UNIVERSITY OF VENDA

THE INVESTIGATION OF EATING AND LIFESTYLE HABITS OF OVERWEIGHT AND OBESE TEENAGERS AGED BETWEEN 13-18 YEARS IN THULAMELA MUNICIPALITY.

BY

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DECLARATION

I, Ntovhedzeni Ligege hereby declare that the dissertation submitted to the University of Venda for the Master of Public Nutrition has not previously been submitted by me for a degree at this or any other University; and that it is my own work. The sources that I have used or quoted have been indicated and acknowledged by means of complete references.

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Ntovhedzeni Ligege

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Date

DEDICATION

To God Almighty for the strength and direction that He gave me;

To my parents, Rosina and Gilbert, for love, encouragement and support;

To my wife and lovely daughter for their undying love and support;

To my aunt for having confidence in me.

God bless them.

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ABSTRACT

Context: A survey made worldwide (including South Africa) revealed that most teenagers are overweight and obese and that they eat little nutritious food. Obesity and overweight are public health problems and need to be addressed from a community perspective. The reason for exploring this problem in this study was that South Africa has one of the highest rates of overweight and obesity in the world among urban and rural black women.

Objective: Investigating the eating and lifestyle habits of overweight and obese female teenagers in Thulamela Local Municipality, Limpopo province, South Africa.

Design, setting and participants: This was an exploratory, descriptive study conducted in 2006–2007 amongst 125 female teenagers aged 13 to 18 years from rural schools in Thulamela Local Municipality. A hundred and twenty-five questionnaires were completed and data were gathered on the demographics, social and lifestyle habits, nutrition-related problems, dietary patterns and dietary history of the participants.

Measurements: Eating and lifestyle habits, physical activity, meaning of healthy and unhealthy dietary habits, weight, height and body mass index were measured.

Results: Seventy percent of the respondents actively consumed three meals in a day, 83% consumed starchy snacks between meals, whilst 72% of the respondents carried lunchboxes to school. Regarding lifestyle habits, 88% of the respondents slept more hours than recommended (8 hours) 88% performed sedentary activities and 66% did physical activities such as walking.

Conclusion: The results pointed out unhealthy eating and lifestyle habits influencing teenagers' weight. Identified factors must be considered in order to develop tailored nutrition interventions to improve teenagers' consciousness about adopting a healthy lifestyle.

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LIST OF ABBREVIATIONS

WHO	World Health Organization
BMI	Body mass index

DEFINITIONS OF TERMS

Body mass index (BMI): BMI is defined by weight (kg)/height (m^2) (Matheson et al., 2012)

Demographic and environmental data: Information about personal circumstances and surroundings people live in.

Dietary habits: Practices of individuals with regard to food intake and patterns (Naeeni et al., 2014).

Dietary intake: A method of assessment used to determine nutrient levels in the diet (Shim et al., 2014).

Food frequency questionnaire: A method of obtaining dietary information on nutrient intake (Shim et al., 2014).

Lifestyle habits: A characteristic bundle of behaviours that makes sense to both others and oneself in a given time and place, including social relations, consumption and entertainment (Al-Hazza et al., 2012).

Obesity: A nutritional disorder where there is an accumulation of body fat that results from the imbalance between energy intake and energy expenditure (Popkin et al., 2012).

Overweight: BMI equal to or more than 25kg/m^2 (Matheson et al., 2012).

Weight: A sensitive measure of growth that can be used for early detection of growth problems and nutritional inadequacy (Matheson et al., 2012).

CHAPTER 1: INTRODUCTION

1.1. INTRODUCTORY STATEMENT

This is a quantitative investigation into the eating habits, lifestyle and other contributing factors to overweight in female teenagers from a rural area. This chapter focuses on the problem and setting: the background, reasons for and purpose of the study, the research question(s), objectives, a brief summary of the topic and nature of the research, assumptions, delimitations, importance of the study and organisation of the remainder of the dissertation.

1.2. BACKGROUND AND REASONS FOR THE STUDY

Obesity is a complex and chronic multi-factorial disorder that affects many people worldwide (Hurt et al., 2010). It comes about as a result of dietary intake that exceeds individual energy requirements. Obesity is an abnormal accumulation of body fat, usually 20% or more over an individual's ideal body weight. It is a public health problem that needs to be addressed from a population or community perspective. A worldwide survey (including South Africa) revealed that most teenagers are obese and that they eat too little nutritious food (Hurt et al., 2010). According to Rossouw et al. (2012) obesity is emerging as a global public health problem.

