rich food intake
- Retinol rich foods
- Carotenoids foods
- Fortified foods

FIGURE 3.1: CONCEPTUAL FRAMEWORK OF CONSUMPTION PATTERNS OF VITAMIN A-RICH FOODS

Using the two models discussed in Chapter 2 as a starting point, data collection in this research was guided by the conceptual framework designed for this project (see Figure 3.1). This conceptual model addresses the consumption patterns of children that lead to intake of vitamin A.

The conceptual framework (Figure 3.1) consists of two environments (external and internal). The external environment includes food availability and socio-cultural food habits that influence the internal environment. This is comprised of endogenous/individual characteristics like knowledge, attitudes and beliefs of 10-13 year old children. Consumption patterns with specific reference to meal pattern, food types and frequency of intake will be studied, focusing specifically on vitamin A-rich foods in the subcategories indicated. Food consumption patterns are an integral aspect of food habits and also interact with food habits and the intake of specific foods, in this case, the vitamin A-rich foods that may ultimately impact on the nutritional status of children and growth.

3.7 DEFINITIONS OF THE CONCEPTS

3.7.1 Food habits refers to the means by which individuals, or groups of individuals, select, consume and utilize portions of available food supply in response to social and cultural pressures (Den Hartog & Van Staveren, 1983:4; Williams, 1993:296). Food habits are based primarily on food

availability, economics and personal food meanings and beliefs (Williams, 2001:297). For the purpose of this study, food availability, socio-cultural environment, knowledge and beliefs as factors in the environment that impact on food habits were studied.

3.7.1.1 The availability of food is defined as the food available in the children's environment, specifically the availability of food that is an important source of vitamin A in the school and home (Blijham *et al*, 2006:3).

3.7.1.2 The Socio-cultural environment is a system involving processes by means of which the meaning and content of any society are reinforced or changed (Sanjur, 1982:37). It includes the cultural and ideological ideas about the role of food in health, religious beliefs involving food, specific foods and restrictions and the use of food in social interaction (Jerome, Pelto & Kandel, 1980:15).

3.7.1.3 Endogenous/individual characteristics include values, attitudes, beliefs and knowledge components. Children use these factors when choosing food from what is both available and culturally acceptable (Jerome *et al*, 1980:15; Viljoen, 2001:19). For this research, the beliefs and knowledge of the children regarding vitamin A-rich foods were studied.

3.7.2 Food consumption patterns are repeated arrangements or events that can be observed regarding the consumption of food by a specific population group. It concerns the types and quantities of foods, and their combinations as they are compiled into different dishes or meals (Gerbens-Leenes *et al*, 2002:189). For the purpose of this study, consumption pattern are referred to as the meal pattern, the types of foods and the frequency of the consumption of vitamin A rich foods.

3.7.2.1 Meal patterns in this study refer to the set of food components, food items, and minimum qualities required for breakfast, supplements (snacks), lunch or supper for this age group.

3.7.3 Vitamin A is an essential fat-soluble vitamin occurring in three different forms as retinol, retinal and retinoic acid in foods. Vitamin A is found naturally in animal foods or food sources as compounds (retinylesters), and in plant foods or sources as carotenoids and is added to foods in an artificial form. These foods are then classified as fortified (addition of nutrient to those naturally occurring) or enriched foods (replacement of certain nutrients lost in food during processing according to some standard stipulated by law) (Lee *et al*, 2003:556; Whitney *et al*, 2005:367-369).

3.7.4 Foods are products derived from plants or animals that can be taken into the body to yield energy and nutrients for the maintenance of life and the growth and repair of tissues (Whitney *et al*, 2005:8). For the purpose of this study, the specific focus is on vitamin A-rich foods rich in retinol, including butter, margarine, cheese, milk, eggs and meat, especially liver. It also includes the important sources of β-carotene, including orange-fleshed sweet potatoes, spinach, mangoes, carrots, broccoli, butternut and watermelon (Blijham *et al,* 2006:7; Whitney *et al*, 2005:374), as well as foods fortified with vitamin A, including Kellogg's breakfast cereals and bread.

3.7.5 Children (aged 10-13 years) are in the age group where independence and self-reliance are beginning to emerge (Blair & Burton, 1951:81). These years constitute a unique period in human life. Children develop their own lives outside the home circle, and their natural interests have never been so independent of adult influence (Blair *et al*, 1951:81).

3.8 DESCRIPTION OF THE STUDY AREA

The study was confined to South Africa, specifically the Limpopo Province. According to the mid-2005 population census, the Limpopo Province has a population of 5, 6 million (Internet: South Africa Info reporter: 6). Vyeboom is one of the rural areas in the province, and is found at Makhado local municipality in the Vhembe District. Vyeboom consists of houses built through the Reconstruction and Development Programme (RDP), a few formal houses built by owners and also traditional houses. It has a population of 4, 865 people (Internet: Water Services Report tool: 6). The area is poverty-stricken and the unemployment rate is extremely high. There are three primary schools and two secondary schools in the area.

3.9 STUDY POPULATION

The units of analysis are 10-13 year old children in a rural area in Venda. For the purposes of this study, 10-13 year old children of Vyeboom village are the main focus of this research. Whitney *et al* (2005:570) indicate that children of this age can make many more choices for themselves than they do as young children. They are not fed, but eat according to their own choice and preference; they are not sent out to play, but choose to go. Their brains have developed to nearly their adult size and weight. Health is almost at its premium, activity is greater and more varied than ever before, and there is peculiar endurance, vitality, and resistance to weariness (Blair *et al*, 1951:82).

3.10 SAMPLING PROCEDURE

The permission to conduct the study was obtained from the Department of Education, Vhembe district (Addendum A). All the children in the appropriate age group (10-13 years) were given consent forms (Addendum B) to be completed by their parents. When the signed consent forms were returned, the following methods were applied:

- *Convenience sampling* confines the sample to an accessible section of the population, and was used in this study for the purposes of choosing the area and the schools.

- *Stratified sampling* is a method of obtaining a greater degree of representation, which decreases the probable sampling error (Babbie *et al*, 2001:191). Children were stratified according to their year age groups (10, 11, 12, 13 years) for this study. A minimum of 30 per age group of both genders was recruited, resulting in a total of 120 children.
- *Random sampling* is the use by researcher of random number tables or a similar mathematical random process, so that each sampling element in the population will have an equal probability of being selected (Neuman, 2006:227). For this study the sample was collected randomly from the group with consent forms (Addendum B). The forms were selected from the basket/box and every child stood of selection in order to arrive at approximately 30 children per age from each of the three schools in the village. Sampling was therefore based on parental agreement that their children could participate in the research and on the numbers of children attending each school in the various age categories. These numbers were finalized closer to the implementation phase.

3.11 MEASURING INSTRUMENTS

A socio-demographic questionnaire (Addendum C) was used to obtain information on factors relevant to the household as far as the environment in which the child lives was concerned. The 24-Hour Recall Questionnaire provides information on the child's current diet and eating pattern. The Non-Quantitative Food-Frequency Questionnaire (Addendum D) also provides information on eating patterns and food intake, with reference to vitamin A-rich foods.

3.11.1 Questionnaires - Since the research involved respondents of different ages and genders, the questionnaires were developed and used to collect data during the research process. English versions were used. However, during training the questionnaire was translated into the vernacular. The translation was discussed in detail in a plenary session until consensus had been reached on an appropriate translation. The questionnaire was in five parts consisting of demography, food availability (vegetables), food availability (fruit), consumption patterns and socio-cultural aspects. The length of the questionnaire was limited so that children would not be discouraged from participating.

3.11.2 A non-quantitative food frequency questionnaire- is one listing foods rich in vitamin A. Respondents were asked to indicate how often they consume each listed item during certain time intervals (daily, weekly or monthly). Different vitamin A–rich foods were selected for this study and used in this questionnaire to measure the frequency of intake of these foods. The amount of vitamin A present in these foods was expressed in Retinol Equivalent (RE). RE is a unit developed to standardize the measurement of the variable vitamin A activity of different vitamin A sources. 1RE = 3.33 IU vitamin A activity from retinol (Internet: Nicus: 1999:2). A food in which the RE value is above 50 RE per 100g was recommended. This questionnaire, however, assessed the children's usual food consumption without measuring the quantity of vitamin A-rich foods. Food recognition was achieved by the children looking at the photographs of raw fruit and vegetables, and then writing down the answer on the questionnaire. The decision to use photographs was supported by other studies in which photographic categorization of fruit and vegetables by 8-11 years olds has been successfully used (Edwards & Hartwell, 2002:367).

3.11.3 24-hour recall is a method of dietary recall in which a trained interviewer asks the subject to recall in detail all the foods and beverages consumed during the past 24 hours (Lee *et al*, 2003:562). For the purpose of this study, the 24-hour recall was used to establish the current diet and consumption pattern of children, not for nutrient content.These measuring instruments were tested out in a pilot study beforehand.

3.12 OPERATIONALIZATION

3.12.1 Questionnaire (socio-demographic information, food availability (vegetables & fruits), consumption patterns and socio-cultural information)

The results of the questionnaire were coded before and afterwards. It should be noted that some of the question were open. Descriptive statistics were used to interpret the data. Food items were grouped into five basic food groups. Frequencies were calculated, and patterns constructed.

3.12.2 Non-quantitative food frequency questionnaire - The information from this questionnaire was quantified and compared with the results of the South African National Food Consumption Survey as well as the Food Based Dietary Guidelines (FBDGs) to establish patterns of vitamin A-rich foods utilization/consumption.

3.12.3 24-hour recall - The information from this questionnaire was compared with standard meal patterns and the FBDGs in order to establish patterns of intake and to determine whether children's vitamin A intake was adequate.

3.13 SUMMARY OF DATA COLLECTION AND ANALYSIS

TABLE 3.1: SUMMARY OF DATA COLLECTION AND ANALYSIS

Objectives	Method	Analysis	Statistics	Questions
To explore and describe the availability of foods as it affects the consumption of vitamin A- rich foods by 10-13 year old children living in a rural area in Venda	Questionnaire	SAS	Descriptive statistics & frequency distribution	B5, 9,10, 11,12 C5, 9, 10, 11,12 D7, 8,11
To explore and describe the socio-cultural environment as it affects consumption of vitamin A- rich foods by 10-13 year old children living in a rural area in Venda	Questionnaire	SAS	Descriptive statistics & frequency distribution	E1-8
To explore and describe endogenous/individual characteristics in terms of knowledge and beliefs as they affect the consumption of vitamin A- rich food by 10-13 year old children living in a rural area in Venda	Questionnaire	SAS	Descriptive statistics & frequency distribution	B1, 2,6-8 C1, 2,6-8 D14
To explore and describe the food habits seen in the consumption patterns of vitamin A-rich foods by 10-13 year old children living in a rural area in Venda	Questionnaire	SAS	Descriptive statistics (e.g. mode, mean, frequency distribution)	E3-5
To explore and describe food consumption patterns in respect of patterns including vitamin A -rich foods of 10-13 year old children living in a rural area in Venda	Questionnaire 24-hour dietary recall	SAS	Descriptive statistics Frequencies and patterning	D1-2, 11
To explore and describe the food consumption patterns regarding the types of vitamin A-rich foods consumed by 10-13 year old children living in a rural area in Venda	Questionnaire 24-hour dietary recall	SAS	Descriptive statistics (e.g. mode, mean, percentages)	B4, 11 C4, 11 D2-7, 10-13
To explore and describe the food consumption patterns regarding the frequency of intake of vitamin A rich foods by 10-13 year old children living in a rural area in Venda	Questionnaire 24-hour dietary recall	SAS	Descriptive statistics (e.g. mode, mean) Frequencies and patterning	B3, 4,13 C3, 4,13
To explore and describe the types of foods rich in vitamin A, including the retinol-rich, carotene-rich and fortified foods typically consumed by 10-13 year old children living in a rural area in Venda	Non-quantitative food frequency questionnaire	SAS	Descriptive statistics (e.g. mode, mean, frequency distribution, percentages) Ranking	NQFFQ
To explore and describe how the food habits of 10-13 year old children living in a rural area in Venda influence the type of vitamin A-rich foods they consume	Questionnaire	SAS	Inferential statistics Two-way tables and Chi-squared tests	E3-5
To explore and describe how the food habits of 10-13 year old children living in a rural area in Venda influence the consumption patterns of foods rich in vitamin A	Questionnaire	SAS	Inferential statistics Two-way tables and Chi-squared tests	E1-8

3.14 DATA COLLECTION

The enumerators, including the research leader, collected the data conducting individual face-to-face interviews. The research leader was responsible for entering all the data daily from the first day of the survey. Prior to data collection, a two-day training session for all members was conducted. The research personnel were acquainted with the purpose of the study and the research objectives, as well as research tools, instruments and methodology.

Before the survey itself commenced, survey tools and instruments were pre-tested on targeted respondents outside of the study area. The researcher rehearsed by asking questions and recording these and the replies. The questionnaire was discussed with the principals, teachers and parents concerned, to ensure that the questions posed fell within the children's conceptual framework. The accessibility of the questions was considered, allowing completion within a limited period of time. The pre-test exercise was discussed and necessary changes based on the exercise were made accordingly.

3.15 DATA ENTRY AND ANALYSIS

All the study data was entered in the SAS statistical analysis (version 8.2) software program. This was in order to analyze the data from the questionnaire by means of descriptive statistics (percentages, frequencies, means and a summary of the tables). Inferential statistics (two-way tables and chi-square tests) were used to test the associations between two categorical variables.

3.16 QUALITY OF THE STUDY

Babbie *et al* (2001:277) indicate that a quantitative study cannot be considered valid unless it is reliable. The value and applicability of the results of any research study depend on the validity and reliability of the respective data collection methods.

Validity is the extent to which an empirical measure adequately reflects the real meaning of the concept under consideration (Babbie *et al*, 2001:122).

3.16.1 Validity threats

- *Face validity* is a judgment by the scientific community that the indicator really measures the construct (Neuman, 2006:192). This was corroborated with the use of dimensions and indicators of the variables in this study to construct questionnaire items.

- *Construct validity* is based on the logical relationships among variables (Babbie *et al*, 2001:123). The following steps were taken to support construct validity:
  - More than one method of gathering the information to identify relevant constructs and appropriate terminology was used. A questionnaire, 24-hour recall and the non-quantitative food frequency questionnaire were used and individual face-to-face interviews were conducted.
  - A valid measurement instrument was obtained through good conceptualization.

- *Content validity* refers to how far a measure covers the range of meanings included within the concept (Babbie *et al*, 2001:123). The following steps were taken to support content validity.
  - Subject experts from the Department of Consumer Science, a supervisor and a statistician evaluated the questionnaire for content and measurement validity.
  - The questionnaire was pilot-tested to ensure content validity.

- *Theoretical validity* was ensured by means of an extensive study of the literature on the theories of vitamin A, and the food habits and consumption patterns of children. All the key concepts pertaining to consumption pattern, food habits and vitamin A were identified by means of a thorough literature review.

Reliability is a matter of whether a particular technique applied repeatedly to the same object would yield the same result each time (Babbie *et al*, 2001:119). It means that if the same measures are used and the conditions under which data is collected are as constant as possible, the same data should be collected from situation to situation.

3.16.2 Reliability threats

To reduce the possible sources of error during the questionnaire data collection, the following precautions were implemented:

- A consent form (Addendum B) was distributed to the children's parents for their permission to interview their children. The following were emphasized:
  - The aim and purpose of the study
  - The research affiliation
  - An assurance of confidentiality and anonymity

- The questionnaire was constructed in such a way that:

- A simple, accessible approach in the questions was considered a priority in order to facilitate completion within a limited time.
- The questions were relevant to the topic.
- The photographs of the raw fruit and vegetables were used as an aid to recognition.
- The questionnaire had been pilot/pre-tested.
- Well-trained assistants assisted in data collection.

Chapter 4

RESULTS AND DISCUSSION

4.1 INTRODUCTION

This chapter presents, explores, describes and discusses the results of the study. It provides an analysis of the results, based on the research aims listed in Chapter 3. It is divided into four subsections: demographic information; food habits (food availability, socio-cultural environment and endogenous characteristics); consumption patterns (meal pattern, types of food and frequency of intake); and foods rich in vitamin A (retinol, carotenoid and fortified food) eaten by the 10-13 year old children who participated in the study.

Vyeboom is a rural area village and is part of the Makhado local municipality in the Vhembe district of the Limpopo Province (Figure 4.1). The population of the village is estimated to be 4, 865 people (Internet: Water Services Report tool: 6). Vyeboom consists of houses built as part of the Reconstruction and Development Programme (RDP), a few formal houses built by owners and informal traditional houses (see Figure 4.2).

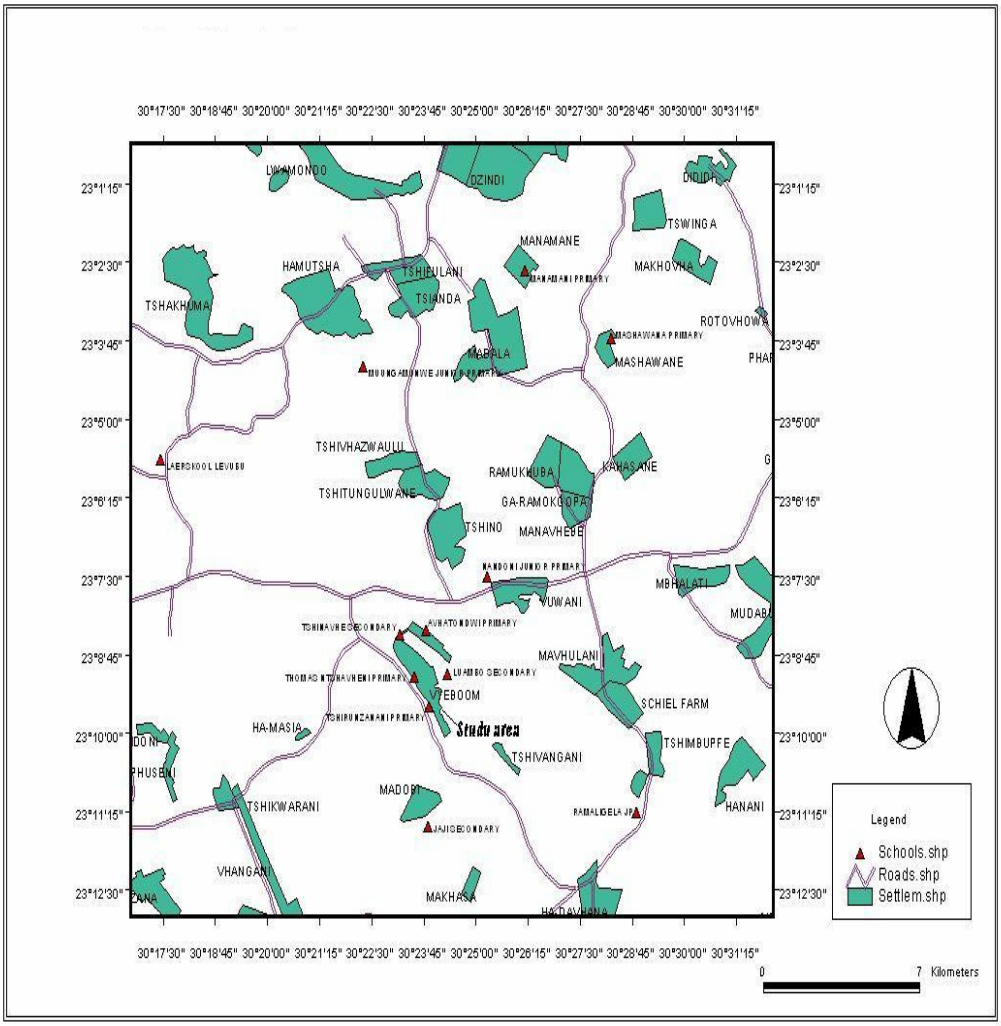


FIGURE 4.1: MAP OF THE STUDY AREA, VYEBOOM VILLAGES

FIGURE 4.2: ENVIRONMENT OF STUDY AREA, VYEBOOM VILLAGE

The sample was comprised of 155 school children, aged 10-13 years, from three primary schools, Avhatondwi, Tshirunzanani and Thomas Ntshavheni in Vyeboom village. The ages of the children (10, 11, 12, 13 years) were most important in sampling, and both boys and girls were interviewed, all being children living in a rural area. Pre-requisites for participation were a consent form (Addendum B) signed by the parents or guardian and conformation to the age requirements. Confidentiality was assured. The children were not asked to disclose their names or any other personal details, as these were not required for meeting the research goals. The children did not voice any problems in comprehending the questions, nor did their answers indicate that the questions had been misinterpreted.

4.2 RESULTS

4.2.1 Socio- demographic information

Although 155 children participated in the individual questionnaire interview, more females (n=90) than males (n=65) participated. However, this had been expected because there are more females than males in primary schools, as indicated in Table 4.1.

TABLE 4.1: GENDER, AGE AND GRADE OF THE RESPONDENTS

	Frequency (N=155)	Percentage (%)
Gender		
Female	90	58.6
Male	65	41.9
Ages		
10 yrs	30	19.4
11 yrs	35	22.6
12 yrs	42	27.1
13 yrs	48	30.1
Grades		
Grades 3 & 4	38	24.5
Grade 5	37	23.9
Grade 6	41	26.5
Grade 7	39	25.2

Fewer males (n=65, 41.9%) than females were interviewed in the study. This is probably owing to a naturally smaller component of males attending primary schools in Vyeboom village. The ages of the respondents ranged from ten to 13 years, with the majority (n=48, 30.1%) being 13 years old. However, a maximum of 40 children per age group and a minimum of 30 were expected to be interviewed. The educational distribution of the respondents varied equally between the grades, with (n=41, 26, 5%) of the respondents being in grade six and only (n=39, 25.2%) in grade seven, as indicated in Table 4.1. The ethnic group and family structure of the respondents are presented in Table 4.2.

TABLE 4.2: ETHNIC GROUP AND FAMILY STRUCTURE OF THE RESPONDENTS

	N=155	%
Ethnic group		
Venda	151	97.4
Tsonga	3	1.9
Sotho	1	0.7
Total number of people living together in the house		
2-4 members	45	29.0
5-6 members	68	43.9
7-8 members	36	23.2
9+ members	6	3.9
Family structure		
Nuclear family #	82	52.9
Extended family*	73	47.1
Friends family	-	-
Other (relatives family)	-	-

Nuclear family- referred to the independent family consisting of a father, a mother, and their children (Internet: Glossary, 6).
* *Extended family*- refers to a family inclusive of three or more generations. Normally, that includes grandparents, their sons or daughters, and their children. They live together, sharing eating, drinking and living conditions (Internet: Glossary, 6).

Almost all the children interviewed (n=151, 97.4%) were Vendas because most of the people living in Vyeboom are Venda. A number of the children (n=45, 29.0%) lived in families with two to four members (siblings). The majority of children (n=110, 70.1%) lived in families of more than five members. More than half (n=82, 52.9%) of the respondents lived in nuclear families, while the rest (n=73, 47.1%) lived as an extended family.

In order to describe the employment profile of the breadwinners in the children's families, their jobs were categorized as follows:

- Doctor/nurse/teacher/professional - the kind of jobs that require relevant educational qualifications
- Business/taxi/self-employed formal - a person who works for themselves in their own business
- Typist/assistant/office work - formal work for an employer, some types of qualification being required
- Domestic worker/garden/contract - formal work for an employer, with no qualifications required
- Hawker/car washer/informal sector – non-professional work (like piece jobs), with no education required

The employment profile of the breadwinners is presented in Table 4.3.

TABLE 4.3: EMPLOYMENT PROFILE OF THE BREADWINNERS LIVING WITH THE RESPONDENTS

	N=155	%
Employment status		
No job (grants money)	42	27.1
Irregular (piece work)	-	-
Part time (1-4 days/week)	7	4.5
Full time (5+ days/week)	106	68.4
Breadwinners		
Father	57	36.8
Mother	43	27.7
Grandmother	21	13.6
Grandfather	-	-
Sisters & brothers	12	7.7
Others	12	7.7
Grandmother and mother	4	2.6
Grandparents	3	1.9
Parents	3	1.9
Type of job		
Not working	42	27.1
Doctor/nurse/teacher/professional	24	15.5
Business/taxi/self employed Formal	19	12.3
Typist/assistant/office work	13	8.4
Domestic worker/garden/contract	45	29.0
Hawker/car washer/informal sector	6	3.9
Other (security)	6	3.9

Most of the breadwinners (n=112, 72.2%) in the respondents' families were employed, (68.4%) in full-time jobs, of whom the majority were fathers (n=57, 36.8%), followed by mothers (n=43, 27.7%) and other members of the family (n=55, 35.5%). Only a small percentage (n=24, 15.5%) were professional workers (doctors, nurses, and teachers) while more (n=45, 29.0%) were domestic workers, gardeners or contract workers.

The results reflect the fact that some of the breadwinners (n=42, 27.1%) were unemployed, but depended on social grant money e.g. child, old age or disability, to support their families (see Figure 4.3).

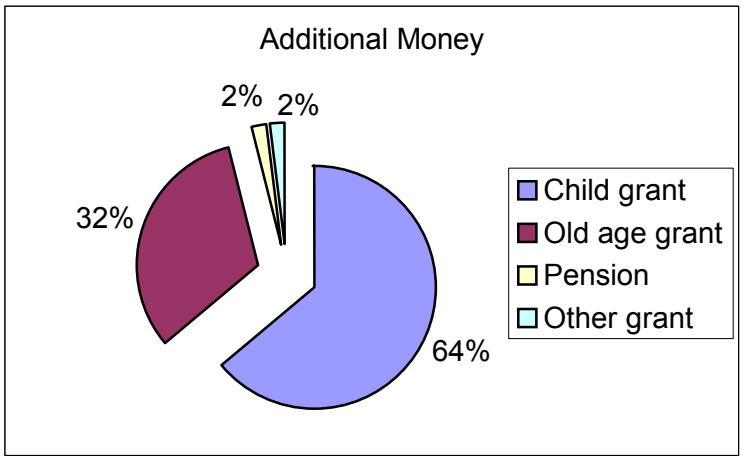


FIGURE 4.3: ADDITIONAL INCOME FROM VARIOUS SOURCES

Most (n=123, 79.4%) of the families were receiving additional monthly incomes from various sources. The majority (n=97, 62.6%) of respondents indicated child grants to be the most common additional source of income in their families.