Overweight can be defined as weighing 10% more than the desirable body weight, based on weight for height (Chan and Woo, 2010). Obesity has been associated with high energy and fat intake and a lack of physical activity (Hill *et al*, 2012). Popkin et al. (2012), declared it a pandemic and in many parts of the world obesity is doubling every five years; projections suggest that this pandemic will create huge health burdens.

South Africa has been experiencing one of the highest rates of obesity in the world among urban and rural black women and it was found that 44% of black women in Cape Town were obese (Devanathan et al., 2013). Other studies have also revealed that rural black women suffer from overweight and obesity (Dalais et al., 2014). The increase in obesity is more marked among females, and it is increasing more rapidly in adolescents (Reddy et al., 2012).

Unless intervention takes place, millions of patients will develop obesity-related conditions such as hypertension, coronary heart disease and type 2 diabetes, which may prove to be fatal

later in life (Marks, 2015). Obesity can be considered to be a serious medical problem, not a physiological failing, and it cannot be prevented or managed solely at the individual level. All levels of society in the community, government, media and food industry need to work together to modify the environment with reference to advertisement, awareness campaigns and the food system (WHO, 2012b).

The quality and quantity of the diet within the community should be improved to combat the development of obesity (Chan & Woo, 2010). The health sector needs to control the promotion of dangerous and deliberately deceptive approaches to obesity management. The question remains as to whether obesity is seen as a public health problems or not. If it is to be addressed, behaviour modification and lifestyle management are essential. People must prepare themselves for major life changes and start "eating to live rather than living to eat". It is thus crucial to intervene at an early age when eating patterns are being developed.

1.3. THE PURPOSE OF THE STUDY

The aim of this study was to investigate eating and lifestyle habits of overweight and obese female teenagers in Thulamela Municipality, Vhembe District, Limpopo province, South Africa.

1.4. RESEARCH QUESTION(S)

A research question is a tentative statement, the validity of which has to be proved or disproved (Farrugia et al., 2010).

The following research questions were formulated:

1. What is the influence of socio-economic status on overweight and obesity in female teenagers residing in Thulamela Municipality?
2. Does rewarding play any role in influencing overweight and obesity in female teenagers residing in Thulamela Municipality?
3. Do sedentary lifestyle and behaviour play a role in overweight and obesity in female teenagers residing in Thulamela Municipality?
4. Do physical activity levels have any influence on the development of overweight and obesity in female teenagers residing in Thulamela Municipality?

5. In which way do dietary intake patterns contribute to overweight and obesity in female teenagers residing in Thulamela Municipality?
6. Are female teenagers residing in Thulamela Municipality aware of the importance of food in maintaining their health?
7. Does food bought from hawkers/vendors influence the development of overweight and obesity in female teenagers residing in Thulamela Municipality?
8. Does environmental exposure have any impact on overweight and obesity in female teenagers residing in Thulamela Municipality?

1.5. OBJECTIVES OF THE STUDY

The objectives of the study were:

1. To determine demographic, environmental and socio-economic factors related to development of overweight and obesity in female teenagers residing in Thulamela Municipality.
2. To determine the lifestyle habits of overweight and obese female teenagers residing in Thulamela Municipality.
3. To assess body composition of overweight and obese female teenagers residing in Thulamela Municipality using anthropometric measures (weight, height and waist and hip circumferences).
4. To determine dietary habits of overweight and obese female teenagers residing in Thulamela Municipality using a diet history questionnaire.
5. To compare anthropometric data, dietary intake, demographic data and lifestyle habits of female teenagers residing in Thulamela Municipality.

1.6. SIGNIFICANCE OF THE STUDY

The findings of this study may assist health authorities in understanding the underlying factors influencing eating and lifestyle habits of overweight and obese teenagers in rural environments. This could also help the authorities in the planning and implementation of appropriate measures (e.g. policies and guidelines) to counteract these determinants effectively and efficiently. The information may also assist health authorities to plan appropriate nutrition intervention

strategies for teenagers to prevent overweight and obesity and the consequent health hazards that may manifest during child-bearing age or late adulthood.

1.7. ORGANISATION OF THE DISSERTATION

Chapter 1: Introduction

This chapter includes the following aspects: introduction, background and reasons for the study, nature of the topic, purpose of the study, objectives, research questions and the significance of the study.