The housing most commonly occupied in Vyeboom village could be described as follows:

- *Formal house* - built with bricks and formal roofing (zinc) with two or more rooms (Privately owned or Reconstruction and Development Programme (RDP) houses by government)
- *Traditional house* - built with mud bricks and grass roofing, with one room

- *Shack* - house built with wood or zinc, mostly with one or two rooms
- *Single room* - one room house built with mud bricks or cement bricks

Some of the housing structures used by respondents are represented in Figures 4.4, 4.5 and Table 4.4.

FIGURE 4.4: HOUSEHOLD STRUCTURE - TRADITIONAL HUT

FIGURE 4.5: HOUSEHOLD STRUCTURE - FORMAL HOUSE

TABLE 4.4: TYPE OF HOUSE, OWNER OF THE HOUSE AND SOURCE OF WATER

	N=155	%
Type of house		
Formal house	101	65.2
Traditional house	25	16.1
Shack	2	1.3
Single room	11	7.1
Other (RDP)	16	10.3
Owner of the house		
Father	61	39.4
Mother	51	32.9
Grandmother	25	16.1
Grandfather	5	3.2
Sisters or Brothers	2	1.3
Others (uncle, aunt)	7	4.5
Grandparents	4	2.6
Water source		
Fountain, river	1	0.7
Communal tap	152	98.0
Tap on premises	2	1.3
Tap in house	-	-
Other	-	-

The majority of children (n=101, 65.2%) were living in formal housing with an outside room (*tshitanga* – a room used for preparing food with fire wood). The rest were in traditional houses, shacks, single rooms and RDP houses. Of these houses, most (n=112, 72.3%) were owned by parents, and the rest by other family members like grandparents. None of these respondents had water in their houses, but the majority of respondents (n=152, 98.0%) fetched water from a communal taps and only two (1.3%) had borehole water on their premises.

The appliances used in the households are represented in Figure 4.6.

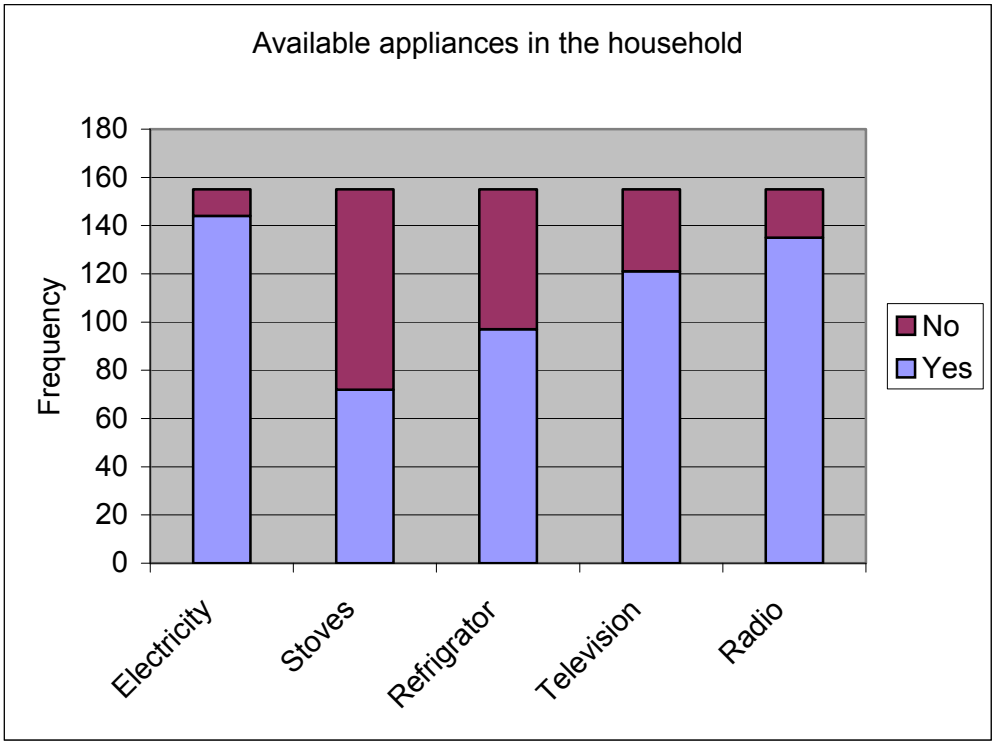


FIGURE 4.6: APPLIANCES AVAILABLE IN THE RESPONDENTS' HOUSEHOLDS

Most of the respondents (n=144, 92.9%) were living in houses with electricity, while a few of them (n=11, 7.1%) were without it. About 46.5% (n=72) had stoves and a variety of appliances, including, amongst others, items like radios and television sets. Most of the stoves listed by the respondents were two-plate electric stoves without ovens, and firewood was still used for cooking most of their food.

4.2.2 Food habits

4.2.2.1 Food availability

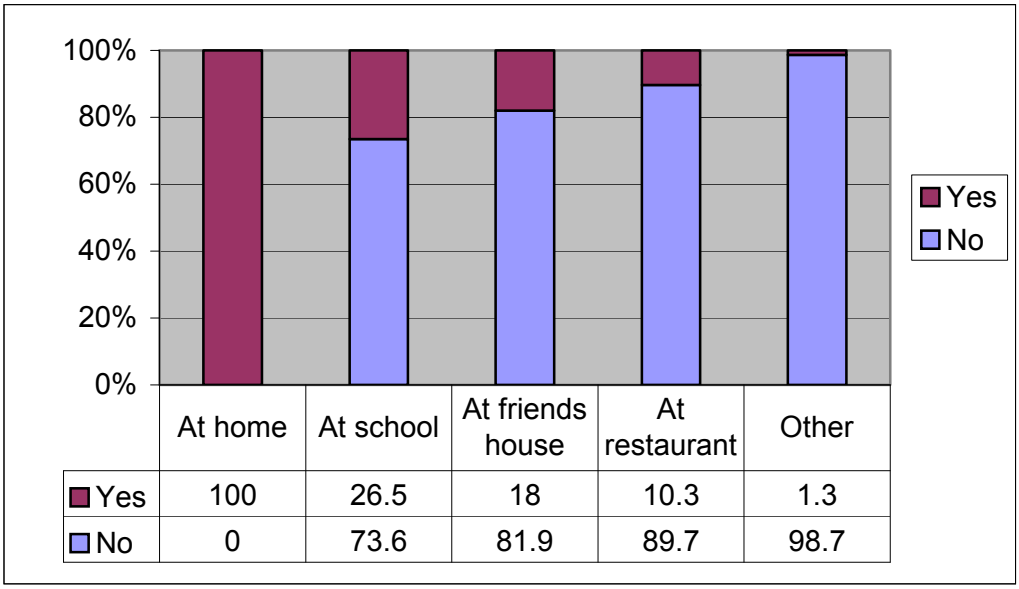
For the purposes of this study, *food availability* was defined as 'the food available in the children's environment (home, school, friend's home and restaurants/shops)', which was thus the food they most frequently consumed. The availability of various foods in the respondents'

environment was determined by their indication of the locations where they usually consumed vegetables and fruit, as well as the areas where they obtained wild foods. Vitamin A was found in large quantities in relatively few foods that are often highly seasonal, such as mangoes, oranges and dark green leafy vegetables like spinach.

The observations on the food environment showed that in Vyeboom village a variety of vegetables and fruit was available. However, the availability and types of fruit and vegetables depend on the season. The favorable climate allows for growing fruit and vegetables high in vitamin A, such as mangoes, papaya, avocados and dark green leafy vegetables. There were also fortified foods for sale in the local shops, such as maize meal and bread. Not much fruit could be bought at the school tuck-shop or from vendors.

Vegetables - Cultivated vegetables were harvested from the backyard gardens (38.1%). About (n=96, 61.9%) of the respondents obtained wild vegetables in the veldt or in the bush (mountain) or as weeds in their cultivated land.

Respondents indicated several locations where they were likely to eat vegetables. The most common locations were at home, at school, in restaurants and at their friends' homes, as is reflected in Figure 4.7.



	At home	At school	At friends house	At restaurant	Other
Yes	100	26.5	18	10.3	1.3
No	0	73.6	81.9	89.7	98.7

FIGURE 4.7: LOCATIONS WHERE RESPONDENTS CONSUMED VEGETABLES

The results indicated that all the children (n=155, 100%) ate vegetables at home. Most of the respondents (n=125, 80.7%) indicated that they ate both wild and cultivated vegetables, whereas only (n=30, 19.4%) of the respondents ate only cultivated vegetables.

The cultivated vegetables the respondents usually ate at home were: cabbage, spinach, thanga *(pumpkin leaves)*, mutshaini *(Chinese cabbage),* murodishia, muxe *(black nightshade),* munawa *(bean plant)* and mukusule *(dried vegetables)*. However, cabbage was also eaten in the school feeding scheme.

The types of wild vegetables mentioned by respondents are presented in Table 4.5.

TABLE 4.5: COMMON WILD VEGETABLES CONSUMED BY RESPONDENTS

Wild Vegetables				
Venda name	***Botanical name**	***Common name**	**Frequency (N=383)**	**Responses %**
Delele	*Corchorus tridens*	Wild jute	123	32.1
Murudi or Bangala	*Cleome gynandra*	Spider-whisp	41	10.7
Mukake		Climbing cucurbit	17	4.4
Vowa	*Weed amaranthus thunbergi*	Amaranthus	72	18.8
Muvhazwi	*Obetiatenax*	Stinging shrub urera tenax	10	2.6
Mutoto	*Green leafy vegetable*	Tuxalis	3	0.9
Nngu	*M.foetida*	Bushman karo, karu	1	0.3
Muthanzwa	*Shrub pouzolzia hypoleuca*	Soap bush	25	6.5
Mutohotoho	*C.monophylla*	Spindlepod	6	1.7
Mushidzhi	*Bidens pilosa*	Black jack	59	15.4
Muxe	*Solanum nigrum*	Black nightshade, nastergal	22	5.7
Muduhwi	*Ipomoea plebeia*	Creeper ipomoea obscura	2	0.5
Museto	*Dicerocaryum zanguebarium*	Prostrate herb	1	0.3
Ngowa	*White vegetable*	Mushrooms	1	0.3
Xaxadi	*Teedia lucida rudolphi*		1	0.3

*Botanical name and common names of wild vegetables (Singo, 1996: 34-76; Van Warmelo, 1989; Venter, 2005; Tshikhudo, 2005: 20-21).

Most of the respondents ate delele (32.1%) followed by vowa (18.8%) and mushidzhi (15.4%). The less popular wild vegetables were xaxadi (0.3%), museto (0.3%) and ngowa (0.3%).

The frequency of uncultivated vegetable consumption is indicated in Table 4.6.

TABLE 4.6: FREQUENCY OF CHILDREN'S CONSUMPTION OF WILD VEGETABLES

Responses	N=155	%
Once a week	37	23.9
Twice per week	35	22.6
Three days per week	37	23.9
Four days per week	10	6.5
Every day	7	4.5
Never	29	18.7

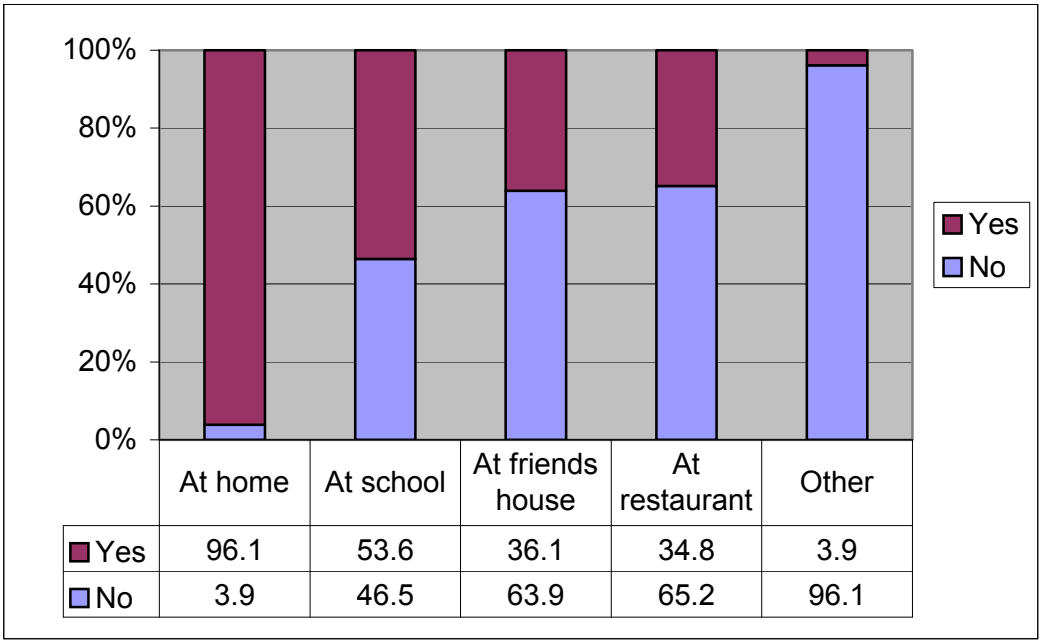
The majority of respondents (47.8%) ate wild vegetables either once a week (23.9%) or three days per week (23.9%). Only 18.7% did not consume wild vegetables at all.

Respondents also had the opportunity of indicating their reasons for eating the uncultivated vegetables they mentioned on (Table 4.5). Respondents indicated nutrient intake as the main

reason for consumption. Some of the reasons are reflected in the following ethnographic descriptions (in the respondents' own words).

- ❖ 'To build healthy body because is healthy'
- ❖ 'My mother and grandmother likes it'
- ❖ ' Because we get them free, there is no need to buy'
- ❖ ' It is a cure, it prevents diseases'
- ❖ ' It is always cooked at home and there is no other option/vegetable'

Fruit - Respondents indicated several locations where they were likely to eat fruit, as reflected in Figure 4.8.



	At home	At school	At friends house	At restaurant	Other
Yes	96.1	53.6	36.1	34.8	3.9
No	3.9	46.5	63.9	65.2	96.1

FIGURE 4.8: PLACES WHERE RESPONDENTS CONSUMED FRUIT

All the children indicated that they enjoyed eating fruit. Most of them (n=149, 96.1%) said they ate it at home, followed in frequency by at school, friends' houses and in restaurants.

The cultivated fruits most often eaten by the children at school were apples, bananas and oranges, while guavas were mostly eaten at home. There was also high availability of various wild fruit at Vyeboom village, resulting in increased consumption of that fruit by 91% of the children see Table 4.7.

TABLE 4.7: FREQUENCY OF WILD FRUIT CONSUMPTION BY CHILDREN

Responses	N=155	%
Once a week	51	32.9
Twice per week	33	21.3
Three days per week	20	12.9
Four days per week	7	4.5
Every day	30	19.4
Never	14	9.0

Most of the respondents (32.9%) ate wild fruit only once a week, followed by twice per week (21.3%) while 19.4% ate fruit every day.

The majority of respondents (n=141, 91.1%) indicated the farms, the bush and the mountain as the places where they most often obtained and ate the wild fruit. The most commonly available wild fruit eaten by the respondents in Vyeboom village is presented in Table 4.8.

TABLE 4.8: THE WILD FRUIT MOST COMMONLY CONSUMED BY THE RESPONDENTS

Wild fruit	*Botanical name	*Common name	Frequency (N=581)	Responses (%)
Mbuyu	*Baobab*	Adansonia digitata	1	0.2
Tsuma	*Diospyros mespiliformis*	Jackal-berry	44	7.6
Thaseli	*Rhus leptodictya*	Mountain karee	47	8.1
Thithima	*Not yet*		77	13.3
Lamahunguvhu	*Tree albizia versi color welw*	'Strech drumhead'	60	10.3
Mahuyu		Figs	20	3.4
Thanzwa	*Ximenia americana*	Blue sourplum	4	0.7
Mazwilo	*Wild medlar*	Vangueria infausta	55	9.5
Maembe	*Annona senegalensis*	Wild custard-apple	30	5.2
Thogwa	*Azanza garckean*	Azanza	12	2.1
Khukhuma	*Berchemia discolor*	Brown ivory	43	7.4
Maramba	*Strychnos spinosa*	Green monkey-ovary	21	3.6
Makwakwa	*Strychnos madagascariensis*	Black monkey-orange	2	0.3
Tshili or Tsengele	*Ximenia caffra*	Sourplum	24	4.1
Mafula	*Sclerocarya birrea*	Marula	12	2.1
Mponwani	*Ehrentia rigida*		14	2.4

Wild fruit	*Botanical name	*Common name	Frequency (N=581)	Responses (%)
Mbubulu	*Mimusops zeyheri*	Transvaal red milk wood	4	0.7
Thungulu	*Carrisa edulis*	Simple spined num-num	84	14.9
Mutshatshagwali	*Unknown*		6	1.0
Thodoli	*Unknown*		3	0.5
Kolokote	*Piliostigma thonningii*	Camel's foot	2	0.3
Mbula	*Parinari curatelifolia*	Mobola plum	5	0.9
Mbambangoma	*Stretch drumhead*	Albizia versicolor	5	0.9
Magwavha		Guavas	1	0.2
Zwivhuyu		Types of figs	2	0.3
Tshidzimba-putule	*Soft shrublet*	Lantana rigosa	3	0.5
Tshiromberombe	*Small spiny tree*	Gardenia amoena sims	1	0.2

*Botanical and common names translated of wild fruit (Van Warmelo, 1989; Venter, 2005)

As indicated in Table 4.8, the most popular wild fruits were simple thungulu (14.9%), thithima (13.3%), lamahunguvhu (10.3%), mazwilo (9.5%) and thaseli (8.1%). Less popular were tshiromberombe (0.2%) and mbuyu (0.2%), which were mentioned only once.

Fruit collected from indigenous trees and plants was used to supplement the intake of cultivated fruit. Wild fruit was mostly eaten as a snack, to prevent hunger, for its sweet taste was simply admired. Some of the reasons mentioned by the respondents were:

- ‘It has vitamins, nutrients’
- ‘It taste nice’
- ‘To keep myself busy in the bush’
- ‘ My friends are eating as well’
- ‘ I just admire it or just ate’

It was very clear that home gardens played a role in supplying families with vegetables, and home was the most popular place for the children to eat vegetables (indigenous and cultivated). The availability of fruit in season, particularly in the home gardens, had a strong influence on the children’s intake. Guavas were often eaten because of seasonal availability during the study, whereas apples, bananas and oranges were easily and cheaply acquired at the school tuck shops and were also included in the school feeding scheme. The

consumption of indigenous fruit was high, especially after school when the children play near the mountain, or in the bush.

4.2.2.2 The socio-cultural environment

The socio-cultural environment focused on the cultural and ideological ideas on the role of food in health, religious beliefs involving food, specific foods and restrictions and the use of food in social interaction (Jerome *et al*, 1980:15). However, the socio-cultural environment for this study was measured by indication of the type of foods known as children's foods, foods that children are not allowed to eat or are forced to eat, and the role of family members in the decisions on food and its preparation.

The respondents indicated that a number of people made the decisions about what they would eat (see Table 4.9)

TABLE 4.9: THE PEOPLE WHO MADE DECISIONS ABOUT THE FOODS TO BE CONSUMED BY THE RESPONDENTS

People	N=155	%
Parents (mother or father)	113	72.9
Grandparents	24	15.5
Sisters/brothers	10	6.5
Me (myself)	5	3.2
Other (aunt)	3	1.9

The majority (n=113, 72.9%) of the respondents said their mothers usually made the decisions about what they ate at home, followed by their grandparents. Most of the respondents (n=92, 59.4%) said that they could not choose what to eat at home if their mothers were present, but did make their own decisions in their mothers' absence or when granted permission, especially after school.

Table 4.10 reflects the people responsible for preparing the food most often eaten by respondents.

TABLE 4.10: PEOPLE RESPONSIBLE FOR FOOD PREPARATION IN FAMILIES

Responses	N=155	%
Parents (mother or father)	97	62.6
Grandparents	15	9.7
Sisters	33	21.2
Brothers	5	3.2
Other	9	5.8

The children's families were mainly responsible for food preparation. Within the nuclear family, mothers (n=97, 62.6%) most frequently prepared food, followed by their sisters (n=33, 21.2%). Even though mothers were generally responsible for food preparation, some respondents were also given the opportunity of participating in meal preparation (see Table 4.11).

TABLE 4.11: PARTICIPATION BY CHILDREN IN MEAL PREPARATION

Responses	N=155	%
Once a week	37	23.9
Twice per week	55	35.5
Three days per week	9	5.8
Four days per week	4	2.6
Every day	16	10.3
Never	32	20.7

1.3% of answers were missing because children were unwilling to answer, even though they had been asked.

Most (n=55, 35.5%) of the children confirmed that they helped at least twice a week during the weekends and only a few (n=37, 23.9%) helped with meal preparation at least once a week, whereas some (n=32, 20.7%) did not help with meal preparation at all. The meals that respondents helped to prepare could be classified as breakfast, lunch, supper and snacks, as indicated in Table 4.12.

TABLE 4.12: LEVEL OF PARTICIPATION IN MEAL PREPARATION

Meals			Foods prepared	Preparation methods	%
	N=155	%			
Breakfast	75	48.4	Tea	Boil, mix all ingredients	20.8
			Bread (brown, white and rolls)	Cut, spread supplements	18.3
			Maize meal soft porridge	Boil water and cook	2.6
			Eggs	Fry, boil	1.9
			Maize meal porridge (stiff)	Boil water and cook	1.6
			Canned fish	Open, cook with tomato and onion	0.3
			Meat (chicken, beef, pork etc)	Cut, boil, stew, fry	0.3
			Cabbage	Cut, fry, boil	0.8
			Potatoes	Peel, cut, cook	0.3
			Avocado	Peel, cut, mash	0.3
			Corn flakes	Mix with milk & add sugar	0.3
			Squash	Mix with water in the glass	0.5
			Mopane worms	Boil with tomato and onion	0.2
Lunch	81	52.3	Maize meal porridge (stiff)	Boil water and cook	21.2
			Dark green leafy vegetables	Cut, cook	14.2
			Meat (chicken and beef)	Cut, boil, fry, stew,	7
			Eggs	Fry, boil	1.9
			Rice	Boil	1.9
			Mukusule (dry vegetables)	Boil with tomato & onion	1.3
			Canned fish	Open, cook with tomato and onion	0.7
			Atchaar	Serve in the bowl	0.7
			Sugar beans	Boil with tomato and onion	0.7
			Bread (brown and white)	Cut, spread supplements	0.3
			Sausage (wors)	Cut, boil, fry	0.6
			Gravy	Cut onion and tomato and cook	0.3
			Maize meal soft porridge	Boil water and cook	0.3
			Salads	Cut and mix	0.3
			Squash / cold drink concentrate	Mix with water	0.3
			Tomatoes	Cut	0.3
			Boiling water	Put in the fire	0.3
Supper	65	41.9	Maize meal porridge (stiff)	Boil water and cook	18.4
			Meat (chicken and beef)	Cut, boil, fry, stew	8.4
			Dark green leafy vegetables	Wash, cut, cook	7.5
			Rice	Wash and boil	1.3
			Wors	Cut, boil, fry	0.7
			Mopane worms	Wash and cook	0.3
			Canned fish	Open, cook with tomato and onion	0.3
			Tea	Boil, mix all ingredients	0.3
			Sour milk	Mix with porridge	0.3
			Gravy	Cut onion and tomato and cook	0.3
			Soup	Cook the minestrone	0.15
			Carrots	Peel and cut	0.3
			Mukusule (dry vegetables)	Boil with tomato & onion	0.1
			Eggs	Fry, boil	0.1
Snacks	9	5.8	Sweets	Take out from the packets	1.6
			Cool drink	Pour in the glasses	0.7
			Cake	Cut	0.3
			Eat sum more (biscuits)	Take out from the packets	0.3
			Squash	Mix with water	0.3
			Juice	Pour in the glass	0.3
			Any bread	Cut and spread supplements	0.3
			Custard	Cook	0.3
			Polony	Cut	0.3
			Popcorn	Cook	0.3
			Twigglies	Take out from the packets	0.3
			Cornflakes	Mix with milk and sugar	0.3
			Stir up (sweet aid)	Mix with water	0.3

The actual meals the children most often helped to prepare were breakfast (48.4%), lunch (52.3%), and supper (41.9%), while a few (5.8%) helped prepare snacks.

Breakfast - The most common type of breakfast preparation performed by the children was either cutting bread or spreading it with margarine or peanut butter (18.3%). Some cooked stiff maize meal porridge (1.6%) or soft porridge (2.6%), the most common supplement being fried or boiled eggs (1.9%), probably because they are cooked easily and quickly. Different vegetables (0.8%), meat (0.3%), mopane worms (0.2%) and canned fish (0.3%) were also cooked as an accompaniment to porridge. The children also prepared tea (20.8%) for the whole family, especially during the weekends, when they had more time.

Lunch - The majority of respondents helped with lunch preparation, because during the week they had time after school, and they were mostly alone at home. They usually cooked stiff maize meal porridge (21.2%) with different dark green leafy vegetables (14.2%) and sometimes meat (chicken or beef) (7%). The eggs (1.9%) were usually boiled or fried (0.3%), while bread was also used, as during breakfast.