Chapter 2: Literature review

This chapter focuses on the following aspects: definition of overweight and obesity, aetiology of overweight and obesity, consequences of overweight and obesity in adolescence, treatment of overweight and obesity, prevention of overweight and obesity and research on overweight and obesity in South Africa.

Chapter 3: Methodology

This chapter describes the methods that were used in the study. It includes the following aspects: study design, study population and sampling methods of data collection, equipment used, pilot study and data analysis.

Chapter 4: Results

In this chapter, the results are presented, analysed and interpreted in a logical sequence according to the objectives of the study. Graphs and tables are used where appropriate to illustrate the results.

Chapter 5: Discussion

The discussion is based on the findings (results) and methodology. Findings are compared to known literature and possible explanations are provided.

Chapter 6: Conclusions and recommendations

This chapter is included to highlight the meaning and findings of the study, including concluding remarks. References and appendices are listed at the end of the dissertation.

CHAPTER 2: LITERATURE REVIEW

2.1. OVERVIEW

In this chapter a series of topics are covered, including the distinction between overweight and obesity, which are understood to be complex, multi-factorial disorders that affect many people worldwide. The determinants of aetiological factors will also be covered, which includes genetic, environmental and regulatory factors. To direct further discussions, health consequences of overweight and obesity are also emphasised. Lastly, management and prevention of overweight and obesity as serious medical conditions are also covered. In order to understand this epidemic, especially in South Africa, it was important to investigate the eating and lifestyle of overweight and obese female teenagers from a rural area.

2.1.1. Definitions of overweight and obesity

In epidemiological studies, the most commonly used measure to define overweight and obesity is body mass index (BMI) (Pasco et al., 2014). Overweight is defined as a BMI equal to or more than 25kg/m^2 and obesity as a BMI of equal to or more than 30kg/m^2 (Pasco et al., 2014). Obesity is a nutritional disorder that results from the imbalance between energy intake and energy expenditure, with the intake being greater than the expenditure and the excess being stored as body fat (Hill et al., 2012). Table 2.1provides the classification of overweight and obesity according to World Health Organization (WHO) recommendations (Ogden et al., 2012).Obesity is a global public health problem and should be addressed according to these recommendations. According to Kushner (2012), the gradual classification of overweight and obesity allows for the following:

1. Meaningful comparison of weight status within and between populations.
2. The identification of individuals and groups at increased risk of morbidity and mortality.
3. The identification of priorities for intervention at individual and community levels.
4. A firm basis for the evaluation of intervention programmes.

Table 2.1. Classification of overweight and obesity in adults according to body mass index (BMI), waist circumference and associated disease risk. Adapted from WHO (2006).

Description	BMI(kg/m^2)	Obesity class	Waist circumference Men ≤94cm Women ≤80cm (ideal/increased risk)$^+$	Waist circumference Men >102cm Women >88cm (substantial)	Disease risk*
Underweight	<18.5	-	-	-	Increased
Normal$^+$	18.5–24.9	-	-	-	Average
Overweight	25.0–29.9	-	Increased	-	Increased
	25.0–29.9	-		High	Increased
Obese	30.0–34.9	I	High		Moderate
	30.0–34.9	I		Very high	Moderate
	35.0–39.9	II	Very high	Very high	Severe
Extremely obese	≥40	III	Extremely high	Extremely high	Very severe

*Disease risk for type 2 diabetes, hypertension, and cardio vascular diseases relative to weight and waist circumference
$^+$ Increased waist circumference can also be a marker for increased risk even for persons of normal weight.

2.1.2. Prevalence of overweight and obesity in South Africa

The prevalence of obesity among South African men and women (aged 15–64 years) is increasing (Sturm et al., 2013). This increase is more pronounced among women and is becoming more rapid in adolescents (Pienaar, 2015). The prevalence of overweight and obesity results from affluence and has traditionally been found in developed countries (Manage et al., 2014). Recently, however, there have been reported increases in developing countries (Grøntved & Hu, 2011). In South Africa, both urban and rural women of upper, middle and lower income classes were reported to be suffering from overweight and obesity (Popkin et al., 2011). In some cases it might be caused by hormonal disorders, but the major cause is the consumption of more food than the body needs (Grontved & Hu, 2011). In the past, to be overweight or obese was considered a sign of wealth in African populations, but the idea has now changed (Rossouw et al., 2012). The prevalence of overweight and obesity in adult South Africans is shown in

Table 2.2.