Supper - Although the same patterns were repeated at supper, only (41.9%) helped prepare this meal, because most of the adults prepared food themselves or ate left-overs from lunchtime. Some children, however, helped prepare maize meal porridge (18.4%), meat (8.4%), rice (1.3%) and vegetables (7.5%).

Snacks - Not many of the children helped make snacks because they bought junk food at the tuck-shops or from vendors at school and at home. Snack foods were generally only removed from the packets, for example, sweets (1.6%), ‘Eat sum more’ biscuits (0.3%) or Twigglies (corn snacks) (0.3%). The children were also able to slice cake (0.3%), and mix juice (0.3%) and Sweet Aid (0.3%).

Food allocated to children - It was evident that most of the families had dining etiquette and a range of food items considered edible or appropriate. Respondents were given the chance to indicate whether there were any foods that were eaten only by the children in their household and to give the reasons for such allocation. The foods that were commonly allocated to and consumed by children were soft maize meal porridge, potato chips (Simba), Twigglies, sweets, biscuits like 'Eat sum more', bananas and apples.

Several reasons were given for such consumption, namely:

- 'It gives me nutrients, vitamins, energy and it makes me healthy' (e.g. brown bread and apples)
- 'My parents are allergic to this food' – (canned fish and maize snacks e.g. Twigglies)
- 'It has sweet taste and it taste nice' – (sweets and ice pop)
- 'To prevent diseases and infections' – (Halls' sweets and vegetables)
- 'The elders eat better foods' – (chicken feet and heads)

Foods avoided by children - The study revealed that some of the children avoided certain types of foods, irrespective of gender. The most commonly avoided foods among this particular age group (10-13 years) were chicken pelvis or rump (khondo), drumstick (tshizwa), beef, sour milk, sausage, traditional beer, alcoholic drinks, cigarettes, chicken gizzards, livers (beef and chicken), eggs, fresh fish, ZCC (Zion Christian Church) tea and chili sauce. Cultural rules and general health were the major reasons offered for avoiding these foods. Some of the superstition- related reasons were:

- 'I was just told that there are certain part of meat that belongs to my father – (chicken rump and drumstick)
- 'Expensive foods are eaten by elders only in our house' – (Liquifruit juice and Hall's squash)
- 'They just follow the order from the ZCC ' – (Maltabella pap and ZCC tea)

- ‘I am allergic to these types of foods’ – (beef and beef products, sour milk, sausages, and fresh milk) and pork
- ‘If is not enough for the whole family the elders have to eat’ – (scones and cold drink)

Forced food intake - The children were also forced to eat certain food items, and they mentioned various foods and reasons for not eating them. The foods children were most commonly forced to eat were delele *(corchorus tridens),* thanga *(pumpkin leaves),* mutshaini *(Chinese cabbage),* mukusule *(dry vegetables),* soft porridge, vowa *(amaranthus thunbergi),* spinach and cabbage. The children generally disliked vegetables, presumably on account of the same vegetable being repeated at every meal. Respondents cited cultural, health and nutritional reasons, including:

- ‘I will get vitamins, nutrients and proteins’ – (dark green vegetables pumpkin leaves, *corchorus tridens*, Chinese cabbage) and sour milk
- ‘To prevent hunger’ – (maize meal soft porridge (stiff) and beef soup)
- ‘To prevent left over in the morning’ – (Stiff maize meal porridge and spinach)
- ‘It is healthy’ – (*corchorus tridens* and maize rice)
- ‘To cure diseases’ – (fresh lemons)

Cultural foods – Respondents ate several Venda dishes because they were available at home. Some of these dishes take a long time to prepare (several hours), for example, tshidzimba. Certain of these foods, such as *thophi,* lead to a high intake of vitamin A, while others, like *bovhola* and *tshidzimba,* are very high in nutrients. Table 4.13 indicates cultural Venda dishes used, with a description of each.

TABLE 4.13: THE CULTURAL VENDA DISHES CONSUMED BY RESPONDENTS

Venda dish	Explanation
Tshidzimba	Stiff porridge of mathuthu boiled with beans, peanuts or jugo beans
Mathuthu	Ripe maize grains (tohola) cooked and eaten as is
Thophi	Pumpkin porridge
Maranga	Small cultivated calabash, eaten when green
Khavhelo	Very young (immature) pumpkin (fruit from pumpkin plant)
Magege	Grass-cutting termites
Luthavhi-thavhi	Dovhi sauce containing no morogo
Dovhi	Sauce or gravy of stamped peanuts, eaten as a savory with porridge
Bovhola	Dish of pumpkin flowers, leaves and small immature pumpkins chopped up and boiled together, as savory or as a meal on its own if nothing else is available

It was very clear that mothers are the family caretakers, because they generally fulfill the role of decision-maker and preparer of the food the children eat. Grandmothers, sisters and the children themselves also had the chance of participating in decision-making on what they were going to eat. However, those respondents who participated in decision-making and meal preparation normally did so during the weekends, especially when they were given permission by the adults. The food they prepared and the decisions they made were based on what was available in the house. Preparation was normally for breakfast, lunch and supper. The most popular task was making tea, putting spreads on the bread, cooking stiff maize meal and soft maize meal porridge, and chopping and cooking vegetables and meat.

Social-cultural practices influenced their food intake because some of the foods cited as being for children were poor in nutritional value, and were particularly low in vitamin A and high in sugar content. On the other hand, food children were forbidden to eat, for various reasons, was high in vitamin A and other nutrients, such as liver. When parents forced their children to eat certain foods that they disliked, it was most likely to improve their intake of beta-carotene, because they were usually made to eat dark green, leafy vegetables.

4.2.2.3 Individual characteristics

Indigenous criteria applied by the children when choosing food from what was available and culturally acceptable included values, attitudes, beliefs and knowledge components (Viljoen, 2001:19). For purposes of this research, the children's beliefs and knowledge about vitamin A-rich foods were studied.

The children were given the opportunity of indicating the reasons for not eating certain foods. Several reasons were given. The reasons were categorized into five groups, namely:

- General health reasons – (referring to general health and well-being of the human body)
- Nutritional reasons – (referring to different nutrients supplied to and needed by the body)
- Sensory reasons – (referring to the senses influencing the choice of foods)
- Misconceptions – (wrong / irrelevant / non-scientific reasons)
- Cultural reasons –(referring to the cultural background and beliefs)

Vegetables (knowledge and beliefs) - The majority of respondents (n=153, 98.7%) indicated that they ate vegetables and gave a variety of reasons (n=212) for doing so (see Table 4.14).

TABLE 4.14: REASONS FOR VEGETABLE CONSUMPTION

General health reasons (31.6%)	Frequency (N=212)	%
- 'To get energy'	12	5.7
- 'To build healthy body in order to have good health'	35	16.5
- 'To prevent infections and diseases'	4	1.9
- 'To grow well'	2	0.9
- 'It is healthy'	10	4.7
- 'To satisfy myself'	4	1.9
Nutritional reasons (56.1%)		
- 'To get vitamins'	44	20.8
- 'To get nutrients'	75	35.4
Sensory reasons (Positive) (8.5%)		
- 'It has nice color'	1	0.5
- 'It has nice taste, glucose, sweet'	9	4.3
- 'It is very nice and I like it'	7	3.3
- 'I just enjoy eating it'	1	0.5
Sensory reasons (Negative) (0.5%)		
- 'I hate them, I don't like them'	1	0.5
Misconceptions (2.4%)		
- 'To get proteins'	3	1.4
- 'To gain weight or become fat'	2	0.9
Cultural reasons (Negative) (0.5%)		
- 'We just eat at home'	1	0.5

General health reasons indicated were fewer (n=67, 31.6%) compared to nutritional reasons (n=119, 56.1%), although the explanation was very generally stated.

In terms of the level of knowledge, most of the respondents (n=150, 96.8%) had some form of knowledge of basic/general nutrition. This was verified by different follow-up questions. When asked *why they thought it was important to eat vegetables,* two themes emerged:

nutritional value (n=93, 47.6%):

- 'It has vitamins'
- 'It has nutrients'
- 'It provides carbohydrates',

general health (n=78, 39.8%):

- 'To build healthy body in order to have good life'
- 'To prevent diseases'
- 'To grow well'
- 'It gives me energy and strength'
- 'To feed my stomach or to be satisfied'.

Another follow-up question posed to verify their knowledge and beliefs was *what they thought could happen to them if they didn't eat vegetables.* Various responses were given and most of these were scientifically-based (nutritional) reasons. However, some (n=48, 26.1%) of the respondents knew nothing at all about the importance of vegetable consumption.

Some scientifically-based reasons, or misconceptions, in their own words, are summarized in Table 4.15.

TABLE 4.15: IMPORTANCE OF VEGETABLES

Scientifically-based reasons	**Reasons**
- 'I won't get vitamins'	Nutritional
- 'I won't get nutrients'	Nutritional
- 'I can be affected by various diseases and sick always'	General health
- 'I won't have healthy skin and not beautiful'	General health
- 'I won't grow properly'	General health
- 'I can become tired about eating meat every day because some meat cause diseases'	General health
- 'I won't feel right'	General health
- 'I won't have good health and healthy body'	General health
- 'My body will be weak and not able to fight diseases'	General health
- 'I won't live proper life'	General health
Misconception	
- 'I won't have energy and power'	Irrelevant
- 'I will loose weight and become skinny or thin'	Irrelevant
- 'Blood pressure will increase'	Irrelevant
- 'I will die'	Irrelevant
- 'Nothing will happen'	Irrelevant
- 'My body will lack proteins'	Irrelevant
Others	
- 'I don't know'	

Fruit (knowledge and beliefs) - All children (n=155, 100%) said they liked fruit, indicating several reasons (n=201) influencing their consumption. These reasons were categorized into the same five groups previously mentioned (see Table 4.16). The children indicated mostly nutritional reasons (n=91, 45.3%), followed by general (n=69, 34.4%) and sensory reasons (n=35, 17.4%) for fruit consumption.

TABLE 4.16: REASONS FOR FRUIT CONSUMPTION

General health reasons (34.4%)	Frequency (N=201)	%
- 'To get energy'	17	8.5
- 'To build healthy body in order to have good health'	34	16.9
- 'To prevent infections and diseases'	8	4.1
- 'To grow well'	1	0.5
- 'It is healthy'	6	3.1
- 'To satisfy myself'	1	0.5
- 'To balance the diet'	2	1.0
Nutritional reasons (45.3%)		
- 'To get vitamins'	53	26.4
- 'To get nutrients'	37	18.4
- 'To get carbohydrates'	1	0.5
Sensory reasons (17.4%)		
- 'It has nice color'	1	0.5
- 'It has nice taste, glucose, sweet'	23	11.4
- 'It is very nice and I like it'	11	5.6
Misconception (2.5%)		
- 'To get proteins'	3	1.5
- 'To gain weight or become fat'	1	0.5
- 'To loose weight'	1	0.5
Culture (Negative) (0.5%)		
- 'We just eat at home'	1	0.5

Although all their reasons could be categorized in the various categories, it was clear that the children did not have very specific knowledge and could provide only vague or non-specific answers. Most of the children (n=123, 70.7%) had some knowledge of the functions of fruit in their bodies. Their thoughts on the consequences of poor fruit intake are summarized in Table 4.17.

TABLE 4.17: CONSEQUENCES OF POOR FRUIT INTAKE

Scientifically-based reasons (70.7%)	Frequency (N=173)	%
- 'I won't get vitamins'	13	7.5
- 'I won't get nutrients'	2	1.2
- 'I can be affected by various diseases and sick always'	58	33.5
- 'I won't have healthy skin and not beautiful'	3	1.7
- 'I won't grow properly'	1	0.6
- 'I won't feel right'	2	1.2
- 'I won't have good health and healthy body'	42	24.3
- 'My body will be weak and not able to fight diseases'	1	0.6
Misconceptions (24.7%)		
- 'I won't have energy and power'	7	4.0
- 'I will loose weight and become skinny or thin'	11	6.35
- 'I can't feel the taste'	1	0.6
- 'I will die'	2	1.6
- 'Nothing will happen'	22	12.7
- 'I won't enjoy life'	1	0.6
Others (4.6%)		
'I don't know'	8	4.6

The majority of the respondents (n=123, 70.7%) mentioned scientifically-based reasons, whereas (n=43, 24.7%) had no knowledge of the importance of fruit consumption.

Healthy food choices. Respondents had to indicate the food they thought was healthiest to eat for breakfast, lunch, supper and as snacks. Table 4.18 summarizes the 18 most commonly chosen food items for the different meal times.

TABLE 4.18: CHILDREN'S CHOICES OF HEALTHIEST FOOD ITEMS FOR THE VARIOUS MEAL TIMES

Breakfast	%	Lunch	%	Supper	%	Snack	%
Tea	18.1	Porridge (stiff)	22.8	Porridge (stiff)	26.2	Sweets	17.3
Porridge (stiff)	10.6	Rice	6.7	Chicken	7.4	Twigglies	13.4
Any bread	9.9	Chicken	5.8	Rice	7.1	Apples	11.1
Maize meal soft porridge	8.1	Any bread	4.1	Mutshaini *(Chinese cabbage)*	4.4	Oranges	6.8
Brown bread	5.2	Mutshaini *(Chinese cabbage*)	4.1	Tea	3.7	Eat sum more	6.8
Corn flakes	4.7	Delele *(corchorus tridens)*	3.7	Any vegetables	3.4	Banana	5.4
Apple	2.9	Any vegetables	3.7	Cabbage	2.9	Potato chips	4.6
Banana	2.3	Spinach	2.8	Pap and meat	2.5	Chocolate	3.2
Oranges	2.3	Any kind of meat	2.5	Delele *(corchorus tridens)*	2.5	Biscuits	3.2
Danone	2.3	Cabbage	2.5	Thanga *(pumpkin leaves)*	2.5	Ice cream	2.4
Thanga *(pumpkin leaves)*	1.8	Cool drink	2.3	Any bread (white or brown)	2.5	Maize snacks	2.2
Mutshaini *(Chinese cabbage)*	1.8	Mukusule *(dry vegetables*)	2.1	Beef	2.2	Juice	1.7
Squash	1.6	Tea	1.8	Spinach	2.2	Pop corn	1.7
Peanut butter	1.4	Beef	1.8	Apple	1.7	Mayo	1.5
Delele *(corchorus tridens)*	1.4	Pap and meat	1.8	Atchaar	1.7	Cool drink	1.2
Spinach	1.4	Banana	1.6	Any kind of meat	1.7	Any fruit	1.2
Any fruit	1.4	Thanga *(pumpkin leaves)*	1.6	Vowa *(amaranthus thunbergi)*	1.5	Naartjies	1.1
Avocado	1.4	Oranges	1.4	Squash	1.1	Guavas	1.1

Seventy two breakfast food items were mentioned. Tea was repeatedly mentioned (19.1%), followed by bread (white and brown) (15.1%) and maize meal porridge (10.6%).

Seventy five lunch food items were mentioned, the most popular being maize meal porridge (22.8%), followed by rice (6.7%) and chicken (4.2%). Dark green leafy vegetables (Chinese cabbage, delele, spinach and thanga), calculated as a group, contributed 15.9% of the total mentioned. Few fruits were listed, none of which were vitamin A-rich.

For supper, 72 food items were mentioned. Porridge was mentioned most often (26.2%), mainly because it is the staple food of the Vendas, followed by chicken (7.4%) and rice (7.1%).

Regarding the snacks items mentioned, it was clear that the children had misconceptions about healthy snacks. Sweets were suggested to be the healthiest item by 17.3% followed by Twigglies (13.4%). Fruit like apples (11.1%) and oranges (6.8%) was, however, included in the smallest categories.

It could be concluded that most of the respondents believed that it was important to eat fruit and vegetables. However, their reasons for doing so were general health reasons. None of the children gave specific reasons or mentioned the different nutrients in the foods. The respondents also indicated health reasons based on their habits or the foods that they ate while growing up at home and at school. The popular foods, which they believed were healthy, were porridge, tea, bread, chicken and dark green leafy vegetables. The snacks most popularly believed to be the healthiest were sweets and Twigglies (Cheese Curls or maize snacks).

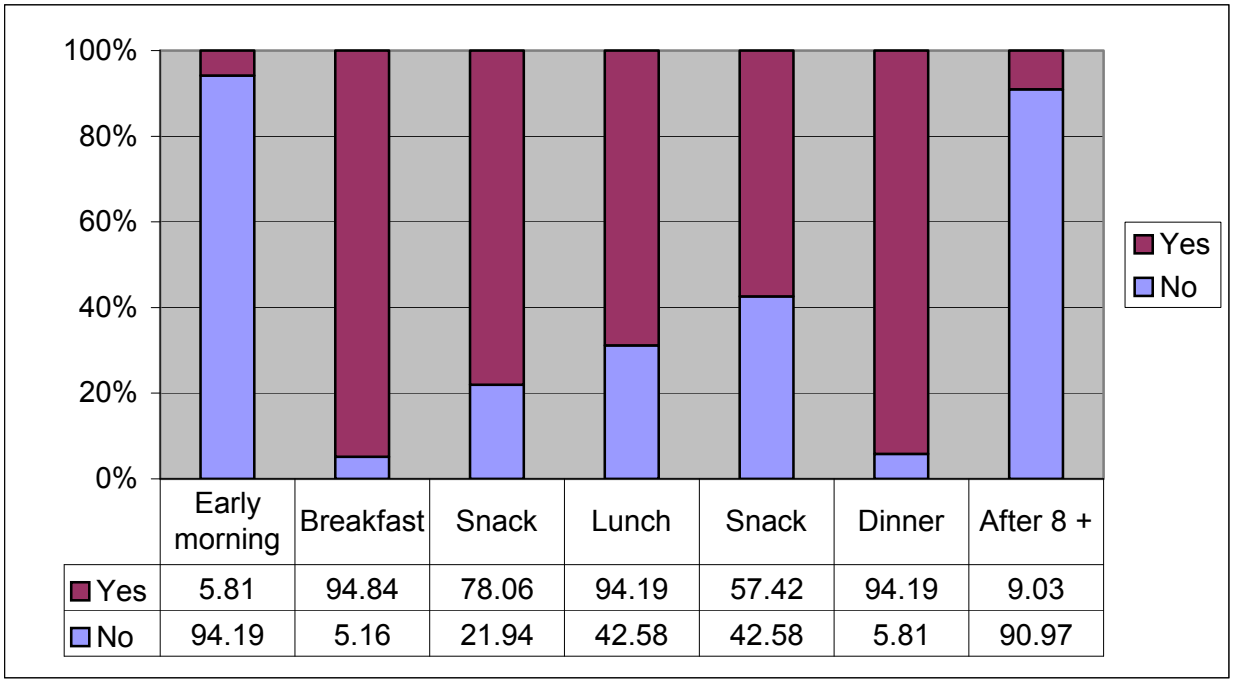
4.2.3 Consumption patterns

The main focus of this research was the intake of vitamin A-rich fruit and vegetables among rural children. The consumption patterns for this study focused on the meal patterns, types of vitamin A-rich foods and the frequency of vitamin A-rich food consumption.

4.2.3.1 Meal patterns

The majority of the respondents (85.2%) had three main meals a day, but some of them (48.4%) had three meals with two snacks in between. Some (36.8%) had three meals with one or no snacks between meals. The rest (14.9%) could afford fewer than three meals a day. The meals most often mentioned by the respondents were breakfast, lunch and supper. The first meal (breakfast) was enjoyed in the morning between 6h00 and 9h00, while the second meal of the day was served between 12h00 and 15h00. The last meal of the day was served after sunset, between 17h00 and 20h00. The snacks were most often eaten between 9h00 and 12h00, during school time, and between 15h00 and 17h00 at home.

Figure 4.9 indicates the different meal patterns of the respondents.



	Early morning	Breakfast	Snack	Lunch	Snack	Dinner	After 8 +
Yes	5.81	94.84	78.06	94.19	57.42	94.19	9.03
No	94.19	5.16	21.94	42.58	42.58	5.81	90.97

FIGURE 4.9: THE CHILDREN'S FOOD INTAKE PATTERNS

The general meal patterns of the children who participated in this research study were compiled from the non-quantitative 24-hour recall carried out specifically for this purpose, as well as from several questions in the questionnaire used to cross-check information given by the children. Most respondents ate breakfast, with only 5.2% of the respondents indicating that they could not afford that meal. There was a high consumption (78.0%) of snacks among respondents during school time, in comparison with afternoon snacks (57.4%) after school. Most (n=146, 94.2%) of the respondents had lunch, with only 5.8% could not afford it. Their meal consisted mostly of maize meal porridge and relish, either vegetable or protein-based (see Table 4.19). Some respondents said they ate bread again for lunch when there were no leftovers of porridge. Supper could be considered the main meal of the day because the majority of respondents (94.2%) had it, and only 5.8% could not afford this meal.

4.2.3.2 Types of foods

Once the meal pattern had been verified, the usual food intake within this pattern was identified from the 24h-recall questionnaire, in which respondents had to indicate all the foods, including beverages, they had eaten or drunk the day before the interview. The cross-checking questions were included. This was done to determine the most common foods in the children's diets. Their responses were coded and categorized into the different food groups. The results of meal patterns, types of foods and frequency of intake are reflected in Table 4.19.

TABLE 4.19: CHILDREN'S CONSUMPTION PATTERNS REVEALED BY MEAL PATTERNS, TYPES OF FOODS AND FREQUENCY OF INTAKE

Foods	<6 Early morning %	6-9 Breakfast %	9-12 Snack %	12-3 Lunch %	3-5 Snack %	5-8 Dinner %	8+ After dinner %
Starchy foods and supplements							
Soft maize meal porridge	12.5	5.9	1.1	-	-	-	-
*Corn flakes	-	0.7	0.5	-	-	-	-
Jungle oats	-	-	-	0.4	-	-	-
*Bread (brown and white)	25	29.4	5.9	2.5		1.7	
Fat cake, scones and muffins	-	1.1	-	-	-	1.4	-
*Tea and bread	-	5.5	-	-	-	0.3	-
*Bread and margarine	6.3	0.4	-	0.4	-	-	-
*Bread and polony	-	-	-	-	-	0.3	-
# Pap (maize meal porridge)	12.5	10.3	9.7	43.5	9.4	44.1	40.7
*Pap and protein(beef, chicken, eggs, fish)	-	-	-	0.4	1.4	0.3	-
Pap and gravy	6.3	-	-	-	0.7	-	-
*Pap and vegetables (Chinese cabbage, Corchorus tridens, pumpkin leaves)	-	1.4	-	1.7	0.7	1.7	-
Rice	-	-	-	0.7	-	1.4	-
Maize rice	-	-	3.2	0.7	-	-	-
Samp	-	-	5.9	0.7	-	0.7	-
Samp and beans	-	-	0.5	-	-	-	-
Protein foods							
*Milk (fresh and sour)	-	0.7	1.1	0.4	-	0.3	-
*Cheese	-	-	0.5	-	-	-	-
Yoghurt	-	-	-	-	1.4	-	-
Ice cream	-	-	2.7	-	1.4	-	-
Meat (chicken and beef)	-	1.1	-	14.4	2.9	17.2	22.2
Mopane worms	-	-	-	0.4	-	-	-
Polony	-	0.4	0.5	-	-	-	-
Peanut butter	-	0.4	-	-	-	-	-
Beans	-	-	1.6	0.7	-	0.7	-
Fish (Baked and tinned)	-	-	0.5	0.7	1.4	1.0	-
*Eggs	-	-	-	1.8	-	1.0	-
Drinks							
Tea	37.5	33.8	2.2	0.7	-	3.1	7.4

Foods	<6 Early morning %	6-9 Breakfast %	9-12 Snack %	12-3 Lunch %	3-5 Snack %	5-8 Dinner %	8+ After dinner %
¥ Juice	-	0.4	0.5	-	1.4	-	-
Squash and sweet aid	-	-	2.2	1.8	-	-	3.7
Coffee	-	0.4	-	-	-	-	-
∞ Cool drink	-	-	-	0.7	0.7	-	-
Fruit							
*Avocado	-	1.5	-	-	1.4	-	-
*Watermelon	-	0.4	-	-	-	-	-
*Paw-paw	-	-	-	-	0.7	-	-
*Mango	-	-	-	-	1.4	-	-
Orange	-	0.7	2.7	0.7	5.0	-	-
Banana	-	0.4	2.2	-	2.2	-	-
Apple	-	-	2.7	0.4	7.2	-	-
Guava	-	-	0.5	0.7	3.6		
Naartjie	-	-	-	-	0.7	-	-
Grape	-	-	-	-	1.4	-	-
Sugar cane	-	-	-	-	1.4	-	-
Wild medlar	-	-	-	-	0.7	-	-
Brown ivory	-	-	-	-	0.7	-	-
Vegetables							
♣ Vegetables	-	0.7	-	3.5	0.7	5.2	7.4
*Dark green leafy vegetables	-	2.9	-	13.0	4.3	8.2	11.1
♥ Dry vegetables	-	0.7	-	0.7	-	2.1	-
*Sweet potatoes	-	-	-	-	-	0.3	-
Cabbage	-	0.4	4.8	4.9	0.7	2.8	-
Potatoes	-	-	-	0.70	0.71	1.03	-
® Gravy	-	-	-	0.35	-	-	-
Snacks							
Biscuits	-	-	7.5	-	10.1	-	3.7
Potato chips	-	-	5.4	-	5.8	-	-
Maize snacks	-	-	3.2	-	0.7	-	-
Puffs	-	-	0.5	-	-	-	-
Pop corn	-	-	2.2	-	-	-	-
Twigglies	-	-	7.5	-	12.2	-	-
Sweets	-	-	15.6	-	8.6	-	-
Chocolate	-	-	1.6	-	1.4	-	-
Halls	-	-	-	-	0.7	-	-
Chappies	-	-	-	-	2.9	-	-
Ice block and ice pop	-	-	0.5	-	2.9	-	-
Mayo (drink yoghurt)	-	-	0.5	-	0.7	-	-
Water	-	-	-	-	-	-	3.7
Others							
Atchaar	-	0.4	-	1.4	-	-	-
€ Soup	-	-	3.8	1.1	-	0.3	-

* Foods high in vitamin A
# Pap or porridge – stiff maize meal porridge made with boiling water and maize flour cooked until thick and very stiff
¤ Soft porridge – soft maize meal or sorghum porridge made of boiling water and flour mixed to a runny consistency
® Gravy – mixture of onion, tomatoes, cooking oil, salt and sometimes an added packet soup
€ Soup – packet soup powder that has been reconstituted, such as minestrone, oxtail produced by Royco or Maggi
¥ Juice – any 100% juice such as Liquifruit and Ceres not mixed with water
∞ Cold drink – any carbonated cold drink like Coca Cola
♣ Vegetables – any green and dry leafy vegetables that act as a supplement to stiff maize meal porridge
♥ Dry vegetables – leafy green vegetables preserved by a drying method to extend storage life
Red color – represents highly consumed foods at different times of the day

4.2.3.3 Frequency

Starchy foods

Starchy foods dominated all their meals (breakfast, lunch, supper and snacks). The starchy foods eaten were mostly stiff maize meal porridge, bread and soft porridge. Stiff maize meal porridge was eaten with cultivated or uncultivated vegetables, whereas some of the respondents also indicated meat, fish, and atchaar as supplements. Maize meal porridge was eaten daily at breakfast by 12.5% of respondents. Bread was either plain or with margarine, peanut butter or avocado as the spread by 25% of the respondents. Alternatively, soft porridge prepared from either maize meal or sorghum meal was most common and this was usually served with sugar. Stiff maize meal porridge was eaten at any of the meals and bread was mostly eaten at breakfast and lunch, while soft porridge was consumed only in the morning for breakfast.

Protein foods

Poor intake of protein-rich food was apparent in the breakfast menus (1.1%). The meat intake was somewhat higher at lunch (14.4%) and even higher at supper (17.2%) and later during the evening (22.2%). Chicken was the main source of animal protein for the respondents and was eaten mainly with major staple foods (porridge). Beef was eaten less frequently because of affordability and the allergies mentioned by the children, especially to beef liver. Low consumption could also be related to cultural rules or beliefs that forbid children to eat liver, because it is reserved for the head of the family or elderly people. Eggs were eaten, being quick to prepare and were also served with porridge. The protein dishes were eaten with maize meal porridge at almost all the meals.

Vegetables

Dark green vegetables played an important role in the children's diet, as indicated in the previous sub-section. The frequency and types of vegetables consumed and the frequency of consumption are presented in Table 4.20.

TABLE 4.20: TYPE AND FREQUENCY OF VEGETABLE CONSUMED

Vegetables	Responses					
	1x per week		2x per week		3x per week	
	N=155	%	N=155	%	N=155	%
Vit A (Spinach, pumpkin, carrots, orange sweet potatoes and butternut)	43	27.7	44	28.4	68	43.9
Vit C (Peas, potatoes, cabbage, tomatoes and lettuce)	36	23.2	49	31.6	47	30.3
Others (Onion, beetroot, cauliflower, gem squash and mushrooms)	33	21.3	23	14.8	35	22.6

VIT C: Missing (n=23, 14.8%) - they were unwilling to answer even though questions were put to them.
OTHERS: Missing (n=64, 41.3%) - they were unwilling to answer even though questions were put to them

Only (n=68, 43.9%) of the respondents ate vitamin A-rich vegetables (spinach, pumpkin, carrots, *morogo*, orange sweet potato, butternut) more than three times a week, whereas (n=47, 30.3%) all the respondents ate vitamin C-rich vegetables three times per week, while only (n=35, 22.6%) ate vegetables rich in other vitamins and nutrients three times per week.

Fruit

Oranges, apples and bananas were most commonly eaten by respondents at school. A more complete record of the types of fruit consumed and the frequency of consumption are presented in Table 4.21

TABLE 4.21: TYPE AND FREQUENCY OF FRUIT CONSUMED

Responses						
Fruit	1x per week		2x per week		3x per week	
	N=155	%	N=155	%	N=155	%
Vit A (Apricots, watermelon, avocado, mangoes, paw-paw & yellow peaches)	35	22.6	20	12.9	65	41.9
Vit C (Guavas, kiwi, litchi, orange, lemon & naartjies)	30	19.4	40	25.8	78	50.3
Others (Apple, banana, grapes, pear & pineapple)	30	19.4	39	25.2	78	50.3

VIT A: Missing (n=35, 22.6%): they were unwilling to answer even though question was asked.
VIT C: Missing (n=7, 4.5%): they were unwilling to answer even though the question was asked.
OTHERS: Missing (n=8, 5.2%): they were not willing to answer even though the question was asked.

Only 41.9% of the respondents ate vitamin A-rich fruit (apricot, watermelon, avocado, mango, paw-paw and yellow peaches) more than three times per week. Half of the respondents (n=78, 50.3%) ate vitamin C-rich foods more than three times per week, because oranges and guavas were in season (winter), as was also fruit rich in other nutrients and vitamins, such as apples and bananas.

Drinks /beverages

Consumption of tea was very high (70.1%) during the morning meal and the consumption of cold drink was very low (0.7%) at lunchtime. There were no specific beverages that respondents drank after each meal. If they had money, they would buy a drink like coke or juice. Money was the limiting factor as far as beverage consumption was concerned. Ice cream, ice block, ice pop and mayo (drinking yoghurt) were most often consumed.

Snacks

The majority of respondents (n=129, 83.2%) indicated that they liked eating snacks between meals, and only (n=26, 16.8%) didn't like snacks at all. Most (78.1%) of the respondents had morning snacks, while 57.4% ate them in the afternoon. Some of the respondents had no specific times when they ate snacks; they just did so whenever they had money. Only (n=17, 10.1%) ate snacks at school, while (n=15, 9.7%) ate them at home. Amongst those who

snacked between meals, the most preferred snacking foods were 'junk foods' (63%) like sweets, rather than healthy snacks (36.8%) like fruit.

Favorite and least liked foods

The respondents were also given the opportunity of indicating both their favorite and least-liked snack foods. The favorite snacks were biscuits ('Eat sum more', Marie and Lemon Creams) (15.1%). Also popular were maize snacks (Nik Naks, Twigglies, Cheese Curls) (30.5%), sweets (5.1%), chocolate (5.1%), ice cream (4.2%) and fruit (oranges, apples and bananas) (15.4%). The least-liked snacks were Puffs (6.34%), Jigglies (4.2%) and ice block (3.4%). None of the children listed vitamin A-rich foods as their favorite snack.

It could be concluded that the children's general meal pattern was three meals a day with two snacks between meals. Only a few of them had less than three meals a day. The foods eaten most often at meals were bread, tea, stiff and soft maize meal porridge, dark green leafy vegetables and meat (chicken). Stiff maize meal porridge was mostly eaten for breakfast, lunch and supper, with its supplements; however, bread with tea were mostly eaten for breakfast.

4.2.4 Foods rich in vitamin A

As one of the purposes of this study was to investigate and describe the types of vitamin A-rich foods typically consumed by 10-13 year old children, a non-quantitative food frequency questionnaire (NQFFQ) was conducted. The different vitamin A–rich foods selected for this study were included because their Retinol Equivalent (RE) values were above 50 RE per 100g of each food. The RE is a unit developed to standardize the measurement of variable vitamin A activity in different vitamin A sources: 1RE = 3.33 IU vitamin A activity from retinol

(Internet: Nicus: 1999:2). The RE was used to measure the value of these foods high in vitamin A. The values of the selected foods are presented in addendum D.

This section describes the types and frequency of vitamin A-rich foods consumed by respondents. It was measured by seven frequency periods, such as: never or less than once a month, 1-3 times per month, once a week, 2-3 times per week, 4-6 times per week, once a day, 2-3 times per day and 4+ times per day. However, to reduce the data from the seven frequency periods, the portions were categorized into three periods, namely low (never or less than once a month and 1-3x per month), medium (once a week and 2-3x per week) and high (2-3x per week, 4-6x per week, once a day, 2-3x per day and 4+x per day). To further simplify the data, the foods were also divided into six sub-groups (vegetables, fruit, animal products, dairy products, fats & oils, and bread & cereals) according to vitamin A content, as indicated in Table 4.22.

TABLE 4.22: FREQUENCY OF VITAMIN A - RICH FOODS CONSUMED

Vitamin A-rich food	Low (1-2)	Medium (3-4)	High (5-8)
Vegetables			
Broccoli	98.0	1.9	-
Beetroot leaves	70.3	25.8	3.9
Butternut squash	65.2	29.7	5.2
Carrots	51.0	42.6	6.5
Green beans	58.7	34.2	7.1
Imfino (Morogo)	5.2	56.1	38.7
Parsley	98.7	1.3	-
Peas	94.2	5.2	0.7
Pepper (red)	78.1	17.4	4.5
Pumpkin	54.8	39.4	5.8
Spinach	19.4	57.4	23.2
Sweet potato (orange)	57.4	37.4	5.2
Sweet potato (white)	61.7	32.9	5.2
Fruit			
Apricots	98.1	1.9	-
Avocado pear	9.0	46.5	44.5
Mangoes	86.5	6.5	7.1
Paw-paw	59.4	29.7	11.0
Peaches (yellow)	92.9	4.5	2.6
Prunes	100	-	-
Watermelon	76.1	20.7	3.2
Animal products			
Beef liver	85.8	12.3	2.0
Chicken liver	47.7	40.0	12.3
Lamb liver	98.1	1.3	0.7

Vitamin A-rich food	Low (1-2)	Medium (3-4)	High (5-8)
Sheep liver	98.7	0.7	0.7
Chicken giblets	40.7	51.6	7.7
Egg	73.6	20.7	5.8
Dairy products			
Yellow cheese	88.4	7.7	3.9
Cream	34.2	45.2	20.7
Ice cream	63.9	29.7	6.5
Yoghurt	45.8	40.0	14.2
Milk	27.7	47.1	25.2
Fats and oils			
Butter	82.6	9.7	7.7
Margarine (Flora, Sunshine, Nuvo, Rama, Blossom, Stork)	23.9	36.1	40.0
Bread and cereals			
Enriched bread (Sasko, Albany, Sunbake, Blue ribbon)	1.3	18.7	80.0
Enriched maize meal (Super Sun, Iwisa, Ace, Tafelberg, White Star, Impala)	1.9	2.6	95.5
Kellogg's (All Bran, Corn flakes, Bokomo, Weet-bix)	72.9	18.1	9.0
Whole wheat Pro Nutro	91.6	5.2	3.2

Red color – represents highly consumed food per period
Blue color – represents fairly consumed food per period
Black color – represents poorly consumed food per period

4.2.4.1 Beta-carotene

Vegetables: The intake of *morogo* was medium, with 56.1% of the children eating it three to four times per week, followed by spinach 57.4% three to four times per week as well. There was poor identification of broccoli, parsley and peas, which leads to low intakes. More than 90% of children never ate these vegetables. Even well-known vegetables like carrots (49.3%), green beans (41.3%) and pumpkin (45.2%) were eaten by only some respondents more than three times per week.

Fruit: The majority of respondents (46.5%) ate avocado pear three to four times per week, whereas a fairly similar number (44.5%) had a high consumption rate of more than five times per week. The consumption of apricots and prunes was very low, with more than 95% of the children never eating these fruits, for which there was poor identification.

4.2.4.2 Retinol-rich products

Animal products: The majority of the children (59.4%) ate chicken giblets more than three times per week and 52.3% had chicken liver more than three times per week as well. The intake of eggs was high, with 72.3% eating them more than three times per week. The intake of liver (lamb, beef, and sheep) was very low, with more than 80% of the children never having it.

Dairy products (milk based) – the consumption of both ice cream (6.5%) and milk (25.2%) was fair for those consuming it more than five times per week, whereas consumption of yellow cheese and yoghurt was low with more than 60% never eating them.

Fats and oils - the consumption of butter was low because it was more expensive than margarine. Margarine was most affordable and popular, with 40% of children eating it more than five times per week on bread, while only 23.9% of the respondents ate it less than twice per week.

4.2.4.3 Fortified foods

Bread and cereals: The consumption of maize meal was highest, with 95.5% eating it more than five times per week (daily). This was followed by bread, 80% consuming it daily. The consumption of breakfast cereals was very low, with more than 70% never consuming Kellogg's and whole-wheat Pro Nutro.

It was clear that the most frequently eaten beta-carotene vegetables were *morogo* and spinach, while avocado pear was the most frequently consumed beta-carotene rich fruit. Chicken giblets and milk were the most popular retinol products. Margarine, porridge and bread were the most fortified products eaten more than five times daily. Generally, the foods

that contributed most to the children's diet were beta-carotene vegetables (*morogo* and spinach) and fortified foods (pap and bread).

4.2.5 Correlations of vitamin A rich food variables and food habit variables

All the food habit variables identified in the literature review conducted were included in the conceptual framework model, and were all investigated. The selected variables identified were used to test the correlations with two-way tables. The variables were defined explicitly for the purpose of the two-way analysis of variables (see Table 4.23).

TABLE 4.23: EXPLANATIONS OF THE VARIABLES APPLICABLE UNDER THE IDENTIFIED TERMS IN THE CONTEXT OF THIS STUDY

Terms	Variables	Explanation
Food habits	Accessibility	Indicating where they eat fruit and vegetables: home only or home + school
	Indigenous vegetables	Indicate consumption of wild vegetables that measured by: yes or no
	Indigenous fruit	Indicate consumption of wild fruit that measured by: yes or no
	Frequency of vegetable intake	Indicate daily consumption of vegetables or not
	Frequency of fruit intake	Indicate daily consumption of fruit every day or not
	Family rules	Rules mostly made by the mother or grandmother, which influence their food intake
	Children's foods	Foods allocated in the family for only children's use
	Adult foods	Foods that children are forbidden to consume but that older people eat
	Forced foods	Foods that children are forced by family members to eat
	Children knowledge	Children's knowledge about the importance of fruit and vegetables intake
	Personal preferences	Preferences influencing children to choose certain foods
Consumption pattern	Meal pattern	Three meals (breakfast, lunch and dinner) + two snacks
		Three meals (breakfast, lunch and dinner) + one or no snacks
		Fewer than three meals per day
Vitamin A-rich foods	Beta-carotene	Fruit and vegetables naturally high in vitamin A
	Retinol	Animal products naturally high in vitamin A
	Fortified	Foods fortified to improve vitamin A content

The two-way tables and chi-square test was used to test the associations between two categorical variables. Referring to the non-quantitative food frequency questionnaire, the

seven frequency periods (see FFQ, Table 4.24) were used to measure the types and frequency intake of vitamin A-rich foods in the various categories of vitamin A. However, to determine categories of low, medium and high intake of the different categories of vitamin A-rich foods, some of the categories were combined. For each frequency category mentioned, the frequency was calculated as portions used per month (study conducted during June - 30 days) as follows (see Table 4.24):

Example: *never or less than once per month* meant that a child could indicate zero or one portion used per month. To give the respondents the benefit of the doubt, the mid-point of the frequency range was always used. Therefore, the mid-point is between 0 and 1 = 0.5 portions per month.

TABLE 4.24: CALCULATED PORTION SIZE

Initial category	Calculation	Portion consumed
Never or less than once a month	0 and 1 =	0.5 portion
1-3 per month	1-3 =	2 portions
Once a week	30/7 =	4 portions
2-3 per week	2.5 x (30/7) =	10.71 portions
4-6 per week	5 x (30/7) =	21.42 portions
Once a day	30 x 1 =	30 portions
2-3 per day	2.5 x 30 =	75 portions
4+ per day	5 x 30 =	150 portions

Following this, the portions of beta-carotene and retinol-rich foods were categorized into low (<1 per day), medium (1-2 per day) and high (>2 per day), because the recommended daily intake of beta-carotene (fruit and vegetables) is one fruit rich in vitamin A and one rich in vitamin C per day, including also the daily intake of other fruit or vegetables that are rich in other vitamins (Stadler, 2003:3).

Fortified foods, however, were categorized into low (<3 per day), medium (3-4 per day) and high (>4 per day), because the recommended daily allowance for starch and cereals is 6-11 portions per day. This is assuming that half of those (3-4 portions) may be from fortified or

enriched food sources like maize meal and bread (SA), which is normal for the children in this study (Love, Maunder, Green, Ross, Smale-Lovely & Charlton, 2001:7-8).

Based on these categories of intake levels low (<1 per day), medium (1-2 per day) and high (>2 per day)), a two way table and chi-square test were used to test for associations between two categorical variables, such as the relationship between each of the categories of vitamin A-rich foods (beta-carotene fruit and vegetables, retinols and fortified foods) and the identified food habits (accessibility, indigenous food, frequency, family rules, beliefs, knowledge and personal preferences).

Beta -carotene (vegetables) and food habits

There was no evidence of a statistically significant association (p-value <0.05) between intake levels of beta-carotene vegetables and food habits variables (accessibility, frequency, family rules, foods for children, forbidden and forced foods). However, children who consumed high (88.2%) beta-carotene vegetables in more than two (>2) portions per day showed a tendency (p-value >0.0938) towards a higher indigenous vegetable intake compared with children (71.9%) who ate less than one (<1) portion per day of beta-carotene vegetables.

Beta -carotene (fruit) and food habits

In the case of beta-carotene fruit, there was a positive association between intake levels and the frequency of intake (p-value <0.05). Children who ate more than two (>2) fruits per day were more likely to include beta-carotene fruit in their daily diet (40.7%) compared with children who were eating less than one (<1) fruit per day (21.4%).

There was also statistical evidence of a significant association between intake levels and food allocated to children (children's food) (p-value<0.05). A high percentage (94.9%) of the children who ate more than two (>2) beta-carotene fruits per day were more likely to have foods allocated in their family only to children compared with children who ate less than one (<1) beta-carotene fruit per day (66.7%). Therefore the percentage of children with no family beliefs on children's food decreased as they ate more beta -carotene rich (see Table 4.25 and Figure 4.10).

TABLE 4.25: BETA-CAROTENE RICH FRUIT ASSOCIATIONS

Beta-carotene rich fruit	>2 per day	1-2 per day	<1 per day	p-value
Fruit daily	40.7%	44.4%	21.4%	0.0496
Children's food beliefs	94.9%	77.8%	66.7%	0.0011

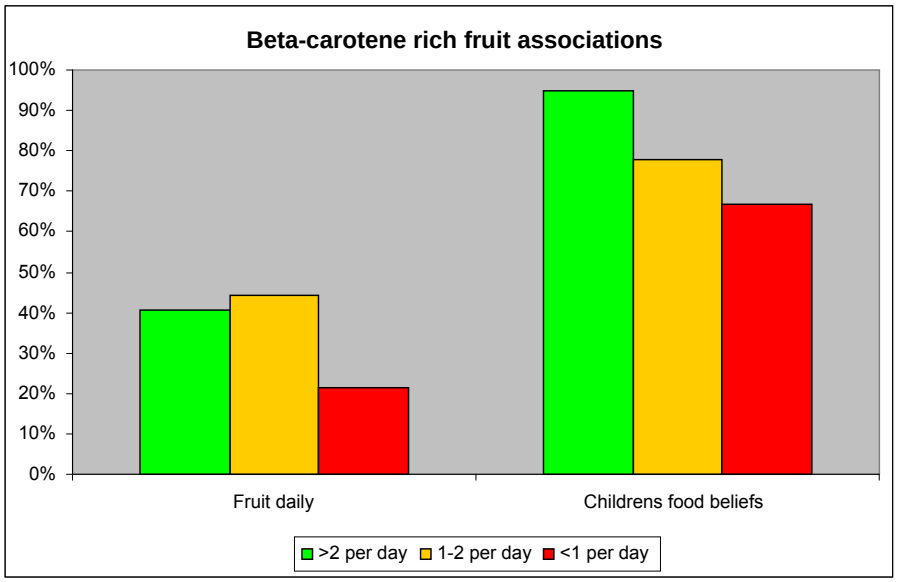


FIGURE 4.10: BETA-CAROTENE-RICH FRUIT ASSOCIATIONS WITH FOODS HABITS

Children who ate more than two (>2) portions per day of high (91.5%) beta-carotene fruit showed a tendency (p-value >0.0877) towards a higher indigenous fruit intake than children (83.3%) who ate less than one (<1) portion of beta-carotene fruit per day. There was no evidence of a statistically significant association (p-value >0.05) between intake levels and other food habit variables (accessibility, family rules, forbidden and forced foods).

Retinol and food habits

There was no evidence of a statistically significant association (p-value >0.05) between the intake level of retinol foods and all food habits variables (accessibility, indigenous food, frequency, family rules, beliefs, knowledge and personal preferences).

Fortified food and food habits

In the case of fortified foods, there was statistical evidence of a significant association between intake level and family rules (p-value<0.05). Children who ate 3-4 portions per day (6.3%) were less likely to have family rules than children who eat <3 portions per day (24.4%) (See Table 4.26 and Figure 4.11).

TABLE 4.26: FORTIFIED FOODS ASSOCIATIONS

Fortified foods	>4 per day	3-4 per day	<3 per day	p-value
Family rules	92.4%	93.8%	75.6%	0.0116
Children's food Beliefs	89.4%	64.6%	87.8%	0.0017

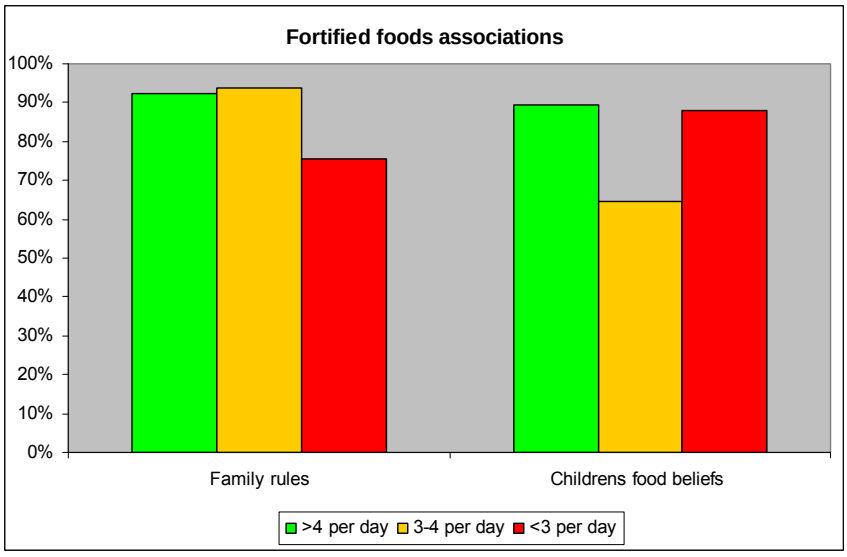


FIGURE 4.11: FORTIFIED FOODS ASSOCIATIONS WITH FOODS HABITS

There was also statistical evidence of a significant association between intake level and children's foods (p-value<0.05). Children who ate fortified foods more than four (>4) times per day were more likely to have food allocated to children only in their family (89.4%) than children who ate 3-4 portions per day (64.6%). There was no evidence of a statistically significant association (p-value >0.05) between the level of fortified food intake and some food habits variables (forbidden and forced foods).

4.2.6 Correlations of consumption pattern variables and food habits variables

As has already been indicated, the general meal patterns of the children who participated in this research study were compiled from the non-quantitative 24-hour recall carried out specifically for this purpose, and secondly from several questions in the questionnaire used to cross-check information given by the children. The meals were categorized into three main meals and two snacks (48.4%), three main meals and one or no snacks in between meals (36.8%) and lastly into <3 meals (2 or 1 meal only) (14.9%).

Meal pattern and food habits

There was a statistically significant association between the responses to the intake level of meals and the accessibility of vegetables (p-value <0.05). A higher percentage of those children (38.4%) who ate 3 meals and 2 snacks per day were more likely to consume vegetables at home and at school than children (4.4%) who ate fewer than three meals per day.

Regarding meal patterns, there was also a statistically significant association between the responses to the intake level of meals and the accessibility of fruit (p-value <0.05). Children who ate 3 meals and 2 snacks daily were less likely to eat fruit at home only (36.6%) than

children who had 3 meals and one or no snacks in between meals (58.9%) (See Table 4.27 and Figure 4.12).

TABLE 4.27: MEAL PATTERN ASSOCIATIONS

Meal pattern	3 meals & 2 snacks	3 meals & 1 or 0 snacks	< 3 meals	p-value
Vegetables at home & school	38.4%	20.3%	43.5%	0.0022
Fruit at home & school	63.4%	41.1%	54.6%	0.0434
Children's food beliefs	91.8%	66.1%	87.0%	0.0006
Adults' food beliefs	84.9%	54.2%	78.3%	0.0004
Children forced to eat	82.2%	61.0%	87.0%	0.0072

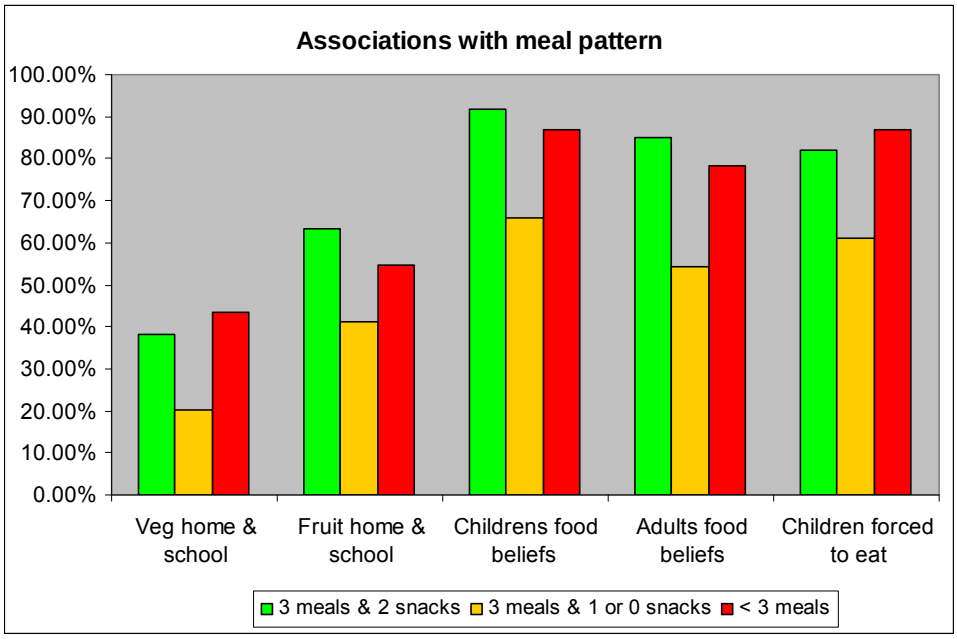


FIGURE 4.12: MEAL PATTERN ASSOCIATIONS WITH FOOD HABITS

The percentage of children who ate indigenous fruit increased with the increase in the number of meals, <3 meals (78. 3%) 3 meals and one or no snack (91.5%) 3 meals and 2 snacks (94.5%). This showed a tendency (p-value >0.0589) towards a higher indigenous fruit intake compared with that of children (78.3%) who ate fewer than three (<3) meals per day.