Table 2.2.The prevalence of overweight and obesity in South African adults aged >15 years. Adapted from Rossouw et al. (2012). BMI: body mass index, kg/m^2.

Prevalence	Men (%)					Women (%)				
	African (n = 4,006)	Mixed (n = 740)	Indian (n = 174)	White (n = 470)	Total (n = 5,390)	African (n = 5,897)	Mixed (n = 986)	Indian (n = 262)	White (n = 572)	Total (n = 7717)
Under-weight (BMI <18.5)	12.9	12.1	16.9	5.0	12.2	4.8	10.5	14.9	3.1	5.6
Normal weight (BMI 18.5–24.9)	61.7	57.1	50.3	40.4	58.6	36.7	37.3	36.1	47.8	37.8
Overweight (BMI 25–30)	19.4	23.1	24.0	36.3	21.7	26.7	25.9	27.8	26.5	26.6
Obese (BMI >30)	6.0	7.7	8.7	18.2	7.5	31.8	26.3	21.1	22.7	30.9

The overall prevalence of overweight (BMI>25 kg/m^2) and obesity (BMI>30 kg/m^2) in South Africa was found to be high, with more than 29% of men being classified as overweight or obese. Black women had the highest prevalence of overweight and obesity (58.5%), followed by women of mixed ancestry (52%), white women (49.2%) and Indian women (48.9%) as indicated in

Table 2.2 (Rossouw et al., 2012). The prevalence of obesity in rural adult South Africans was reported to be 15% in white males and 18% in white females (Tathiah et al., 2013), whereas in the coloured community it was found to be 7% in males and 31% in females (Rossouw et al., 2012).

South Africa is a country of many contrasts, in which various communities are undergoing rapid epidemiological, nutritional and demographic transitions. Consequently, chronic lifestyle diseases co-exist with communicable diseases (Chan & Woo, 2010). Recent studies suggest that chronic lifestyle diseases accounted for 28.5% of deaths in all South Africans between the ages of 35 and 64 years and more than 56% of South Africans between the ages of 15 and 64 years have risk factors for chronic lifestyle diseases (Van Zyl et al., 2012).

Increasing dietary diversity could potentially lead to an increased energy intake and, therefore, contribute to further increases in the prevalence of obesity and associated problems such as cardiovascular disease and type 2 diabetes (Chan & Woo, 2010). People have problems with selection of food and use a variety of high-energy foods (Kearney, 2010). Malik et al. (2010)

concluded that a high variety of sweets, snacks, condiments, entrees and carbohydrates coupled with a low variety of vegetables could promote long-term increases in energy intake and body fat.

Toriola and Goon (2012) reported that 11% of teenagers aged 10–16 years from Limpopo were at risk of overweight. Overweight and obesity in children and adolescents are on the increase worldwide (Neslihan, 2014). This in turn increases the risk for the development of non-communicable diseases during childhood and adolescence, which predisposes individuals to the development of overweight, obesity, cardiovascular diseases and metabolic and other disorders in adulthood.

In South Africa, overweight and obesity in children and adolescents are increasing, but the prevalence varies with age, gender and population group. These differences are important when intervention programmes and policies are considered. South Africa faces a double burden of disease where under-nutrition and over-nutrition are found in the same populations, in the same households and even in the same children. Malnutrition has been suggested as the major contributor to the double burden of disease in South African children and adolescents (Rossouw et al., 2012).

2.2 AETIOLOGY OF OVERWEIGHT AND OBESITY

Overweight and obesity have long been considered the results of an imbalance of energy intake and output in the diet. It was believed that a positive energy balance was the result of the rate of energy intake exceeding energy expenditure. It is now recognised, however, that this traditional obesity equation is over-simplistic as it implies that each calorie/kilojoule has the same value in the balance, independent of whether the energy is derived from fats, carbohydrates or proteins (Serra-Majem & Bautista-Castaño, 2013).

The traditional obesity equation by Wells and Siervo (2011) stated the following:

Positive energy balanced= energy intake>energy output

Negative energy balanced=energy intake<energy output

Scientific evidence is accumulating to show that energy balance can only be achieved when macronutrient balance is achieved, which is believed to occur when the net oxidation of each

macronutrient equals the average dietary intake of the same macronutrients (**Error! Reference source not found.**) (Hill et al., 2012).

Overweight and obesity are therefore viewed as a longstanding imbalance of dietary fat in particular due to poor regulation (Jonathan, 2012). The body's capacity for storing protein and carbohydrates is small and close regulation is necessary. In the case of carbohydrates, regulation is particularly important to ensure sufficient glycogen at all times so that blood glucose levels are maintained. The situation regarding fat is different as there is virtually no auto-regulation between the intake and oxidation of fats. When extra fats are consumed, fat oxidation hardly changes. Part of the reason for this is that body-fat stores are virtually unlimited in size (Tathiah et al., 2013).

Overweight and obesity are attributed to lack of physical activity, unbalanced dietary intake and hormonal imbalance and the consequential risk factors of obesity include coronary heart disease, type 2 diabetes, hypertension and cancer (Martínez et al., 2014). Economic development over the past years has resulted in greater purchasing power and has brought about dietary behavioural changes in all sections of the population (Sturm & Ruopeng, 2014). Total food intake, especially of fat, has increased due to industrialisation of the food industry. Furthermore, migration has created urban slums, where residents face serious nutritional inadequacies, and, according to the WHO, urbanisation was found to be an aetiological factor in obesity (Afshin et al., 2015).

According to Monasta et al. (2010), determinants of overweight and obesity can be divided into genetic, environmental and regulatory factors.

2.2.1 Genetic determinants of overweight and obesity

Genetic influences may be more important in determining regional body fat distribution than total body fat, particularly the critical visceral fat deposit (Rhee et al., 2012). If one or both parents of a child are overweight or obese, the child will be more susceptible to gaining weight (Rhee et al., 2012). Recent studies have indicated that a genetic component accounts for 50 to 60% of the variations in abdominal fat content in different individuals (Grøntved & Hu, 2011). It is, therefore, true that obese parents are likely to have obese children. Recent discoveries have helped to explain how genes may determine obesity and how they may influence the

regulation of body weight. The fact that genetic influence accounts for only 33% of variation in body weight means that the environment exerts a strong influence (Zonderman et al., 2014).

2.2.2 Environmental determinants of overweight and obesity

Environmental factors that influence the development of overweight and obesity include an overabundance of high-energy, processed food choices and decreased opportunity and motivation for physical activity (Angela et al., 2015). Nonetheless, research has indicated that the most susceptible individuals are those with a genetic tendency who are chronically exposed to excess food intake (Rhee et al., 2012).

2.2.2.1 Socio-economic status and overweight and obesity

Socio-economic status is an important factor that determines overweight and obesity, particularly among women (Kiwasaki et al., 2014). The negative correlation between socio-economic status and obesity might be a reflection of an underlying cause. In most Western societies, children from socio-economically deprived environments have a greater risk of obesity than those from more affluent groups (Dinsa et al., 2012). It is possible that some of the effects of socio-economic status are mediated through an individual's education level, but studies have demonstrated both factors to be independently related to adult BMI, suggesting that circumstances in early life have an enduring and important effect (Burke et al., 2011).

2.2.2.2 Nutrition transition and overweight and obesity

Certain population groups are more inclined to gain weight than others when they are exposed to a high-fat diet. This phenomenon has been observed repeatedly when populations exchange their high-fibre, high-carbohydrate, low-fat eating habits to high-fat, high-energy diets (Mallick et al.; 2014). Dietary changes may be partially explained by family income and other social inequalities (Ludwig, 2011). In South Africa, this kind of transition is also evident as an increasing number of people leave rural villages to move to the cities. When children from rural areas become city dwellers, their diets undergo a radical change as they substitute grains, fruits, vegetables and sour milk with high-energy snack foods and cold drinks (Duffey et al., 2012). Ironically, undernutrition and obesity often occur in members of the same family living in disadvantaged communities.

2.2.2.3 Lack of physical activities and overweight and obesity

As society changes and fewer people are involved in manual work, their energy expenditure decreases and their energy requirements are reduced. Regular exercise is important in the maintenance of a desirable body weight and preventing the development of both obesity and cardiovascular diseases and should be encouraged throughout all stages of life (Mallick et al., 2014).