There was statistically significant association between the responses to intake level of meals and children's foods (p-value <0.05). A higher percentage of children (91.8%) who eat 3

meals and 2 snacks are more likely to have food allocated in their families only to them than children who eat 3 meals and one or no snacks (33.9%) per day.

There was also a statistically significant association between the responses to the intake level of meals and forbidden foods (p-value <0.05). A higher percentage of children (84.9%) who ate 3 meals and 2 snacks daily were more likely to have restricted food in their families than those children who ate 3 meals and one or no snacks in between meals (54.2%).

Regarding meal patterns, there was a statistically significant association between the responses to the level of meal intake and forced foods (p-value <0.05). Children who consume 3 meals and 2 snacks (82.2%) were more likely to eat forced foods than those who had 3 meals and one or no snacks between meals (61.0%). There was no evidence of a statistically significant association (p-value >0.05) between meal pattern and some food habits variables (intake of indigenous vegetables, indigenous fruit, frequency of vegetables and fruit, family rules).

4.3 DISCUSSION

This study was initiated with the specific aim of exploring and describing the consumption patterns of vitamin A- rich foods among 10-13 year old children living in a rural area in Venda. A quantitative research paradigm was chosen for this research and three different data collection methods were implemented, namely, a questionnaire designed to obtain information regarding food habits and demographic information, a non-quantitative food frequency questionnaire, and a non-quantitative 24- hour dietary recall. The interpretations of the discussion were carried out in accordance with the objectives set for this study. The purpose of this section is to discuss general issues of importance and certain aspects that

emerged in the results. These were integrated into the key findings of the results in terms of the sub-sections and objectives of the study.

4.3.1 Socio-demographic information

A high percentage of these rural children were living in poor conditions and had to fetch water from the communal taps. These findings corresponded with the results of Labadarios *et al* (1999: 536), who found that a very high percentage of the rural population still lives in poor socio-economic conditions. In fact, during the study, several families were buying water from those with boreholes in their yards owing to a shortage of water in their communal taps. Most (65.2%) of the children lived in formal houses with separate kitchens (*tshitanga*), which were mostly owned by fathers as the head of the family. Nearly half of the sample (47.1%) lived with their relatives in an extended family situation. However, this was expected, considering the fact that most rural Venda families include grandparents and other family members.

It was very clear that most of the people who were employed in this community were fathers, the majority (68%) of whom had full-time jobs. They worked in different areas as professionals (doctors/nurse/teachers) and 29% as domestic/ garden / contract workers. As the majority of the families were receiving grant money each month, it was obvious that grants played an important role in supporting their families. Breadwinners who were unemployed could support their families with those grants, especially the child grant from the government. The child support grant is a poverty-alleviation grant. It is aimed at supporting the children's caregivers in seeing to their basic needs, and contributes some of the resources necessary for their adequate growth and development. Given the depth and breadth of income poverty in South Africa, it is an essential mechanism for ensuring that children receive adequate nutrition and have their other basic needs met (Leatt, 2004:4).

The majority of respondents had electricity in their houses. This was used mainly for basic demands/needs like lights, refrigerators, radios and televisions. Even though they had two-plate electric stoves, they still preferred using firewood for cooking. These results were similar to the results of Faber *et al* (2002: 1051) in KwaZulu- Natal (Ndunakazi), who found that large numbers of households had electricity but preferred wood as an energy source, cooking on an open fire inside their dwelling. Most of the older women prefer fire for cooking, so that they can save electricity (money). Others cannot cook food on electrical stoves because they do not know how to operate them. Some are of the opinion that food cooked using firewood tastes better than that cooked on an electric stove. According to Labadarios *et al* (1999: 322), it is clear that, in tribal and rural areas of residence, an open fire is by far the most commonly-used facility (approximately 50% of residents), which was the case in the Limpopo Province.

4.3.2 Food habits

4.3.2.1 Food availability

Seasonal availability and accessibility appeared to be major factors influencing vegetable and fruit consumption among these rural children. In other studies (Kristjansdottir, Thorsdottir, De Bourdeaudhuij, Due, Wind & Klepp, 2006; Molaison e*t al*, 2005; Blijham *et al*, 2006; Blanchette & Brug, 2005), availability contributes to explaining the children's fruit and vegetable consumption. Unlike these studies, this one studied fruit and vegetable consumption separately.

Vegetables

Seasonal availability was found to be the strongest influence on vegetable consumption, because most of the vegetables mentioned by respondents were types that were abundant only in the winter season, this study being conducted during the winter of 2006. At this time there was a high availability of spinach and mutshaini *(Chinese cabbage)* and other uncultivated vegetables like *Corchorus Tridens* followed by *Amaranthus* and Black Jack. This corresponded with the findings of Hart, Azubuike, Barimalaa & Achinewhu (2005:6-7) in Nigeria, indicating that vegetables were consumed seasonally by a study group of mothers with children less than five years of age. It also agreed with the results of Hendriks & Msaki (2005:2), who indicated that seasonal availability had a strong influence on consumption patterns, especially in the case of peanuts, legumes and vegetables, because the types grown depend on the season.

However, the current study showed clearly that home gardens played an important role in vegetable consumption for these respondents, because they got cultivated vegetables (spinach, pumpkin leaves and Chinese cabbage) freely from their backyard gardens. These findings agreed with the results of Faber *et al* (2001:15), who state that home gardens played an important role in improving the dietary intake of vitamin A-rich foods in households in Ndunakazi. It was also confirmed by Blijham *et al* (2006:8), who found that one-third of the households in La Trinidad, Philippines, ate the fruit and vegetables growing in their backyard gardens.

Results also revealed that the diet of these rural children was supplemented by wild dark green leafy vegetables like Delele (*Corchorus Tridens*), Vowa (*Amaranthus*) and Mushidzhi (Black jack). The availability of these indigenous vegetables depends mainly on seasonal availability, as fresh delele is commonly found during summer. However, they consumed dry delele all year round. These results were similar to those of Van Vuuren, (2006:22),

indicating that South African communities have supplemented their diets with an array of indigenous vegetables, mostly collected (by women) where they were growing wild in the veldt. Indigenous crop species like *Amaranthus*, Black jack, Gallant solider and Spinder plant (*Cleome gynandra*), collectively known as *morogo or imifino*, are believed to be excellent sources of micronutrients (including vitamin A, folate, vitamin C, iron and protein). In periods when there is low availability of vegetables, exposure to fresh vegetables is limited, leading to consumption of dried vegetables (dried leafy vegetables), which are poor in vitamin A. According to Armar-Klemesu, Rikimaru, Kennedy, Kido & Takyi (1995:9) sun-drying destroys up to 60% of the carotenoid content of green leaves, thus limiting their nutritional contribution to the diet.

The results also indicated that there were different reasons for the consumption of wild vegetables by these children. Nutrient intake was the positive reason for indigenous vegetable consumption, such as 'to build healthy body because it is healthy'; it shows that even young primary school children (aged 10-13 years) have some general knowledge of the importance of indigenous vegetable consumption. However, there were also negative reasons, such as 'I eat because my mother and grandmother likes it'. This confirms the fact that mothers and grandmothers were the role models for these children as far as indigenous vegetable consumption is concerned, because the children imitated them in what they eat. It shows further that social pressure from family members also influenced their intake, because sometimes they ate vegetables only to please their parents. Some of the negative reasons influencing them to consume these vegetables were 'we get them free', 'it prevents diseases' and 'there is no option because it is cooked at home'.

This study, however, revealed that the accessibility to cooked, dark green leafy vegetables was poor at school compared with home, probably because the children consumed what was catered for them in their school feeding scheme meal. Cabbage was the most commonly available cooked vegetable eaten at school, but it is low in vitamin A. These results

corresponded with the findings of Kristjansdottir *et al* (2006:5), who found availability at home to be one of the most important determinants of children's intake, because, when there is a high availability or accessibility to fruit and vegetables, they eat more than those with less availability or accessibility. The results also concurred with that of Molaison e*t al* (2005:248), who indicate that an environmental factor impacting on fruit and vegetable consumption is lack of availability. Participants said that fruit and vegetables were not available at home on account of low affordability.

Seasonal availability and accessibility had been observed to be the influence on fruit consumption in this study, because the types of fruit mentioned most often were in season by the time of the study. Most respondents indicated guavas as the most popular fruit at home, probably because they were abundant and easily accessible, even though they are poor in vitamin A.

The results observed indicated that almost all the schoolchildren ate fruit at home. As was also indicated by Befort, Kaur, Nollen, Sullivan, Nazir, Choi, Hornberger & Ahluwalia (2006:369), home availability of fruit correlated strongly with fruit consumption. However, the study revealed lower availability of vitamin A- rich fruit at schools and higher availability of other fruit like apples, oranges and bananas, probably because they were either included in the school feeding scheme, or could be bought at tuck-shops or from vendors around schools, because it was easy to find apples and bananas in the local market at lower prices all year round. This was also indicated by another study by Kristjansdottir *et al* (2006:5), which found that the actual average consumption of fruit and vegetables at schools in Iceland is low, but as many children bring fruit from home to the school to eat at break time, the availability at home appears to be a more important determinant of fruit and vegetable intake in that country. It can therefore be concluded that a low availability of fruit and vegetables in the environment will subsequently lead to limited exposure to these foods (Blanchette *et al,* 2005:433). In this study, there were, however, several places where children were likely to

eat fruit, namely at friends' houses and in restaurants. Molaison *et al* (2005:249) reported the same findings, that locations where children were likely to eat fruit and vegetables outside their homes was at school, in restaurants and at the homes of other family members/friends.

Before the introduction of cropping practices for producing foreign tropical or subtropical fruit (such as mango, avocado, citrus, macadamia and papaya), the Venda people used to eat indigenous fruit obtained in the veldt. Venda has many kinds of indigenous fruit that served as a diet for the Venda people (Tshikhudo, 2005:19). However, in this study, respondents indicated a higher consumption of wild fruit after school compared with the intake of cultivated fruit. Fruit collected from indigenous trees and plants was used to supplement the intake of cultivated fruit. It was obvious that these children were exposed to indigenous fruit that influenced their intake and shaped their food habits. As the nutrient content of most indigenous fruit is unknown, the intake of vitamin A from such fruit is also unknown and contributions are therefore not guaranteed. Subsequently, there is a need for nutrient analyses of wild/indigenous fruit in South Africa to determine their contribution to the diets of rural people.

In previous research it was indicated that fruit consumption is mainly in the child's control, so if a child chooses to eat fruit, availability is a factor that either facilitates or impedes this behavior (Reinaerts, De Nooijer, Candel & De Vries, 2007:256). In this study, respondents indicated various vague reasons influencing their consumption of indigenous fruit, such as 'It has vitamins, nutrients'; showing that these children have positive but very general nutritional knowledge about the consumption of fruit. Some of the non-specific or negative reasons indicated by the children include 'it taste nice', 'to keep myself busy in the bush', ' my friends are eating as well' and ' I just admire it or just ate'.

The availability of fruit alone may not be enough to influence consumption among adolescents (Befort *et al,* 2006:370). The current study found that money was also an

influence on consumption, as respondents bought fruit at a reasonable price when it was in season. Also, rural children seldom went to town to buy fruit. Most of the respondents rarely ate cultivated fruit, being unwilling to purchase it at the market on account of the expense (Khetarpaul, 2006:129), particularly when it was out of season.

4.3.2.2 The socio-cultural environment

As this study confirms that at the family level the mother was the main household member to take decisions about the preparation of food and what children ate at home. Another study found that the mother was the main caretaker in the household and played a central role in the supply, preparation and distribution of food among the household members (Blijham *et al*, 2006:10). However, this study found that the grandmother and other relatives, like a brother or sisters, are also becoming an important factor in decision-making on food intake. This is especially discernible among extended families, where grandparents live with their siblings or relatives in the household. In fact, this was even more likely to occur, because whole families sometimes depended on a grandmother's grant or pension, and she could buy groceries according to the money she had. This also corresponded with the results of Molaison *et al* (2005:249), who found that the mother or grandmother was most often mentioned as making decisions about what the participants ate at home, mainly because they did the cooking and chose the food. However they also influenced fruit and vegetable consumption, as it was grandparents who grew vegetables and maintained the home gardens.

This research study found that children hardly ever made decisions on food choices, and did so only when granted permission by their elders. This took place mainly in the afternoons after school, because they were usually alone at home. These decisions were also quite limited, as they were based on what was available in the house. However, the findings of Blijham *et al* (2006:11) indicated that children (7-12 years) were allowed to make their own

decisions as to what kind of foods they ate, especially when their mother was pressed for time and assigned one of the children, mostly a daughter, to take over the food practices. This was also confirmed by Molaison *et al (*2005:249), who found that adolescents of 10-13 years were the ones who made decisions about what they ate at home, perhaps because older adolescents are more involved in the decision-making about fruit and vegetable intake (Zabinski, Daly, Norman, Rupp, Calfas, Sallis & Patrick, 2006:820). In another study, respondents indicated that they did not choose what they ate at home if their mother or grandmother was present but did make their own decisions in their absence (Molaison *et al*, 2005:249). In this study, the same response was given by the respondents in Vyeboom village.

Most of the children (35.5%) indicated that they helped prepare meals and snacks at least twice a week. However, it was clear that all the food that parents and grandparents allowed children to prepare was modeled on their own cultural practices. They prepared only what was available at home and accorded with their cultural beliefs. This was confirmed by previous research in SA indicating that children from rural areas adhered to traditional habits and practices (Kruger, Kruger & MacIntyre, 2005:5). Culture generally plays a leading role in food consumption, because it establishes how people use food in their environment and consequently it affects their food intake (Asp, 1999:289).

Several foods were repeatedly prepared by children at all mealtimes. These included cutting and spreading bread (brown and white), cooking stiff maize meal porridge (starchy foods), chopping and cooking cabbage, drying vegetables and preparing fresh dark green leafy vegetables like spinach, Chinese cabbage, pumpkin leaves and *corchorus tridens* (vegetables) for later use, cooking protein foods like chicken or beef, cutting and frying sausage, and frying or boiling eggs. Tea was always prepared to accompany bread, usually in the mornings. Another research study reported that children (aged 10-13 years) helped with the preparation of meals and snacks. Girls were involved in various tasks to do with

food preparation, such as chopping vegetables (onion, celery, potatoes or cabbage), or cooking simple dishes like noodles. Males either did not cook or were involved only in very simple food-associated tasks (Molaison *et al*, 2005:248). In this research study, stiff maize meal porridge was the most popular food that children helped to prepare at home, followed by slicing and spreading bread (white and brown), cutting and cooking dark green leafy vegetables, cabbage, meat (chicken and beef) and sausages, and making tea. Foods less often prepared by children included cooking rice and chopping or mixing salad ingredients, probably because they tended to eat these food items only on Sundays and special occasions.

The results of this study also indicated that culture played an important role in shaping children's food habits regarding the type of food they ate at home. Hart *et al* (2005:7) confirmed that culture played a leading role in vegetable consumption, despite seasonal abundance and the fact that it was farmed, thus showing the deep-rootedness of the people's food culture. For the most part, people relied on bitter leaf vegetables that are easily grown in the backyard. It was also suggested by Hart *et al* (2005:7) that reasons for this could be deduced from the finding that food habits develop within a framework of culture, which consists of values, ways of thinking, customs and habits that are socially learned as people get used to what is physically available and economically feasible in their local environment

Family rules were found to play a role in the diets of children of all ages. This was similar to the results of De Bourdeaudhuij, (1997:49), who confirmed, in a study carried out in Belgium, that family food rules could be identified as relevant predictors of adolescents' eating behavior. On the other hand, Zabinski *et al* (2006:819) found that a household's rules and strategies were the only variables associated with food choices for both fruit and vegetable intake. However, in the present study, family food rules seemed to be important predictors of the foods named by the children as the ones they regularly ate. The foods indicated were

poorer from a nutritional point of view, especially in vitamin A, but were high in energy. These foods were as follows: potato chips (Simba), Twigglies, sweets, biscuits like 'Eat sum more', soft maize meal porridge, banana and apple (poor in vitamin A). This may have been possible because parents were attempting to use snack foods as a reward for consuming healthier foods (Reinaerts *et al*, 2007:256), especially when they wanted children to complete a chore.

Asp (1999:289) indicated that religious rituals and beliefs about certain foods have specific symbolic meanings, or alternatively there may be prohibited foods or food taboos. The study revealed that the children avoided certain types of food for various reasons. The foods avoided at ages 10-13 years included chicken pelvis or rump (khondo), drumstick (tshizwa), beef and beef products, alcohol, livers (chicken and beef), eggs, fresh fish, and ZCC tea. It was indicated in other literature that there was a population growth and the adoption of a new lifestyle by Vhavenda people (Tshikhudo, 2005:24). However, these results found that old food restrictions were still practiced in this community, such as certain parts of meat being reserved or belonging to the head of the family, especially the fathers and grandfathers. These restrictions also have a negative influence on the intake of vitamin A, because respondents indicated foods that were rich in vitamin A, such as livers (beef or chicken), milk and eggs as prohibited to some children. It was found that most of the children reported being allergic to beef liver (liver or beef in general) and were therefore not allowed to eat it. This seems a strange allergy to occur so commonly in this community, as beef products are not known allergens. It might indicate the parents use this as a reason for reserving preferred food items for their own intake.

Even though there were foods that children were forbidden to eat, there were also foods that they were forced to eat. For this study, foods forced on the children by their parents (especially mothers) were leafy vegetables like dry vegetables, pumpkin leaves, Chinese cabbage and spinach. Most of the children, however, did not want to eat vegetables every

day, and particularly disliked having the same vegetables day after day. This finding corresponded with the results of Reinaerts *et al*, (2007:255-256), indicating that vegetable consumption by children is often a topic of argument in many households and many children are more or less forced to eat them. However, this study concluded that parents forced children to eat these foods in order to prevent leftovers, food spoilage or hunger (there would be no other vegetables to eat) and because vegetables are good for them. But these results contrast with those of Cullen, Baranowski, Rittenberry, Cosart, Hebert & De Moor (2001:194), who reported that black parents did not prepare or encourage consumption of fruit and vegetables. It can be concluded that, when parents forced their children to eat vegetables, it could lead to higher intakes of carotenes and other nutritious foods, but when left to their own devices, children chose poorly, according to their preferences. These results confirm recommendations made by Blijham, *et al,* (2006:11) that mothers and grandmothers should encourage or force children to eat nutritious foods, because, when they are strict enough, other influences like friends or commercials on television would not play such a significant role in their food choices. The dietary habits of children were also clustering within families, probably due to modeling, whereby children imitate the behavior of their parents (Cullen *et al*, 2001:192; Blanchette *et al*, 2005:433).

It was indicated that the adoption of Western culture seems to have much to do with negative perceptions leading to young people being less willing to eat traditional foods/vegetables and to learn about them. Knowledge about these plants (Van Vuuren, 2006:23) is consequently disappearing. However, the current study showed that there were several traditional dishes that respondents ate within the family circle such as *thophi*, *tshidzimba* and *bovhola*. They ate these foods at home and some indicated that their mothers had told them to eat them because these were traditional dishes. It was important for the children to eat traditional foods (for example, *tshidzimba,* a high protein dish) because this indicates their origin or cultural background, and the dishes are healthy. Amongst the traditional foods that were indicated as being used, some were high in vitamin A, such as *thophi*. The grandmothers

usually played a role in the preparation of these traditional foods, as it takes skill, patience and time to prepare traditional dishes.

4.3.2.3 Individual characteristics

It was clear that, personal factors had a strong influence on the children's intake of cultivated fruit and vegetables. Vegetables are more often eaten as part of a meal than as snacks, and various reasons influencing their consumption were indicated. In terms of the level of personal knowledge, most of the respondents were found to possess some basic knowledge of nutrition. The most important positive reasons given by the respondents were 'to build healthy body in order to have good life' and 'to get vitamins and nutrients' from the vegetables and fruit that they ate. From these findings, as with other research, it was clear that today's children are completely different from children of five or ten years ago, as they are now more knowledgeable, they have increased access to information and have a greater knowledge and understanding of current issues. Children are, however, still rooted in the home and their families are still their most important social group (North & Kotze, 2001:96).

Blanchette *et al* (2005:434) found that children of 10-13 years indicated taste preferences as probably the most important determinant contributing to fruit and vegetable consumption. This is in agreement with other researchers who have studied the reasons for fruit and vegetable consumption (Molaison *et al*, 2005:249). In this study, however, taste was offered by only a few respondents as a determinant of consumption. Only (17.42%) indicated sensory reasons for fruit intake and they were not the major influence. Children indicated that they didn't like a bitter taste, which would lead to avoidance of certain vegetables like muxe and xaxadi. They also indicated that they ate fruit because it tasted sweet, but vegetables were mostly eaten for reasons of health than sensory preferences (taste).

It was clear that respondents had general knowledge of the importance of fruit and vegetables to their health, although none of them had specific knowledge on the types of vitamins in different fruit and vegetables. This was also corroborated by some of the more probing questions, but respondents repeatedly gave the same answers, which were generally non-specific and were only about good health. This agreed with the results of the study by Edwards *et al* (2002:370), which indicated that the two most important reasons for fruit and vegetable consumption were health (62%) and provision of the vitamins needed for a healthy life. It also correlates with the results of the study by Kruger & Gericke (2001:67) on breast-feeding mothers with children 0-36 months in rural areas of South Africa. Health reasons were mentioned for the consumption of fruit and vegetable, such as 'it is good for the baby', 'it has all vitamins and nutrients that is good for the baby' and also 'these foods are healthy'. In this study, respondents perceived general health and nutritional reasons as the most important in fruit consumption. 'To get vitamins', 'nutrients', 'to build healthy body' and 'to prevent infections or diseases' were some of the reasons, in their own words, showing some knowledge on the part of rural children.

The children's choices of the healthiest foods for the various meals focused mainly on food availability and current food consumption. As such, there was little variation among the different meals. However, tea, stiff maize meal porridge, bread and soft maize meal porridge were the most popular breakfast items indicated. It was clear that the children perceived a dichotomy between foods that are good for them and foods that are habitually eaten by their family. Judging by the children's responses, protein foods were not popular and were not regarded as one of the healthiest foods to eat for breakfast. Another study found that children perceived an opposition between foods that are good for them and foods that taste good, and children decide how healthy they think a food is on the basis of how good or bad it tastes (Burchett, 2002:102). However, this study found that the same items were eaten for both lunch and supper, owing probably to the generally limited variety in their diets. The only

carotene-rich foods indicated were a variety of dark green vegetables. Protein dishes like beef and chicken were also indicated to a limited extent.

It was clear that children indicated healthy foods according to their usual food intake and their preferences. For example, chicken was more popular than beef, probably because most of the respondents mentioned allergies as reasons for avoiding beef. An allergy to meat among this many children is highly unlikely, as red meat is not known to be a highly allergenic food (Tompson *et al*, 2005:104; Whitney *et al*, 2005:561), and the life-threatening food allergy reaction of anaphylactic shock is most often caused by peanuts, tree nuts, milk, eggs, wheat, soybeans, fish and shellfish (Tompson *et al*, 2005: 104; Whitney *et al*, 2005:561). It could be inferred that parents told children this to pacify them when the male or the breadwinner of the household ate meat. Furthermore, meat (beef) is expensive in comparison to chicken.

Most of the snack foods respondents claimed to be the healthiest to eat between meals were not healthy at all and were poor sources of vitamin A. It was clear that children decided how healthy they thought a snack was by how good or bad it tasted (Burchett, 2002:102). Sweets were the most popular snack item indicated followed by Cheese Nacks, or maize snacks (Nik Naks). The snacks mentioned as good for contributing different nutrients and vitamins were: apples, oranges and bananas, because of accessibility in their environment. However, biscuits (Tennis, Marie and Lemon Creams) were also incorrectly listed as healthy food items.

It could be concluded that the respondents believed the healthiest starchy foods to be bread, maize meal porridge and rice. However the healthiest relish to be eaten as a supplement was seen as delele *(corchorus tridens),* mutshaini *(Chinese cabbage)*, spinach, thanga *(pumpkin leaves)* and meat (chicken and beef). The healthiest fruit chosen was apples, followed by bananas and oranges, whereas tea was chosen as the healthiest drink.

Exposure obviously influenced the children's preferences, because their choice of healthy foods conformed to what they were used to within their environment.

4.3.3 Food consumption patterns

Food consumption and nutrient intake have been, and remain, the subjects of intense research over the last decade, not only because of their importance in children's growth and development, but also because of the increasing realization that eating habits in the early stages of life may be important determinants in the prevention of the so-called chronic degenerative diseases (Labadarios *et al*, 1999:857). However, culture generally plays a leading role in food consumption, because it dictates how people use food, consequently affecting their food intake (Asp, 1999:289). Cultural factors therefore have a particular influence on people's food patterns and behavior (Roux, Couedic, Durand-Gasselin & Luquet, 2000:94). It is apparent that certain aspects of food habits are difficult to change, such as the concept of meals, meal patterns, the number of meals eaten in a day, when to eat what during the day, how food is acquired and prepared, the etiquette of eating and what is considered edible (Asp, 1999:288).

4.3.3.1 Meal pattern

In general, children's meal patterns as observed in this study conformed to three main meals per day (breakfast, lunch and supper). These children also ate either two snacks or no snacks between meals. It was found by Labadarios *et al* (1999:537), that the main meal pattern for children (aged 1-9 years) was primarily three daily meals, with (44%) or without (31%) snacks between meals. However, these current results differ in the results of Manning, Mann, Sorphangisa & Truswell (1974:486), who indicate that the rural Venda people traditionally have two meals a day, one at noon and the other after sunset. Love and Sayed

(2001:29) observed that regional and ad hoc food nutrient studies describe black rural dwellers as eating two main meals a day, consisting of maize meal with green leafy vegetables, and wild spinach or pumpkin. The differences between the observed results in this study and previous studies by Manning *et al* (1974:486) & Love *et al* (2001:29) are mainly owing to the fact that children eat one meal at school in the morning as part of the feeding scheme. At home they have lunch after school and supper in the evening. When fruit is available at home, they have that. In contrast, it was indicated that, at the national level, one out of three children did not have three meals a day in some provinces (at least one out of seven children), while a number of children did not eat anything between meals (Labadarios *et al*, 1999:537).

4.3.3.2 Types of food consumed

Almost all the children ate a regular breakfast. This corresponded with the findings of Labadarios *et al* (1999:537), who indicated that, nationally, the majority (almost 90%) of children (1-9 years old) ate breakfast. Children who did not do so were less likely to meet their daily nutrition needs. Instead, they had a higher intake of fat and a poorer micronutrient status (Labadarios *et al*, 1999:858). In this study, the most popular breakfast foods were bread, stiff maize meal porridge and tea. Those who had breakfast were able to improve their vitamin A intake because they ate fortified foods (bread and maize meal porridge) at home.

However, the school-feeding scheme provided soft and stiff maize meal porridge, cabbage, soup, bread, squash, samp, maize rice and Tshidzimba. The school meal was the first of the day for some children and the second for those who ate at home before school, because the school meal was normally served between 10h00 and 11h30, in order to prevent temporary hunger, to increase performance and to increase children's school attendance (Kallman, 2005:7; Engelbrecht, 2005:1). Apples, oranges and bananas were also provided in the feeding scheme. The least favorite foods in the school feeding scheme were soup, maize

rice and soft porridge, whereas stiff maize meal porridge, bread, samp and cabbage were the favorites.

After school, respondents had lunch at home. This meal consisted of maize meal porridge with relish, which was vegetable-based: morogo (wild or cultivated) or dark green leafy vegetables, and cabbage or protein-based, like chicken. Tea had always accompanied bread at home.

Stiff maize-meal porridge with vegetables or a protein-based relish was served for supper. The pattern of vegetable-based relishes, porridge and meat was similar to those prepared for lunch, indicating that this was a general practice. Supper could be considered the main meal of the day, because the majority of respondents ate it with their families. According to Labadarios *et al* (1999:537), 87% of all children of all ages across the country shared the main family meal. It was reported that children and adolescents who ate dinner with their families consumed food in a healthier dietary pattern and nutrient intakes, which included more fruit and vegetables as well as more fiber and micronutrients (Labadarios *et al*, 1999:878-879). This study found that these children's diets were very high in dark green leafy vegetables and fortified starchy foods. Even though they shared the family meals at home, fruit and animal products, which contribute to vitamin A intake, were low.

Snacking between meals was uniformly high. Junk foods (Twigglies and sweets) were consumed more frequently than healthy snacks. The favorite and most eaten snacks were maize snacks (Nik Naks, Twigglies), and sweets and chocolate. This corresponded with the results of Kruger *et al* (2005:6), indicating that 10-15 year old children in the North West Province also consumed large amounts of empty-kilojoule snack foods (Cheese Curls, sweets). This was possible because these junk foods were very cheap, readily available and accessible in the spaza shops or from vendors at school or at home.

4.3.3.3 Frequency of intake

Overall, children had simple dietary habits, as maize meal porridge is an integral part of the Venda diet and provides vitamin A and energy at a very low cost. At the national level, the five most commonly eaten foods included maize, white sugar, chicken, vegetables (potato/sweet potato) and white rice (Labadarios *et al,* 1999:352). In the current study, the children's daily intake of maize meal porridge was higher than that of any other starchy food (bread, rice, maize rice and samp). Their meals also consisted of soft porridge with sugar, bread with tea, porridge with dark green leafy vegetables and occasionally meat (chicken or beef). This corresponds with the results of Kruger *et al* (2005:371); Faber & Benade (2002:4); Labadarios *et al* (1999:540), indicating that rural people mainly ate staple foods and their diets lacked variety. The poor dietary variety and the low consumption of fruit and vegetables could result in inadequate intakes of most micronutrients, thus increasing the risk of multiple micronutrient deficiencies. Other South African researchers have also indicated high consumption of cereal or starch-based staple foods (maize meal, bread and rice) among 10-15 year old children in the North West Province (SA) (Kruger *et al*, 2005:6).

4.3.4 Vitamin A intake

It was observed that in Vyeboom village the favorable climate allows for growing fruit and vegetables, which are important sources of vitamin A, such as dark green leafy vegetables, mango and papaya. But it was clear that, even in a food environment like that of the research area, where some vitamin A-rich foods were available and accessible seasonally, the consumption of fruit was low. Similarly, Love *et al* (2001:24) indicate that a considerable number of children do not meet the South African FBDGs of consuming five portions (400g) of fruit and vegetables every day. Whereas, according to the current study, children were doing slightly better only when consuming vegetables rather than fruit, presumably because

of greater seasonal availability, and green leaves being freely accessible in the veldt and gardens, mostly cooked as an accompaniment to stiff maize meal porridge.

As indicated by Lee *et al* (2003:19), the appropriate daily intake of vitamin A for children is 600 retinol equivalents (RE) for 9-11 year old male and female children. These amounts could easily be achieved by eating five to nine fruit and vegetable portions each day, including at least one vitamin A-rich portion per day, thus ensuring an adequate intake of beta-carotene and other carotenoids (Tompson *et al*, 2005:277).

4.3.4.1 Beta-carotene

From the NQFFQ it was concluded that the majority of respondents (above 90%) never consumed broccoli, parsley and peas. These vegetables were unknown to the children. Beetroot leaves, on the other hand, were familiar, but were seldom eaten at home. Butternut squash, carrots, green beans, red peppers and pumpkin were occasionally eaten, especially on Sundays with rice, because it is not the kind of vegetable that can be eaten with maize meal porridge (staple food).

Morogo and spinach were frequently eaten, which simply confirmed the possible influence of season, availability and accessibility of vegetables in this rural area, because the study covered the peak period for these vegetables. However, varieties of uncultivated wild dark green vegetables (*morogo*) were eaten all year round and culture modeled what to pick for consumption (Hart *et al*, 2005:7). As was earlier indicated, it is also possible that respondents from this rural area are habitual consumers of dark green leafy vegetables. According to Mackeown & Faber (2005:101), the most frequently consumed vitamin A-rich vegetables were pumpkin or butternut, spinach and morogo (a collection of dark-green leaves eaten as a vegetable). Research carried out in a rural Ghana community found that approximately 99% of vitamin A-intake is from plant sources in the form of pro-vitamin A or

beta-carotene, derived mainly from dark green leafy and other vegetables (Amar-Klemesu *et al*, 1995: 9). It was also clear that sweet potatoes (orange and white) were eaten less frequently and were not available in home gardens. The consumption of a food item more than four times per week shows that a particular food is eaten almost every day of the week (Hart *et al*, 2005:7). As far as this study is concerned, it really showed a higher intake of vitamin A.

It was clear that the vitamin A intake of these rural children was from beta-carotene rich foods, which was also indicated by Kruger *et al* (2005:373). The more often the children consumed dark green leafy vegetables, the higher were their serum retinol levels (Spearman's rho=0.21, p=0.01) (Kidala, Greiner & Gebre-Medhin, 2000:425). This could be ascribed to the fact that these vegetables and fruit are the only affordable sources of micronutrients in the diets of poor households (Special Issue, 2003:2). These vegetables also provide 70-90% of total vitamin A intake owing to their high content of pro-vitamin A carotenoids (De Pee *et al*, 1995:75).

Consumption of apricots and prunes was very low with the majority of respondents (>95%) never eating them, presumably because they were not familiar with them. Even mangoes and peaches were seldom eaten; over 85% of the children had never experienced them, probably because the study did not cover these fruits' season. Mangoes are seasonally freely available during summer (from December) in Vyeboom village. The study covered the peak period of paw-paw, but the consumption of this fruit was poor because it was not a favorite. Avocado pears were eaten more frequently, probably because they were in season at the time of study. They are cheap, and are often eaten as an accompaniment to bread. Season was thus the strongest influence on fruit consumption among children in this rural area. This was followed by availability and accessibility.

When the types of vegetables eaten was considered, there were higher intakes of dark green leafy vegetables compared to low intakes of orange vegetables. This was common because dark green leafy vegetables were eaten as a supplement to porridge, and they grew freely in gardens, on cultivated land and in the bush. This was in contrast to butternut and carrots, which had to be bought in shops. These findings correspond with the results of Khetarpaul (2006:135), who reported that green leafy vegetables and other vegetables were consumed according to availability.

This study shows that, during winter, children obtained vitamin A mainly from paw-paw in their home gardens; and from avocado pears and sweet potatoes, which that they bought from the shops at a reduced price owing to seasonality. The evidence from another study showed that increased availability and accessibility of fruit and vegetables were associated with increased consumption among children (Blanchette *et al*, 2005:433).

4.3.4.2 Retinol

About half of the vitamin A in human diets is the preformed vitamin A found in animal foods like beef liver, chicken liver, eggs and whole-fat dairy products (Tompson *et al*, 2005:281). The recommended daily intake of meat is two to three servings per day (pyramid); however, good sources of vitamin A include animal livers and eggs (Tompson *et al*, 2005:284). At least one chicken liver supplies the body with 1473 RE of vitamin A, whereas one boiled egg can supply 40 RE of vitamin A (Internet: Nicus: 1999:3). Generally, liver consumption was poor with the majority (>90%) of respondents never eating it. Many respondents (>81%) indicated that they never ate beef liver. When probed as to their reasons, some children (37%) indicated that they were allergic to beef liver. Furthermore, most of them were forbidden to eat it for cultural reasons: ‘they just told me that it is the food for adults especially head of the family’ and ‘it is expensive, therefore not given to children’. It was indicated that poor rural children in developing countries have only limited access to these expensive vitamin A-rich

animal foods, including milk, meat and eggs (Low *et al*, 2001:4; King *et al*, 1993:33; Tompson *et al*, 2005:280).

According to the food pyramid, the recommended daily intake of dairy products is two to three servings. Rich sources of vitamin A include full cream milk, which provides 80 RE of vitamin A / 250ml, and cheese (matchbox size piece) providing up to 100 RE of vitamin A (Internet: Nicus: 1999:3). Consumption of yellow cheese was, however, low, probably on account of the price and the need for refrigeration. Bread was mostly eaten as such (no spread or filling), or simply with either margarine or jam. According to Ramakrishnan, Martorell, Latham & Abel (1999:2025), dairy products like milk were consumed less frequently by preschool children in South India. Less than one third of the children consumed these foods at least once a week, whereas a large proportion rarely or never consumed them. Food like dairy and meat products containing preformed vitamin A are therefore often too expensive for most people in African countries, especially those living in rural communities (Hagenimana *et al*, 1998:289).

The recommendation for fat consumption is to use it sparingly (FBDGs, 2004:22). However, the intake of two teaspoons of margarine per day could supply up to 75 RE of vitamin A. Dietary fat (e.g. oil or margarine) is needed for absorbing vitamin A, especially when it is derived from vegetable sources (Internet: Nicus: 1999:3). The consumption of butter was low because it is more expensive than margarine. Margarine was most affordable and popular and was eaten every day with bread.

4.3.4.3 Fortified

There was a high consumption of fortified foods in this rural community, with maize meal porridge and bread being eaten twice daily. Bread consumption was high, possibly because of its inclusion in the school feeding meals, in contrast with the SANFCS, where it was found

that the consumption of both white and brown bread was relatively low among younger children (aged 1-6 years), who are at greater risk of vitamin A deficiency. As children grow older, their bread consumption increases more steeply in comparison with any of the other foods that are part of the consumption pattern, which continues into adulthood (Labadarios *et al,* 1999:911-912). It was indicated that, because of the higher vitamin A requirements of the oldest group of children (aged 7-9 years), the total grain (bread and maize) fortification would provide only about 75% of the requirements for these older children

In the Limpopo Province, where the highest prevalence of vitamin A deficiency occurred among children, it was indicated that fortification of maize meal with vitamin A enjoyed a high degree of intake by rural children, because they ate porridge as a staple food (Hendricks *et al*, 2001:6). However, this contrasts with the results of Kruger *et al* (2005:369) in their study on the comparison of the diets of urban and rural people, where rural people ate mainly unfortified starch foods like maize meal and sorghum porridge, rice and bread, and small amounts of vegetables and animal protein foods. These results support the findings of Hendricks *et al* (2001:4) that in South Africa some foods have already been fortified, including those like margarine, bread, maize-meal and breakfast cereals. As from the 7th October 2003 all maize-meal and bread flour in South Africa were fortified (Internet: Department of Health, 2004:1). Ninety-three percent (93%) of children of all the survey age groups were consuming maize, with the highest frequency in North West Province (100%) and the lowest (76%) in the Western Cape, as well as in informal urban areas (87%). Maize meal offers the best potential for delivering multiple vitamins and minerals to the widest spectrum of the population, including lower income groups (Labadarios *et al,* 1999:916). There was low consumption of breakfast cereals because they are expensive and unfamiliar to the children.

From the NQFFQ it can be concluded that green leafy vegetables were consumed more frequently than orange vegetables. There were also poor intakes of fruit high in vitamin A,

probably because most of it was out of season during the time of the study, and paw-paw was not a favorite fruit. It is important to make available more potent and sustainable food sources of pro-vitamin A carotenoids, and to improve their production and shelf life, because they are the most affordable to rural children. The consumption of foods rich in retinol was low, simply because they are expensive and not really affordable. But the consumption of fortified foods was high, considering that the children ate porridge and fortified bread every day as a staple food.

4.3.5 Correlations of variables regarding vitamin A-rich foods and food habits

Indigenous vegetables correlated significantly with the intake of beta-carotene. About 88.24% of the children who consumed more than two (>2) portions of beta-carotene-rich products were more likely to include indigenous vegetables in their diet. It could be concluded that, if children consumed more indigenous vegetables, their intake of beta-carotene would increase and subsequently their exposure to and intake of wild vegetables. It was found by Reinaerts *et al* (2007:256) that exposure contributes to the explanation of vegetable consumption even when controlling for preferences. There was no evidence of statistically significant associations between the intake levels of beta-carotene-rich vegetables and food habits variables (accessibility, frequency, caretaker, and foods for children, forbidden and forced foods).

The results also indicated the positive correlation between the frequency and the intake of beta-carotene rich fruit. It was clear that children who consumed one to two fruits per day were more likely to eat beta-carotene fruit every day, and it was recommended that, in order to reach adequate beta-carotene intakes, one fruit rich in beta-carotene must be eaten every day. It could be concluded that the more children consumed more fruit, the more it would increase their intake of beta-carotene. A high percentage (78.57%) of the children who

consumed less than one (<1) fruit per day were more likely to have a poor intake of beta-carotene. The less children consumed fruit every day, the poorer their intake of beta-carotene from fruit, resulting in a high risk of vitamin A deficiency.

A positive correlation was found between the foods allocated only to the children in the family and the intake of beta-carotene-rich fruit. It was clear that the more children consumed the foods allocated only to them, the more they included beta-carotene fruit in their diet. Furthermore, the children who consumed more than two (>2) fruit per day were more likely to have food allocated to them, thus influencing the high intake of beta-carotene fruit. It could be concluded that increased use of family rules about the right and wrong foods for children would increase the intake of beta-carotene-rich fruit among children.

The exposure of children to indigenous fruit correlates positively with the intake level of beta-carotene-rich fruit, because the more familiar the children were with the different wild fruit, the more of it they ate. However, the nutrients analyses of these fruits are unknown, and therefore their intake would not guarantee their getting a high beta-carotene intake from wild fruit. But children who consumed one to two fruits per day were more likely to include indigenous fruit in their diet. It could be concluded that indigenous fruit plays an important role in the children's diets. There were no significant correlations between the intake level of beta-carotene fruit and other variables of food habits (accessibility, caretaker, forbidden and forced foods).

There was also no statistically significant association between the intake level of retinol-rich foods and all the variables of food habits (accessibility, indigenous fruit and vegetables, frequency, caretaker, beliefs, knowledge and personal preferences).

There was, however, a positive correlation between the intake level of fortified foods and family rules (caretaker). This was confirmed by the data indicating that children who ate three

to four portions of fortified food per day were more likely to follow family rules or to consume what the caretaker prepared and decided for them. This meant that mothers and grandmothers played an important role in influencing children to have a high intake of fortified foods, which is similar to the normal recommendation (FBDGs) of making starchy foods the basis of all meals, at least 6-8 servings per day for children >7-13 years (Department of Health: 2004:12). In this study, however, the consumption of four servings was recommended as high enough to meet vitamin A recommendations on fortified foods. Children who ate fewer than three (<3) portions of fortified food per day were less likely to eat what the caretaker prepared or decided for them. They normally ate what was available because the decision was obvious – their food choices were limited.

The intake level of fortified foods also correlated positively with children's foods. Children who consumed more than four (>4) portions per day of fortified foods were more likely to eat food allocated to them. It was clear that the more allocated food children ate, the more their intake of fortified foods increased, which meant that most of the foods allocated to children were fortified staple food (maize meal soft porridge). There was no evidence of a statistically significant association between the level of fortified food intake and the food habits variables (forbidden and forced foods).

4.3.6 Correlations of variables regarding consumption patterns and food habits

All the independent variables on food habits correlated significantly with the children's meal pattern (3 meals + 2 snacks, 3 meals + 1 or 0 snacks and <3 meals), with the exception of indigenous vegetables, frequency of intake, fruit intake and family rules. In the present study, however, 38.36% of the children who ate 3 meals + 2 snacks per day were likely to include vegetables in their meals, and they ate them both at home and at school. Access to vegetables for those who consumed less than three (<3) meals per day was very low, both at

school and at home, which meant that their consumption was limited. It was clear that the percentage of access to vegetables increased as the number of meals increased from <3 meals (4.35%) – 3meals + 2snacks (38.36%). As children consumed more meals, they had greater access to vegetables both at home and at school. However, those who ate <3 meals were likely to have access to vegetables only at home, probably because their parents forced them to eat them to prevent hunger, and because there was no other option.

In this study, children who consumed 3 meals + 2 snacks per day were more likely to eat fruit at school and at home. This was understandable, considering the fact that there were spaza shops around the school selling fruit cheaply. Sometimes fruit was included in the school feeding scheme. But at home, seasonal availability played a role by affecting easy accessibility to their home gardens. Fruit is most often consumed volitionally and therefore it has greater potential to become routine (Reinaerts *et al*, 2007:256).

Exposure was also particularly important in explaining children's fruit consumption, because 94.5% of the children who ate 3 meals + 2 snacks per day were more likely to include indigenous fruit in their diet. It was therefore clear that these children were exposed to indigenous fruit and that their consumption was high.

The findings also indicated that the household rules allocating certain food only to children correlated positively with the level of meal intake. It was clear that the more children had food allocated only to them, the more meals they consumed. The children had developed the belief that there was food only for their consumption in their household and it seemed important for them to eat it.

There was a significant correlation between forbidden foods and children's meal patterns. Most of the children (84,9%) indicated that there were foods that they were not allowed to eat, but which the adults ate. Children who consumed 3 meals and 2 snacks per day were

more likely to follow family rules about food allocation. Children who consumed <3 meals per day had less restricted food in their families. It had already been found that children who consumed more meals ate most of the food that was allocated them by the family. Those who have less restricted foods in their diets ate what elders had and possibly at the same time.

It was further found that parental control also correlated with the children's meal patterns. This is in contrast with the results of Reinaerts *et al* (2007:256), indicating that the way parents try to control their children's diets does not always influence intake in the way they intend. In the present study, parental control was correlated with both fruit and vegetable intake. Those children eating more meals (3meals + 2 snacks) were more likely to be forced to eat food. This correlates well with the results of Zabinski *et al* (2006:820), indicating that family support was the only significant correlate of fruit and vegetable intake for girls.

Chapter 5

CONCLUSION AND RECOMMENDATIONS

5.1 CONCLUSIONS

This chapter presents the conclusions of the results in terms of the objectives for this study. Recommendations for further research are proposed.

5.1.1 Summary

Vitamin A deficiency (VAD) continues to be a major health problem in developing countries. It is also a serious public health problem in the low-income populations in less industrialized societies. In South Africa, in 1999, one out of three children under the age of six years had poor/ marginal vitamin A status. The provinces most seriously affected by VAD were Limpopo, KwaZulu/Natal, Mpumalanga, North West and the Eastern Cape. This study set out to investigate the consumption patterns of vitamin A-rich foods by 10-13 year old children in rural areas. The study aim was to explore and describe the food consumption patterns of vitamin A-rich foods of 10-13 year old children living in a rural area in Venda, and consequently to make recommendations on nutrition education in this regard.

This reflects on the objectives set for the research project, namely to explore and describe the consumption patterns of vitamin A-rich foods of 10-13 year old children living in a rural area in Venda. The research followed a quantitative approach and data collection was carried out with various measuring instruments. These included a structured questionnaire (Addendum C) whose purpose was to measure information on factors relevant to the household regarding the environment in which the child lived, a non-quantitative food frequency questionnaire (Addendum D) to measure information on eating patterns and food intake with reference to vitamin A-rich foods, and a non quantitative 24-hour dietary recall questionnaire to gather information on the children's current diet and eating pattern. These were all completed by the researcher and enumerators while interviewing each child. The respondents were recruited through stratified, random sampling and convenience sampling was used to select the areas and schools.

A face-to-face individual interview was found to be an effective means of gathering data from a relatively large number (155) of school children aged 10 to 13 years, because they were too young to complete the questionnaire on their own (incomplete data), even under supervision. It was also preferred to prevent bias of copying from others and to overcome the language barrier, because respondents would find it difficult and frustrating to complete the entire questionnaire correctly. Face-to-face interviews further helped the researcher to obtain behavioural information and to observe reactions. This study was carried out in three primary schools, namely Avhatondwi, Thomas Ntshavheni and Tshirunzanani schools, where children are fed in school feeding schemes as well as buying food from local vendors. The SAS statistical analysis (version 8.2) software was used to analyze the data from the questionnaire by means of descriptive statistics (percentages, frequencies, means and summary of the tables). Inferential statistics (two way tables and chi-square tests) were used to test the associations between two categorical variables.

Demographic information: almost all respondents were Venda-speaking and belonged to nuclear families of 5-6 members in the same household. Most of the breadwinners were fathers with full-time jobs. Overall, these children still lived in a low socio-economic rural area. Child grants played an important role for these families, because the money supported most of the households every month. Formal housing with separated kitchens *(tshitanga)* was most common. Firewood was the most important source of energy used when preparing foods inside the *tshitanga*. Water scarcity was identified during the study, as children used water from the communal tap or bought it from those who had a borehole in their yard.

Food habits: There was poor consumption of vegetables and fruit at school compared with home, most probably because of low availability and accessibility to these foods at school. Children also had no choice under the school-feeding scheme and they normally ate what had been catered for them. Seasonal availability also influenced the types of vegetables and fruit they consumed, and there was also a high intake of wild fruit.

It was very clear that mothers were the caretakers in the families because they played a role in decision-making, preparation and serving of foods eaten by these children. However, some of the respondents participated in decision-making and meal preparation, normally during weekends, especially when they were given permission by the elders. The food they prepared and the decisions they made were based on what was available at home. The most popular tasks in which children were involved were preparing beverages and sandwiches, cooking stiff and soft maize meal porridge, and chopping and cooking vegetables and meat.

Consumption pattern: the children's general meal pattern was three meals a day with two snacks, one snack or no snacks between meals. Generally, children consumed two meals at home and one at school in the feeding scheme. The foods mainly eaten during these meals were bread, tea, stiff and soft maize meal porridge, dark green leafy vegetables and meat (chicken). The most popular snacks were sweets, Twigglies and apples. Stiff maize meal

porridge was repeatedly eaten for breakfast, lunch and supper, with its accompanying items; however, bread with tea was for the most part eaten for breakfast.

Foods consumed rich in vitamin A: it was clear that dark green leafy vegetables played an important role in supplying beta-carotene to these children, because the intake of yellow vegetables was very poor. Most of the retinol foods were regarded as expensive products. Some of the children were allergic to them while others were forbidden to eat them because of culture and family rules. Consumption of fortified foods was very high because stiff maize meal porridge was the staple food and bread was very popular for breakfast.

The final conclusions of this study will be presented according to the research objectives previously stated (see Chapter 3). This chapter concludes with the attempt to answer the research question and sub-sections of this study. Based on these conclusions, recommendations are made to the participating schools. This chapter also presents the limitations that will help the future researchers. Generally, the chapter encompasses the three sections: conclusions, recommendations and limitations.