However, many schools do not have the facilities to permit all pupils to participate in sports and other schools only concentrate on their best athletes, while the majority of less "sporty" children were made to sit on the side-lines (WHO, 2012). In the past children walked or cycled to school, but buses and taxis have now become the norm, thus preventing children from getting exercise on a daily basis (Mori et al., 2012).

Rossouw et al. (2012) reported that physical inactivity in youth is the most common contributing factor to chronic diseases of lifestyle in South Africa, including ischaemic heart disease, type 2 diabetes and hypertension. People enjoy sport as spectators rather than as participants (Eime et al., 2013). Low levels of physical activity were linked to morbidity and mortality in adulthood, particularly from lifestyle diseases and increased risk of being overweight and obese as adults (Knight, 2012)

2.2.2.4 Association between television viewing and overweight and obesity

Technological advances, including the development of television and mobile devices, have led to a marked reduction in the amount of human energy expended in earning a living or engaging in other aspects of daily life (Poterico et al., 2012). It was found that the prevalence of obesity in teenagers increased by 2% for each additional hour spent watching television (Micklesfield et al., 2014). This increase in obesity prevalence was attributed to reduced energy expenditure and high consumption of snack foods while watching television (Raj & Kumar, 2010).

2.2.2.5 Changing eating habits and its influence on overweight and obesity

There is a trend of eating more meals at restaurants, buying take away foods and high-energy snacks. This change in eating habits and the accompanying increase in hidden kilojoules in foods, including tuck shops, large portion sizes and skipping meals due to lack of time, have been found to contribute to overweight and obesity (Verstraeten et al., 2014).

2.2.3. Regulatory factors of overweight and obesity

Prenatal maternal obesity, maternal smoking, intrauterine growth restriction and insufficient sleep can disturb weight regulation (Erickson et al., 2014). Obesity that persists beyond early childhood makes weight loss in later life more difficult (Lakshman et al., 2012). Regulatory factors can be psychological or physiological.

2.2.3.1. Psychological factors

Many parents express their love for their children in terms of food with messages such as "eat up", "your mother made this dinner especially for you" or "don't cry, have a sweet" (Lakshman et al., 2012). If teenagers are continually exposed to energy-rich foods and not encouraged to exercise, the inevitable result is an increase in body mass. The incidence of overweight and obesity among adults in the United States of America is high. Eating too much becomes a habit for many people and sometimes this is a result of ignorance of the calorie value of food (Rosenberger & Dorflinger, 2013). The amount of food is not necessarily excessive, but it is the extra calories, beyond the calorie need that accounts for a gradual increase in weight, for example extra layers of butter, television snacks and the rich desserts (Mehler et al., 2010). Eating too much may also result from having to maintain social relationships, e.g. rich party foods, in addition to usual mealtime eating. Furthermore, excessive amounts of carbohydrates are sometimes eaten because they are cheaper (Sturm & Ruopeng, 2014).

Many people continue to gain weight throughout life because they fail to adjust their appetite to reduced energy needs with age (Hill et al., 2012). For the individual who is bored, lonely or depressed, eating can be a solace (Armstrong et al., 2014); food often becomes the focal point of the day for those with little else to do (Puhl & Heuer , 2010).

2.1.2.2. Physiological factors

Traditionally the physiology of weight gain has been portrayed as energy input versus energy output (Hall et al., 2012). The clinical problem of excessive adipose tissue resides in its strong association with a number of chronic diseases. Overweight and obesity can increase the risk of type 2 diabetes, hypertension, stroke, heart disease, respiratory problems and certain types of cancer, as independent risk factors (Knight, 2011). Moreover, reduction in body fat content reduces the risk for chronic disease, disease morbidity and mortality. Moreno-India's & Tinahones, (2015) have indicated that the increase in cell size (adipocyte hypertrophy) in

human subjects often precedes increases in cell numbers (adipocyte hyperplasia). The development of hyperplastic adipose tissue has been associated with the most severe forms of obesity (Jung & Choi, 2014). Adipose tissue enlargement was found to present during early weight gain, after which it plateaued, whereas increases in cell number presented *paripassu* with fat mass enlargement (Makki et al., 2013). Hyperplasia results from the recruitment of new adipocytes from precursor cells in adipose tissue (Arner et al., 2010).