Objective 1: To explore and describe the availability of foods as it affects consumption of vitamin A-rich foods

It was clear that seasonal availability affected the intake of vitamin A-rich fruit and vegetables because higher availability of foods in season led to easy accessibility to those foods. Availability at school also affected the children's intake because they ate what was catered for them in the feeding scheme, whereas others had a chance to buy fruit from the tuck-shop or from vendors. The fruit available and frequently consumed at school by these children was poor in vitamin A. This included apples, oranges and bananas. However, high consumption of vegetables at home was possible because the children ate whatever had been cooked that day. They also ate to avoid going to bed hungry or to please their mothers. Generally,

the availability of vitamin A-rich fruit and vegetables was low at school compared with home. There is a need for including vitamin A-rich fruit and vegetables in the feeding scheme and to teach children about the importance of vitamin A intake.

Objective 2: To explore and describe the socio-cultural environment as it affects consumption of vitamin A-rich foods

The majority of respondents (72.9%) indicated that their mothers were the main caretakers in their households and that they played a central role in the decision-making, supply, preparation and distribution of food among the family members. These children had to eat whatever their mother prepared for them, which could be poor or high in vitamin A. Some children (59.4%), however, had been given the opportunity of making their own decisions in the absence of their mothers or when granted permission, especially after school or when their mothers were pressed for time. Grandmothers and sisters were also important when it came to decision-making at home. Some respondents had the opportunity of preparing meals at least twice a week, especially during weekends.

It was clear that the decisions that they made and the food they prepared were based on what was available at home. The food preparation in which children were involved at breakfast time were boiling tea, cutting bread and spreading it. They made stiff maize meal porridge for lunch and also prepared and cooked its supplement (dark green leafy vegetable, and chicken or beef). The same tasks were carried out for supper.

It could be concluded that family food rules also affected consumption patterns of vitamin A, because the foods that were allocated as children's food were mostly junk foods with poor nutritional value, especially of vitamin A, such as sweets and Twigglies. The food known as adults' food, which was forbidden to this age group, was mostly good in nutrients, especially vitamin A-rich items like liver. It was found that the food children were forced to eat was dark

green leafy vegetables, because most of the children didn't like vegetables, especially when they had to eat it every day. However, this indicated the positive influences in play when parents forced their children to eat these foods. They led to higher intakes of beta-carotene rich foods (forced consumption of dark green leafy vegetables).

Objective 3: To explore and describe the individual characteristics of knowledge and beliefs as they affect the consumption of vitamin A-rich foods

In terms of knowledge and beliefs, the majority of respondents (97.71%) liked eating vegetables and several reasons were indicated. General health and nutritional reasons were the most important given for eating vegetables, so it could be concluded that the children had only general nutritional knowledge about the importance of vegetable intake. They also revealed that they thought it important to eat vegetables for nutrients and to have good health. However, some believed that nothing could happen to them if they didn't eat vegetables at all, indicating their lack of knowledge and interest.

All the respondents indicated that they liked fruit, mostly for reasons of nutrition, general health and sensory health. It was clear that most (70.7%) of the respondents thought positively of fruit consumption, mainly for general health and nutrition and that few (24.7%) indicated irrelevant reasons such as 'I will die' and 'I won't become fat' if they didn't eat fruit at all. It could be concluded that non-specific or vague reasons indicated only general knowledge. All this indicates that more should be done, especially concerning the promotion of vitamin A-rich foods among rural children, as well as the community in which they were living. A nutrition education program on the different kinds of nutrients found in various fruit and vegetables and their importance in the diet and to health should be designed and implemented.

Objective 4: To explore and describe the food habits concerning consumption patterns of vitamin A-rich foods

Availability, the socio-cultural environment and individual characteristics influenced the intake of vitamin A-rich foods. Owing to the high availability of food in the children's' environment, the consumption of these foods was high. Most of the vegetables and fruit indicated in the study were abundant in the environment. At home, most of the spinach and Chinese cabbage eaten was readily available in their home gardens or obtained cheaply.

The children's socio-cultural environment also influenced their food consumption patterns, because mothers generally made the decisions, and prepared and served the food at home. Culture also modeled their food consumption patterns because children could not eat what was reserved for adults. They were forced to eat dark-green leafy vegetables that are high in vitamin A. Some of the traditional Venda dishes also played a role in improving vitamin A intake, for instance, thophi. Some of the family rules therefore influenced the consumption of vitamin A-rich foods either negatively (reserved for adults) or positively (forced consumption).

Objective 5: To explore and describe the consumption patterns (meal patterns) including vitamin A

It can be concluded that the majority of respondents (85.17%) consumed three main meals per day, whereas 48.4% had three meals with two snacks between meals. Only 36.77% had three meals with one snack or three meals without snacks. This was made possible because they had one meal at school and the other two at home during the week. This meant that those who had only two meals had one meal at home and one at school per day. As the number of the children's meals increased per day, the inclusion of beta-carotene rich vegetables and fruit in their diet also increased.

Objective 6: To explore and describe the consumption patterns of types of vitamin A-rich food consumed

In terms of the types of food eaten for breakfast (6h00 to 9h00), tea, bread and stiff maize meal porridge were the most important items mentioned. Lunch (12h00 to 15h00) consisted mainly of stiff maize meal porridge with chicken, Chinese cabbage or cabbage. The same diet was repeatedly mentioned in the supper menu (17h00 to 20h00). It can thus be concluded that the foods forming their diet were mostly starchy foods (maize meal porridge and bread) and vegetables (Chinese cabbage, and cabbage), whereas proteins were gained mainly from chicken. Twigglies, sweets, naartjies and apples were the snacks eaten most often during the mornings (9h00 to 12h00), and, together with afternoon snacks (15h00 to 17h00), were poor in vitamin A.

Objective 7: To explore and describe the consumption patterns regarding frequency of intake of vitamin A-rich foods

As far as beta-carotene-rich fruit was concerned, there was statistical evidence of a significant association between intake levels and the frequency of intake. Children who ate more than two fruits per day were more likely to include beta-carotene fruit in their diet daily (40.68%), compared with children who ate less than one (<1) fruit per day (21.43%). Children who ate more fruit were likely to include more beta-carotene rich-fruit in their diet. There was no statistical relationship indicating that when children ate more meals it would automatically lead to the increased intake of retinol and beta-carotene vegetables. There was, however, a strong relationship between an increased number of meals and higher intakes of fortified foods.

Objective 8: To explore and describe the types of foods rich in vitamin A (retinol-rich, carotene-rich and fortified foods) typically consumed

A non-quantitative food frequency questionnaire (Addendum D) was used to identify the typical vitamin A-rich foods consumed and to distinguish between the various types or sources of vitamin A consumed. Furthermore, a clear distinction could be made between the various types of vitamin A consumed in this community. It was clear that broccoli, parsley and peas were unknown, while imfino and spinach were eaten most often. It was clear from these results that limited exposure to new and different food items like broccoli could lead to poor consumption. In contrast, yellow vegetables (carrots and pumpkin) were among the most popular vegetables with which they were familiar, but consumption was low because the vegetables were expensive and unavailable from their home gardens. They therefore ate them with rice for Sunday lunch, but not with their staple food (pap). The intake of dark green leafy vegetables was very high, because they were the accompanying items for their staple food (pap); further, they were readily accessible in their home gardens and the veldt.

Regarding fruit, it was clear that the children did not know what a plum was, but apricots, mangoes and watermelons were familiar to them. However, consumption of these fruits was poor because they were out of season during winter and expensive in the shops. On the other hand, the consumption of avocado pears was high because they were in season during winter and easily accessible at a lower price. Generally, these children obtained beta-carotene from dark green leafy vegetables and avocado pears during winter.

The consumption of liver was low because it was forbidden to children. It was further regarded as food for the head of the family. Being expensive, it was not for children. The intake of eggs was high because they were the most available and affordable retinol-rich item used by almost all the families, and were eaten with the stiff maize meal porridge. Dairy products were the most expensive retinol-rich items and were eaten to a limited extent because most of the families could not afford them. The most popular dairy product was ice cream, which acted as a snack. However, children would usually choose the water-based, fruit juice iced lollies, so they did not really eat too many dairy products. The high intake of

fortified food was possible because it was the children's staple food. They ate pap and bread every day at school or at home.

It could be concluded that spinach and morogo were both popular and highly consumed beta-carotene vegetables, while encouragement is needed regarding the consumption of yellow-orange vegetables. The consumption of these vegetables was poor and some of the vegetables were unknown, which led to poor intake.

Objective 9: To describe how the food habits influence the type of vitamin A–rich food consumed

There was no evidence of a statistically significant association between intake levels of beta-carotene vegetables and food habits variables (accessibility, frequency, family rules, food for children, forbidden and forced foods). However, children who ate more than two (>2) portions per day showed a tendency (p-value >0.0938) towards a higher indigenous vegetable intake compared with children (71.88%) who ate less than one (<1) portion per day of beta-carotene vegetables. It was clear that indigenous vegetables played a role in supplying beta-carotene in their diet.

Regarding beta-carotene-rich fruit, there was statistical evidence of a significant association between intake levels and frequency of intake. Children who ate more than two (>2) fruits per day were more likely to include beta-carotene fruit in their daily diet compared with children who ate less than one (<1) fruit per day. This meant that there were more children who ate fruit and subsequently more who ate beta-carotene fruit. A high percentage (94.92%) of the children who ate more than two (>2) beta-carotene fruits per day were more likely to have foods allocated only to children in their family, compared with children who ate less than one (<1) beta-carotene fruit per day (66.67%). Therefore the percentage of children with no belief

practices in their families as far as children's food was concerned decreased, as they ate more beta-carotene rich fruit.

Children who ate more than two (>2) portions of fruit per day showed a tendency (p-value >0.0877) towards a higher indigenous fruit intake compared with children (83.33%) who ate less than one (<1) portion per day. There was no evidence of a statistically significant association (p-value >0.05) between intake levels and other food habit variables (accessibility, family rules, forbidden and forced foods).

There was no evidence of a statistically significant association (p-value >0.05) between the intake level of retinol foods and all food habits variables (accessibility, indigenous food, frequency, family rules, beliefs, knowledge and personal preferences), which meant that there were no relationships between the food habits and the intake of retinol foods. Children who eat 3-4 portions per day (6.25%) are more likely to have family rules that are followed than whose who eat <3 per day (24.39%). The more children consumed vegetables or fruit, the more they followed family rules on what to eat and what not to eat.

Children who ate fortified foods more than four (>4) times per day are more likely to have food allocated only to children in their family (89.39%) than children who eat 3-4 per day (64.58%). There was no evidence of a statistically significant association (p-value >0.05) between the level of fortified food intake and some food habits variables (forbidden and forced foods).

It can be concluded that food habits influenced vitamin A rich-foods intake, especially that of beta-carotene-rich fruit and wild vegetables. Because wild vegetables are easily accessible and mostly prepared as a supplement for porridge, the children ate what had been prepared for that meal. There was no relationship between food habits and retinol foods intake, because family rules favor adults' intake, especially that of the head of the family, who is

allowed to eat liver. However food habits also influenced the intake of fortified foods, because the more children eat starchy foods, the more they are following family rules.

Objective 10: To describe how food habits influence the consumption pattern of vitamin A-rich foods

There was a statistically significant association between the responses to the intake level of meals. Those who ate 3 meals and 2 snacks per day were more likely to consume vegetables at home and at school, compared with children (4.35%) who ate fewer than three meals per day. The most popular vegetables at home were dark green leafy vegetables, unlike at school. Children who ate 3 meals and 2 snacks are less likely to eat fruit at home only (36.62%) than children who eat 3 meals and one or no snacks between meals (58.93%). Those children are more likely to eat poor vitamin A-rich fruit like apples and bananas.

The percentage of children who ate indigenous fruit increased with the increase in the number of meals, < 3 meals (78.26%) 3 meals and one or no snack (91.53%) 3 meals and 2 snacks (94.52%). This showed a tendency (p-value >0.0589) towards a higher indigenous fruit intake compared with children (78.26%) who ate fewer than three (<3) meals per day. A higher percentage of children (91.78%) who ate 3 meals and 2 snacks were more likely to have food allocated to them at home than children who ate 3 meals and one or no snacks (33.90%) per day. A higher percentage of children (84.93%) who ate 3 meals and 2 snacks per day were more likely to have restricted food in their diet than those children who ate 3 meals and one or no snacks in between meals (54.24%).

Children who had (82.19%) 3 meals and 2 snacks were more likely to eat forced foods than those who eat 3 meals and one or no snacks between meals (61.02%). There was no evidence of a statistically significant association (p-value >0.05) between meal patterns and some food habit variables (intake of indigenous vegetables, indigenous fruit, frequency of

vegetables and fruit, or family rules). It was clear that, when children were forced to eat food, they were eating more meals, but when they were restricted to eating certain foods they also ate more meals, which meant they mostly consumed what was allocated to them as children.

5.2 RECOMMENDATIONS

Based on the results of this study, several recommendations could be made to address the problem areas exposed, to reveal the identified factors associated with the children's low vitamin A consumption. The summary in figure 5.1 was made according to the conceptual framework presented earlier in chapter 3.

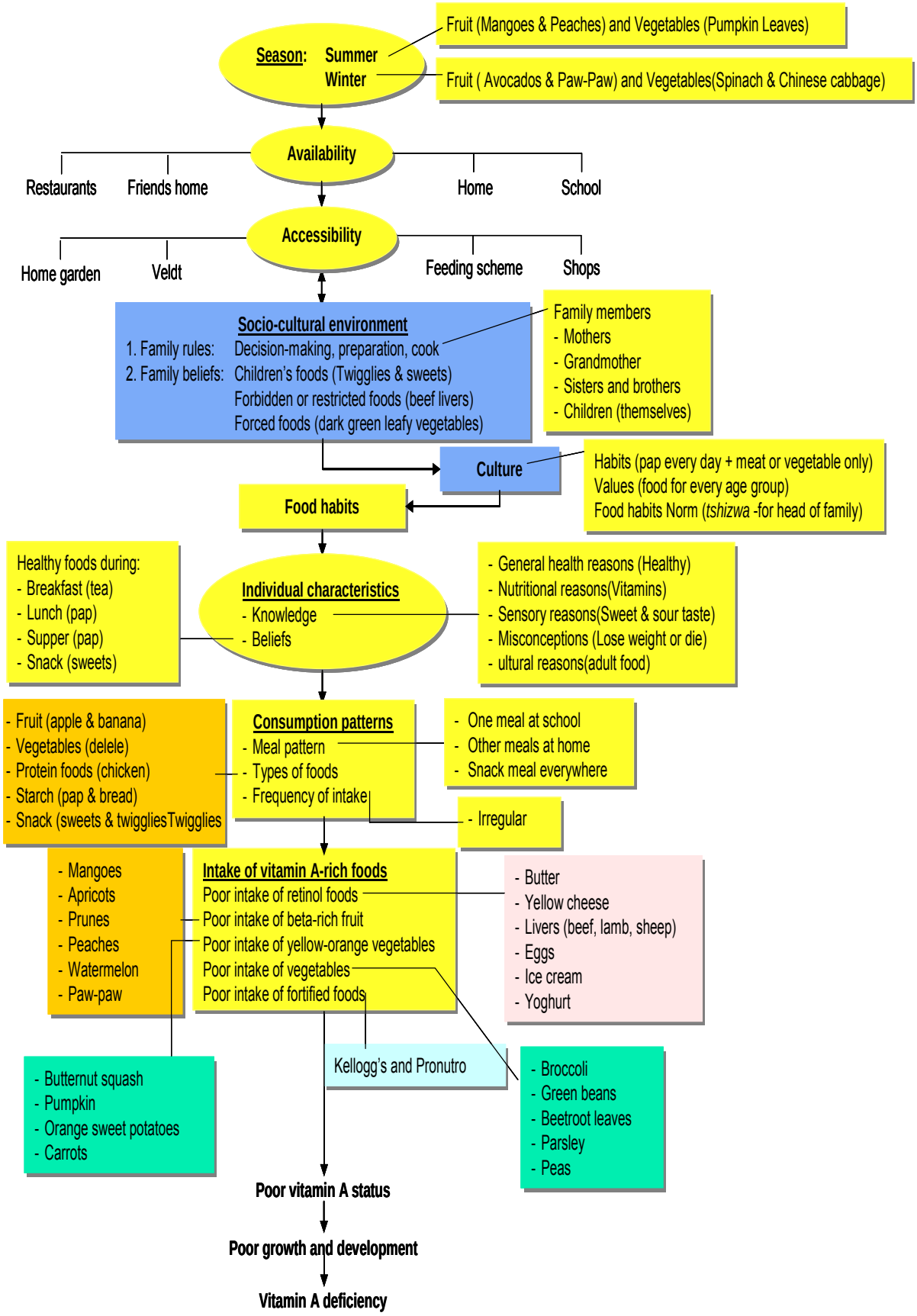


FIGURE 5.1: FINDINGS OF FACTORS ASSOCIATED WITH LOW VITAMIN A INTAKE

In terms of season, availability and accessibility, the respondents should be encouraged to eat plenty of raw fruit and vegetables (raw carrots, fruits like paw-paw and mangoes) when cheaply available and easily accessible in season. This may be achieved by ensuring that health promoters, nutritionists and dieticians should teach children about nutrition every quarter of the year at school. In addition, both parents and children should be taught and encouraged to preserve fruit and vegetables when they are available cheaply and are accessible in season. See Table 5.1 for suggestions.

TABLE 5.1: FUTURE SUGGESTIONS FOR SEASON, AVAILABILITY AND ACCESSIBILITY

Topic	Suggestion	Time	Target	Responsibility	Objectives
Season, availability, accessibility	Nutrition education	Every quarter	In schools For children and mothers	Nutritionist, dietician, health promoters	1. Consumption of raw fruit and vegetables 2. Preservation of foods
Suggestions 1. There should be lectures on nutrition knowledge concerning fruit and vegetable intake 2. Talks and demonstrations should be given on how to preserve foods e.g. vegetables (dry, frozen, canned methods can be used) and fruit (dry, canned, jam, juice)					

As the nutrient content of most indigenous foods is unknown, attention should be given to analysis of South African indigenous fruit and vegetables in order to determine their contribution to the diets of rural people.

Food habit factors have been investigated most extensively. However, to make evidence based decisions on suitable nutrition education regarding fruit and vegetable intake, more studies on the parents' rules regarding consumption patterns and vitamin A intake among children are therefore needed. Furthermore, studies on the cultural beliefs about what is recommended for children only, restricted food and forced practices food based on vitamin A-intake by children are needed. The health promoters and researchers should take into consideration the superstitious beliefs, taboos and especially the culture of the children when developing the nutrition education and other future research (see Table 5.2).

TABLE 5.2: FUTURE SUGGESTIONS FOR FOOD HABITS

Topic	Suggestion	Focus	Responsibility	Objectives
Food habits	Nutrition research	Institutions	Researchers, health promoters,	1. Beliefs that affect vit A intake (there are foods allocated for children or old people only) 2. Restricted foods that lead to poor vit A intake (retinol rich foods –beef liver) 3. Forced foods at home (dark green leafy vegetables) 4. Children's foods (sweets, Twigglies) 5. Taboos and superstitious beliefs that affect vit A intake (foods that are only consumed by head of the family or older people)
Suggestion Further research should be conducted to expose the cultural practices that might affect the intake of vitamin A rich foods by primary school children				

The nutrition education message should be tailored for the primary school child. Messages should be focused on the importance of healthy food consumption patterns, especially the intake of vitamin A-rich foods. It is recommended that the respondents be taught essential knowledge based on the different nutrients found in food, such as protein in meat and milk products, vitamins and minerals in fruit and vegetables and carbohydrates and energy in starchy foods (see Table 5.3 and Figure 5.2).

TABLE 5.3: FUTURE SUGGESTION FOR INDIVIDUAL CHARACTERISTICS

Topic	Suggestions	Target	Responsibility	Objectives
Individual characteristics	Nutrition education	School children at schools	Nutritionist, dietician, health promoters, teachers	1. To know the different nutrients in healthy foods and those rich in vitamin A 2. To link various foods, especially those rich in vitamin A, to the South African FBDGs and to the food guide pyramids
Suggestions 1. A magnetic board should be used showing the different foods found in the food pyramid. 2. Children should be taught about eleven south African FBDGs, e.g. they could use pictures to design a plate displaying a variety of foods 2. Puzzles should also be used as an educational tool, where every piece contains the written name of fruit or foods. Children could then try to build the puzzle based on foods belonging to the same group. 3. Each child should learn to present information on the different foods found in the pyramid as well as recommended servings, and reasons for intake.				

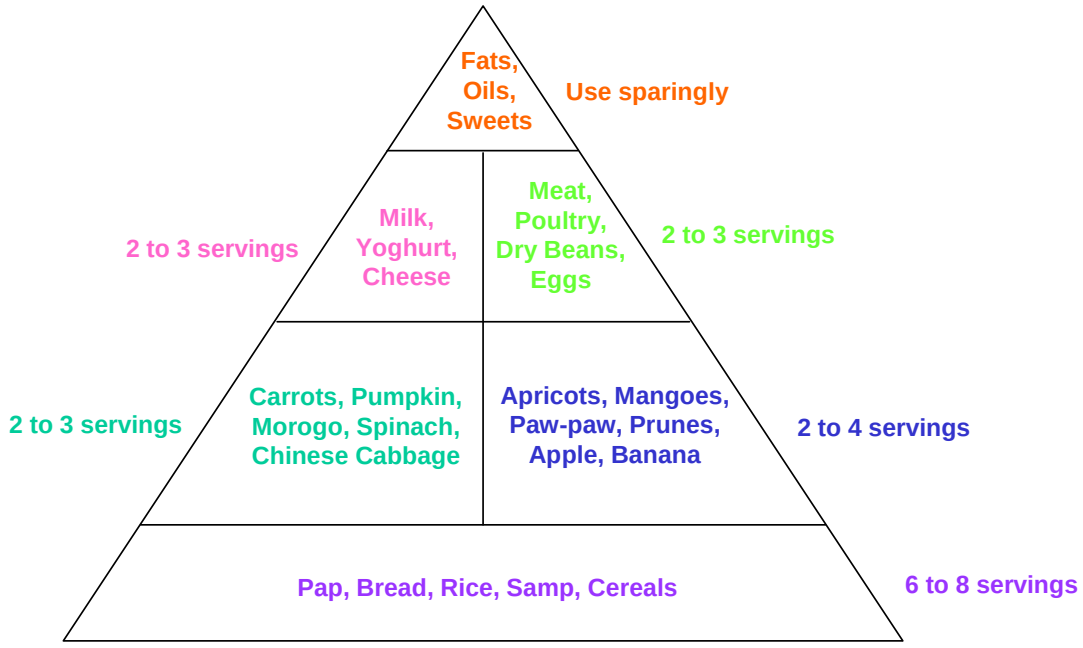


FIGURE 5.2: RECOMMENDED FOOD PYRAMID

An overview of the consumption pattern at the children's schools under the school feeding scheme reveals that there was a poor intake of vitamin A-rich foods. However, the aim of the school feeding scheme is only to prevent temporary hunger and to increase attendance at school. It was also suggested by Labadarios *et al* (1999) that the primary school menu should be reviewed, with a view to improving dietary variety and the quality of foods used. For example: pap with beans, spinach, cabbage, soup (with carrots, potatoes, peas, tomatoes, onion), dry vegetables with nuts; samp with a combination of beans, jugo beans and nuts. Bread should be spread with peanut butter, jam or margarine, while fruit should be provided every day (see Tables 5.4 and 5.5).

TABLE 5.4: SUGGESTED MEALS FOR THE FEEDING SCHEME

Topic	Suggestion	Program	Target	Responsibility	Objectives
Consumption pattern	Nutrition education	School feeding scheme menu	Helpers	Nutritionist, dietician	1. Encourage the preparation of healthy foods 2. Include at least one fruit and vegetable every day
Methods 1. Talks and demonstrations should be conducted on how to prepare and use the different foods 2. Children should be served the *following suggested meals* at school					
Pap +					Dry beans Soup (onion, tomatoes, carrots, potatoes, peas) Dry vegetables with nuts Spinach with potatoes Cabbage with carrots, green pepper and onion Cabbage with potatoes Chinese cabbage Pumpkin leaves with nuts Indigenous vegetables (Delele, Vowa) Bovhola
Samp + Thophi Tshidzimba					Jugo beans and nuts
Bread +					Margarine/ jam/ peanut butter Juice
Fruit should be given every day, irrespective of availability and accessibility in season					

Cost-implications of the various nutritious combinations/menu suggestions should be compared to the current meal plan/menu in order to ensure efficient use of available funds in this low socio-economic group.

TABLE 5.5: SUGGESTED MENU AT THE HOUSEHOLD OF THE CHILDREN

Topic	Suggestion	Target group	Event	Responsibility	Objectives
Consumption pattern	Nutrition education	Whole community	Nutrition day	Nutrition, dietician	1. Consumption of healthy and variety of foods
Methods 1. A lecture in the form of a TV play should be shown in the home language. 2. Pamphlets, posters and leaflets should be given to everyone to read at home. 3. The *suggested menu* is indicated as follows:					
Breakfast	*Snack*	*Lunch*	*Snack*	*Supper*	
Soft porridge with sugar & milk Brown bread with jam/margarine/peanut butter/avocado Glass of juice or milk Tea One fruit	Fruit salads/ Dried fruit (apricots, figs)/ Fresh fruit/	Pap or rice One yellow vegetable One green vegetable Meat or fish/ Mopani worms Glass of water	Vegetable salads/ dry fruit/ fresh fruit/ fresh vegetables	Pap or samp One green vegetable One yellow vegetable Beans or Inkomasi/ Mopani worms Glass of water One fruit	

Children should reduce their consumption of junk foods like sweets, Twigglies (maize snacks) and Cheese Curls, and increase their intake of healthy foods like fruit between meals. This may be achieved by health education that addresses misconceptions and helps children combine foods that they like and that are compatible with their lifestyle, in the right proportion to make a healthy diet. The hawkers (owners of spaza/vendors) near the schools should be taught about nutrition and be advised to sell healthy foods to the children, especially fruit rather than junk food. This could be achieved if all the hawkers could agree to sell different types of fruits. Three or more varieties per table would be recommended (see Table 5.6).

TABLE 5.6: RECOMMENDED FOODS NEAR THE SCHOOLS

Target	Objectives	
Hawkers near the schools	- To sell different and healthy foods in order to discourage consumption of junk foods at school	
Suggestion - Nutrition education for hawkers, to teach them to make snacks e.g. sweet potato fritters - Different foods with variety of nutrients per hawker recommended in order to help children to choose properly when they buy. This will help children to eat healthy snacks at school.		
1st person	*2nd person*	*3rd person*
Oranges, mangoes, prunes, nuts	Bananas, guavas, litchis, biscuits	Apples, naarties, peaches, Cheese Nacks

To improve vitamin A status, it is recommended that the respondents be encouraged to eat at least one beta-carotene-rich vegetable and one beta-carotene-rich fruit every day as the cheapest way of taking in beta-carotene. The vitamin A-rich fruit and vegetables (yellow) intake of these rural children may be improved partly by including these items in the feeding scheme menus every day. Another way of improving vitamin A status is to ensure that children are encouraged to eat plenty of fresh fruits and yellow vegetables, which provide a rich source of essential vitamins (especially vitamin A) and minerals. This may be achieved by ensuring that the nutritionist or dietician draws up the daily menu for helpers to use/follow. A nutrition education campaign also should be conducted in the schools attended by these rural children. Cartoons should be used in the form of a play or drama, and pictures should

be designed showing vitamin A-rich fruit and vegetables. Each child should receive a colorful (colors that represent vitamin A-rich foods) brochure indicating exactly what would be playing on the screen after play. All the posters, leaflets and pamphlets should be written in the vernacular, and then distributed to the schools, clinics, health centers or other community agencies where the whole community could get information freely (see Table 5.7).

TABLE 5.7: SUGGESTIONS ON VITAMIN A RICH FOODS INTAKE

Topic	Suggestion	Target group	Event	Responsibility	Objectives
Vitamin A rich foods	Nutrition education	Children	Vitamin A day	Nutritionist, dietician, health promoters, teachers	1. Improve vitamin A intake and status 2. Prevent vitamin A deficiency
Suggestions 1. Children from different primary schools should compete on the day. - They should perform vitamin A dramas, wearing vitamin A-rich food costumes or a mask or use vitamin A puppets e.g. carrots. - The stage should be painted with vitamin A colors - They should sing vitamin A songs - They should compose poetry - The winners should be given a prize					

The results of this study will be presented at the department of education and the participated schools, the copy will be handed to them for future references and implementation of the recommendations.

5.3 LIMITATIONS OF THE STUDY AND SUGGESTIONS FOR FUTURE RESEARCH

In interpreting the results of this study, some of the limitations should be noted. These limitations expose the weaknesses in the study, which will help future researchers in designing and conducting child-related research in rural areas more effectively.

- Convenience sampling (non-probability sampling technique) was used to select the area and the schools. As a result, the findings could not be applied to the all the school children in the Vhembe district. Unless the populations are acclimatized to and value the benefits of consumption patterns of vitamin A research, random sampling (probability sampling technique) will not be possible in future. The researcher presumes that continuity of research in Vyeboom will help improve the willingness of both children and parents to participate in research on the consumption patterns of vitamin A.

- This study focused only on primary school children (10-13 years) of age, and was specifically quantitative in nature. It dealt with the consumption of vitamin A-rich foods only. Future research should attempt to engage children of different ages from different types of schools and at different levels (e.g. secondary schools). To yield comprehensive insights and perspectives on vitamin A-rich foods intake, future quantitative research should incorporate qualitative techniques of data collection (e.g. focus group discussions). This would help uncover clues on how children could best meet the intake of vitamin A, and could provide reasons for consumption patterns and food utilization

- The data collection period for this study was winter 2006. The winter season is associated with school exams or tests and holidays. Arguably, therefore, this research failed to elicit perspectives from those children who do not attend school after the exams and those who have already gone on holiday. Future researchers on the consumption patterns of school age children should, therefore, collect data during the summer or beginning of winter before the school holiday and examinations, and also throughout the various seasons to determine what vegetables and fruit are eaten in the long term.

- This data collection procedure was time-consuming, because children could not be interviewed during school time and it was difficult to convince parents/guardians to sign a form for 10-year-old children. The sample was also slightly influenced by a higher

percentage of female participants in relation to male participants. This study failed to get the viewpoints of certain children, particularly the 10 year olds attending the school who had signed the form, because the children were very slow to answer the questions and were shy. Efforts to convince them that the questionnaire would take only a few minutes of their time proved futile. The questionnaire was designed to glean information about the consumption pattern of vitamin A. Future research should probably focus on one aspect of the questionnaire, such as the 24-hour recall or Food Frequency questionnaire. Future studies should consider multiple-choice questions rather than open-ended questions, because the children could not be forced to answer. This data collection procedure was expensive because enumerators had to be paid and respondents were given small incentives to encourage them to participate.

- Focus group discussions would have added value in the gathering of data with regard to nutrition knowledge, eating habits and factors influencing food intake and general eating. This type of method would have ensured better participation from the adolescents and would have reduced the respondent burden of the long questionnaires. Some additional skills are required to do this efficiently, but this would be a recommended approach for this type of research.

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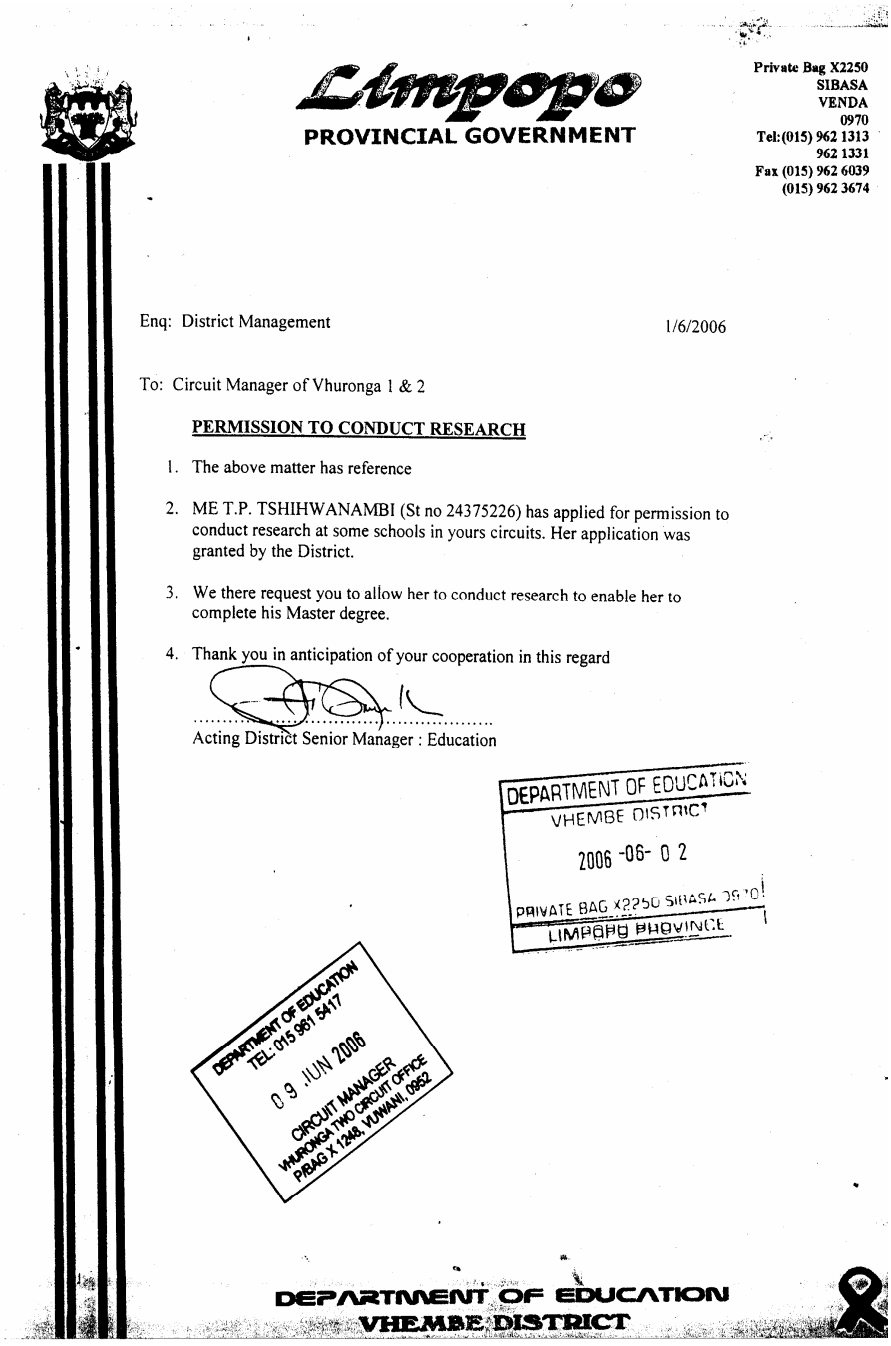
Addendum A

DISTRICT MANAGER LETTER (DEPT EDUCATION)



Limpopo
PROVINCIAL GOVERNMENT

Private Bag X2250
SIBASA
VENDA
0970
Tel:(015) 962 1313
962 1331
Fax (015) 962 6039
(015) 962 3674

Enq: District Management 1/6/2006

To: Circuit Manager of Vhuronga 1 & 2

PERMISSION TO CONDUCT RESEARCH

1. The above matter has reference
2. ME T.P. TSHIHWANAMBI (St no 24375226) has applied for permission to conduct research at some schools in yours circuits. Her application was granted by the District.
3. We there request you to allow her to conduct research to enable her to complete his Master degree.
4. Thank you in anticipation of your cooperation in this regard

.....
Acting District Senior Manager : Education

DEPARTMENT OF EDUCATION
VHEMBE DISTRICT
2006 -06- 0 2
PRIVATE BAG X2250 SIBASA 0970
LIMPOPO PROVINCE

DEPARTMENT OF EDUCATION
TEL: 015 961 5417
09 JUN 2006
CIRCUIT MANAGER
VHURONGA TWO CIRCUIT OFFICE
PRIVATE BAG X 1248, VUWANI, 0952

DEPARTMENT OF EDUCATION
VHEMBE DISTRICT

Addendum B

CONSENT FORM

Research project: Masters in Consumer Science Consumption patterns of vitamin A-rich foods of 10-13 year old children living in a rural area

Universiteit van Pretoria

Your child is invited to participate in a study of consumption patterns of vitamin A- rich foods of 10-13 year old children living in a rural area. My name is Tshililo Tshihwanambi and I am a student at The University of Pretoria, Department of Consumer Science. This study is part of my Masters Degree. I am asking for permission to include your child in this study because his/her participation will help to reach the goal of the study, however the results will aid in the planning of interventions aimed at increasing the vitamin A-rich food consumption in this age groups, as well as helping the parents and teachers to be aware of the consumption patterns of their children. I expect to have minimum of 100 participants in the study.

If you allow your child to participate, I together with my assistant will ask your child questions that will take less than 30 minutes only. The questions will cover the:

- Demographic information (general information about the child and living conditions)
- Food availability (types of food available)
- Consumption patterns (meal information)
- Types of vitamin A foods eaten by child

The study will be conducted from 12 June at Vyeboom village in the schools. Any information that is obtained in connection with this study will be anonymous and the identity of your child will remain confidential. His or her responses will not be linked to his or her name or your name in any written or verbal report of this research project.

You are making a decision about allowing your child to participate in this study on a voluntary basis. Your signature below indicates that you have read the information provided above and have decided to allow him or her to participate in the study. If you later decide that you wish to withdraw your permission for your child to participate in the study, simply tell me. You may discontinue his or her participation at any time without any consequences.

I understand that I cannot hold the University of Pretoria responsible for any inconvenience that I may experience because of the study.

I (name of parent)_____hereby give permission that my child

(name of child)_____may take part in the research study.

_____ _____

Signature of parent(s) or legal guardian Date

_____ _____

Signature of investigator Date

Addendum C

SURVEY QUESTIONNAIRE

QUESTIONNAIRE-CHILDREN'S CONSUMPTION PATTERN OF VITAMIN A-RICH FOODS

		FOR OFFICIAL USE	
DATE OF INTERVIEW			
HOME ADDRESS			
RESPONDENT NO		V1	

Section A - Demographic information

A1	What is your age today?					
	Please indicate your date of birth	D	M	Y	V2	

A2	Please indicate your grade	Grade 5	1		
		Grade 6	2		
		Grade 7	3		
		Grade 8	4		
		Other		V3	

A3	Please indicate your gender	Female	1		
		Male	2	V4	

A4	What is your home language(first)?	Venda	1		
		Tsonga	2		
		Other (Specify)		V5	

A5	Please indicate the total number of people living together in your house.	2 or less	1		
		3 - 4 members	2		
		5 - 6 members	3		
		7 - 8 members	4		
		9 + members	5		
		Other (Specify)		V6	

A6	Please indicate the people who you are living with?	Nuclear family	1		
		Extended family	2		
		Friends family	3		
		Other		V7	

A7	Who is the breadwinner in your household?		
		V8	

A8	Does he/she have a job at the moment?	Yes	1		
		No	2	V9	

A9	If yes - what kind of job?	Doctor/nurs/teacher/professional	1		
		Business/taxi/self employed/formal	2		
		Typist/assistant/office worker	3		
		Domestic worker/gardener/contract	4		
		Hawker/car washer/informal sector	5	V10	

A10	On which day of the week does he/she work?	Irregular (piece work)	1		
		Part time 1-4 days/week	2		
		Full time 5 + days/week	3	V11	

A11	Does someone in your household receive any additional grants?	Yes	1		
		No	1	V12	

A12	If yes, which grants?	Child grant	Yes	No	V13	
		Old age grant	Yes	No	V14	
		Pension	Yes	No	V15	
		Other			V16	

A13	Please indicate the type of house you live in?	Formal house	1			
		Traditional house	2			
		Shacks	3			
		Single room	4			
		Other (Specify)			V17	

A14	Who owns the house that you live in?			
			V18	

A15	Where do you get drinking water from?	Fountain, river	1			
		Communal tap	2			
		Tap on premises	3			
		Tap in house	4			
		Other			V19	

A16	Please indicate which of the following appliances do you have in your household?	Electricity	Yes	No	V20	
		Stove	Yes	No	V21	
		Refrigerator	Yes	No	V22	
		Television	Yes	No	V23	
		Radio	Yes	No	V24	

Section B - Food availability - vegetables

B1	Do you like to eat vegetables?	Yes	1		
		No	2	V25	

B2	Why?		V26	
			V27	
			V28	

B3	How often do you consume vegetables?	Once a week	1		
		Two days per week	2		
		Three days per week	3		
		Four days per week	4		
		Everyday	5	V29	

B4	What type of vegetables do you eat?				
	Vegetables	1 x per week	2 x per week	3 x per week	
	Vit A (Spinach, Pumpkin, Carrots, Morogo, Orange sweet potato, Butternut)				V30
	Vit C (Peas, Potatoes, Cabbage, Tomatoes, Lettuce)				V31
	Others (Onion, Beetroot, Cauliflower, Gem squash, Mushroom)				V32

B5	Where do you eat it?	At home	Yes	No	V33
		At school	Yes	No	V34
		At friend(s) house	Yes	No	V35
		At the restaurants	Yes	No	V36
		Other			V37

B6	Do you think it is important to eat vegetables?	Yes	1	
		No	2	V38

B7	Why?		V39
			V40
			V41

B8	What do you think will happen to you if you don't eat vegetables?	
		V42
		V43
		V44

B9	Do you eat wild vegetables?	Yes	1	
		No	2	V45

B10	Why?		V46
			V47
			V48

B11	Name the five wild vegetables you eat most?	1		V49
		2		V50
		3		V51
		4		V52
		4		V53

B12	Where do you get the wild vegetables?		
		V54	

B13	How often do you eat it?	Once a week	1		
		Two days per week	2		
		Three days per week	3		
		Four days per week	4		
		Everyday	5	V55	

Section C - Food availability - Fruits

C1	Do you like to eat fruits?	Yes	1		
		No	2	V56	

C2	Why?		V57	
			V58	
			V59	

C3	How often do you consume fruits?	Once a week	1		
		Two days per week	2		
		Three days per week	3		
		Four days per week	4		
		Everyday	5	V60	

C4	What type of fruits do you eat?				
	Fruits	1 x per week	2 x per week	3 x per week	
	Vit A (Apricots, Watermelon, Avocado, Mangoes, Paw-Paw, Yellow peaches)				V61
	Vit C (Guava, Kiwi, Litchi, Orange, Lemon, Naartjie)				V62
	Others (Apple, Banana, Grapes, Pear, Pineapple)				V63

C5	Where do you eat it?	At home	Yes	No	V64	
		At school	Yes	No	V65	
		At friend(s) house	Yes	No	V66	
		At the shops	Yes	No	V67	
		Other			V68	

C6	Do you think it is important to eat fruits?	Yes	1	
		No	2	V69

C7	Why?		V70
			V71
			V72

C8	What do you think will happen to you if you don't eat fruits?	
		V73
		V74
		V75

C9	Do you eat wild fruits?	Yes	1	
		No	2	V76

C10	Why?		V77
			V78
			V79

C11	Name the five wild fruits you eat most?	1		V80
		2		V81
		3		V82
		4		V83
		4		V84

C12	Where do you get the wild fruits?	
		V85

C13	How often do you eat it?	Once a week	1	
		Two days per week	2	
		Three days per week	3	
		Four days per week	4	
		Everyday	5	V86

Section D - Consumption patterns

D1	What time do you usually eat foods during the day?	Time	Period			V87	
		<6	Early morning	Yes	No	V88	
		6-9	Breakfast time	Yes	No	V89	
		9-12	Snacks time	Yes	No	V90	
		12-3	Lunch time	Yes	No	V91	
		3-5	Snacks time	Yes	No	V92	
		5-8	Dinner time	Yes	No	V93	
		8+	After dinner/late	Yes	No		

D2	Name two foods that you most commonly eat at these times?								
	<6	Early morning			V94		V95		
	6-9	Breakfast time			V96		V97		
	9-12	Snacks time			V98		V99		
	12-3	Lunch time			V100		V101		
	3-5	Snacks time			V102		V103		
	5-8	Dinner time			V104		V105		
	8+	After dinner/late			V106		V107		

D3	Name your three most favorite foods to eat at home (in order of preference)?	1		V108	
		2		V109	
		3		V110	

D4	Name your three most favorite foods to eat at school (in order of preference)?	1		V111	
		2		V112	
		3		V113	

D5	Name the three foods you least like to eat at home (in order of dislike)?	1		V114	
		2		V115	
		3		V116	

D6	Name the three foods you least like to eat at school (in order of dislike)?	1		V117	
		2		V118	
		3		V119	

D7	Please tell me anything you have to eat although you don't like?	1		V120	
		2		V121	
		3		V122	

D8	Do you like to eat snacks between meals?	Yes	1	
		No	2	V123

D9	When do you mostly eat snacks?		
		V124	
		V125	

D10	Which (three) snacks do you like most?	1		V126
		2		V127
		3		V128

D11	Which (three) snacks do you like least?	1		V129
		2		V130
		3		V131

D12	What do you think are the 3 healthiest kinds of food to eat for?			
	Breakfast time		1	V132
			2	V133
			3	V134
	Lunch time		1	V135
			2	V136
			3	V137
	Supper time		1	V138
			2	V139
			3	V140
	Snack time		1	V141
			2	V142
			3	V143

D13	If you could buy anything to eat, what would you buy most to eat? Name 3 in order of preferences.	1		V144
		2		V145
		3		V146

Section E - Socio-cultural (Food habits)

E1	Who mostly makes the decisions about what you eat?	Parents	1	
		Grand parents	2	
		Sisters/brothers	3	
		Me (myself)	4	
		Other (Specify)		V147

E2	When do you (yourself) make decisions about what you eat?	All the time	1
		Some days	2
		Never	3
		Other (Specify)	

V148	

E3	Name (five) foods that are consumed by children only in your household and why?	
	Foods	Reasons

V149		V150	
V151		V152	
V153		V154	
V155		V156	
V157		V158	

E4	Name (five) foods that (you as a child) are not allowed to eat but older people consume it?	
	Foods	Reasons

V159		V160	
V161		V162	
V163		V164	
V165		V166	
V167		V168	

E5	Name foods that your parents force you to eat and why?	
	Foods	Reasons

V169		V170	
V171		V172	
V173		V174	
V175		V176	
V177		V178	

E6	Who in your house prepares the food/snacks that you eat mostly?	Parents	1
		Grand parents	2
		Sisters	3
		Brothers	4
		Other (Specify)	

V179	

E7	How often do you help to prepare meals?	Once a week	1
		Two times a week	2
		Three times a week	3
		Four times a week	4
		Everyday	5

V180	

E8	Which meals and foods do you help to prepare?		
	Meals	Foods	
	Breakfast		
	Lunch		
	Supper		
	Snacks		

V181		V182	
V183		V184	
V185		V186	
V187		V188	

A NON-QUANTITATIVE FOOD FREQUENCY QUESTIONNAIRE

1. Please tick applicable answer where applicable (in connection with your diet within last month)

	Never or less than once/ month 1	1-3 per month 2	Once a week 3	2-3 per week 4	4-6 per week 5	Once a day 6	2-3 per day 7	4+ per day 8		
Vegetables										
Broccoli									V190	
Beetroot leaves									V191	
Butternut squash									V192	
Carrots									V193	
Green beans									V194	
Imfino (Morogo)									V195	
Parsley									V196	
Peas									V197	
Sweet pepper (red)									V198	
Pumpkin									V199	
Spinach									V200	
Sweet potato (orange)									V201	
Sweet potato (white)									V202	
Fruits										
Apricots									V203	
Avocado									V204	
Guavas									V205	
Mangoes									V206	
Paw-paw									V207	
Peaches (yellow)									V208	
Prunes									V209	
Watermelon									V210	
Meats and products										
Beef liver									V211	
Chicken liver									V212	
Lamb liver									V213	
Sheep liver									V214	
Chicken giblets									V215	
Yellow cheese									V216	
Cream									V217	
Ice cream									V218	
Yoghurt									V219	
Milk									V220	
Egg									V221	
Fats and oils										
Butter									V222	
Margarine (Flora, sunshine, nuvo, rama, blossom, stork)									V223	
Bread and cereals										
Enriched bread (Sasko, Albany, Sunbake, Blue Ribbon)									V224	
Enriched maize meal (Supersun, Iwisa, Ace, Tafelberg, White star, Impala)									V225	
Kellogg's (All bran, Corn flakes, Bokomo, Weet-bix)									V226	
Whole wheat pronutro									V227	

24-HOUR DIETARY RECALL FORM (QUESTIONNAIRE)

1. I'd like you to give me the list of anything you had to eat and drink day yesterday, from midnight to midnight. Please include everything you ate and drank at home and away and even snacks. 1=Home, 2=School, 3=Friends, 4=Other

Time	Food/drinks/snacks	Where
Early morning <6		
Breakfast 6-9		
Snack 9-12		
Lunch 12-3		
Snack 3-5		
Dinner 5-8		
After 8+		

V228		V255	
V229			
V230		V256	
V231		V257	
V232			
V233			
V234			
V235		V258	
V236		V259	
V237			
V238			
V239		V260	
V240		V261	
V241			
V242			
V243			
V244		V262	
V245		V263	
V246			
V247			
V248		V264	
V249			
V250			
V251			
V252			
V253		V265	
V254			

addendum D

RETINOL EQUIVALENT VALUES OF VITAMIN A – RICH FOODS CONSUMED

Different vitamin A – rich foods that selected for this study were recommended because RE value was above the 50 RE per 100g each foods. The Retinol Equivalent (RE) was used to measure the value of these foods. RE is a unit developed to standardize measurement of variable vitamin A activity of different vitamin A sources. 1RE = 3.33 IU vitamin A activity from retinol (Internet: Nicus: 1999:2). The vitamin A values of selected foods were indicated in the addendum D.

RE VALUES OF VITAMIN A - RICH FOODS CONSUMED (Langenhoven, Kruger, Gouws & Faber, 1991)

Selected vitamin A-rich foods	RE per 100g
Vegetables	
Broccoli	**139**
Beetroot leaves	**510**
Butternut squash	**487**
Carrots	**2455**
Green beans	
Imfino (Morogo)	**761**
Parsley	**520**
Peas	
Pepper (red)	**570**
Pumpkin	**487**
Spinach	**819**
Sweet potato (orange)	**2182**
Sweet potato (white)	
Fruit	
Apricots	**724**
Avocado pear	**61**
Mangoes	**389**

Selected vitamin A-rich foods	RE per 100g
Paw-paw	**201**
Peaches (yellow)	**216**
Prunes	**199**
Watermelon	**57**
Animal products	
Beef liver	**10728**
Chicken liver	**4913**
Lamb liver	**1800**
Sheep liver	**7806**
Chicken giblets	**2229**
Egg	**65**
Dairy products	
Yellow cheese	**437**
Cream	**437**
Ice cream	
Yoghurt	**57**
Milk	**450**
Fats and oils	
Butter	**754**
Margarine (Flora, Sunshine, Nuvo, Rama, Blossom, Stork)	**750**
Bread and cereals	
Enriched bread (Sasko, Albany, Sunbake, Blue ribbon)	
Enriched maize meal (Super sun, Iwisa, Ace, Tafelberg, White star, Impala)	
Kellogg's (All bran, Corn flakes, Bokomo, Weet-bix)	**1351**
Whole wheat pronutro	**1050**