2.3 HEALTH CONSEQUENCES OF OVERWEIGHT AND OBESITY IN CHILDHOOD AND ADOLESCENCE

Overweight-related symptoms in children and adolescents include psychological problems, increased cardiovascular disease risk factors, abnormal glucose metabolism, sleep apnoea, hepatic gastrointestinal disturbances and orthopaedic complications (Reilly & Kelly, 2011). Long-term consequences of childhood obesity are its persistence into adulthood along with the associated health risks (Clarke et al., 2010).

2.3.1 Psychosocial effects

The most common consequences of obesity in children in industrialised countries are psychosocial functioning. Pre-adolescent children were found to associate an overweight body shape with poor social functioning, impaired academic success and reduced fitness and health (Nieman et al., 2012). However, there is little evidence to suggest that self-esteem is significantly affected in young obese children. According to Nieman et al. (2012), overweight in adolescence may be associated with later social and economic problems.

2.3.2 Cardiovascular risk factors

Dyslipidaemia, hypertension and insulin resistance are frequently present in obese children and dyslipidaemia appears to be related to increased abdominal fat distribution (Raj & Kumar, 2010). According to Velásquez-Rodríguez et al. (2014), insulin resistance in children may also be associated with abdominal obesity. Serum lipids and lipoprotein levels, blood pressure and plasma insulin are known to proceed from childhood into adulthood (Friedemann et al., 2012).

2.3.3 Hepatic and gastric complications

Hepatic complications in obese children have been reported, hepatic steatosis in particular, which is characterised by raised transaminase levels (Navarro-Jarabo et al., 2013). Gastro-oesophageal reflux and gastro-emptying disturbances, which affect a minority of obese children, may be a consequence of raised intra-abdominal pressure due to increased abdominal fat (Kelly et al., 2013).

2.3.4 Other consequences

Obstructive sleep apnoea is another complication that has been reported to cause hyperventilation and even sudden death both children and adolescents (Reilly & Kelly, 2011). Furthermore, childhood obesity affects health, resulting in lowered physical fitness (Cawley, 2010) and these are powerful reasons for developing effective obesity therapies for children. The seriousness of these complications calls for intervention strategies to reduce obesity (Narang & Mathew, 2012).

The results of most studies did not confirm the concept of healthy obesity, but indicated that efforts should be made for the early diagnosis and effective treatment of overweight and obesity (Chan & Woo, 2010) and propagating the importance of a healthy lifestyle (Hurt et al., 2010). Acceptable and convenient intervention programmes should be developed to treat obesity in young people and especially to prevent excessive weight gain (Chan & Woo, 2010). A better understanding of the medical hazards of obesity should enhance motivation to prevent excessive weight gain (Cornier et al., 2011).

2.4. MANAGEMENT OF OVERWEIGHT AND OBESITY

A wide variety of management modalities for overweight and obesity are available. These include dietary management, physical activity, behaviour modification, pharmacological treatment and surgery (Kissane & Pratt, 2011).

2.4.1. Dietary management

A reduction of dietary energy intake while maintaining or increasing physical activity will reduce relative body weight in children (Hill et al., 2012), but the long-term sustainability of dietary restrictions has been questioned (Dwyer et al., 2015). Bacon and Aphramor (2011)

indicated that several benefits can be achieved through dietary control, but several negative consequences may also arise, such as eating disorders and potential loss of fat-free mass.

The education of overweight patients about foods and eating habits that facilitate weight control have been shown to be essential components of weight management strategies (Hurt et al., 2010). Dietary intake and patterns should be assessed to identify areas requiring special attention, such as nutritional adequacy, meal size, meal frequency and meal timing (Noakes, 2013). Dietary restrictions represent the most conventional treatment for overweight and obesity and it usually induces weight loss in the short-term, but the long-term effectiveness of dietary restriction has been widely recognised, especially when used in isolation (Bacon & Aphramor, 2011). On the other hand, diets based on healthy eating principles, including the individualised modest energy deficit diet and low-fat diet, appeared to have better long-term outcomes (Wadden et al., 2012).

It is generally recommended that only small reductions in energy intake be made to the diet of an overweight child as adequate intake of both energy and nutrients are required by children to ensure that normal growth and development is not compromised (Raj & Kumar, 2010). Limiting take-away and ready-to-eat food, which tend to be particularly high in fat and energy, may also help to control energy intake (Currie et al., 2010). These foods are making increasingly larger contributions to the energy intake of children and adolescents around the world (Patterson et al., 2012).

Children should also be encouraged to eat fewer high-energy snacks, such as crisps and biscuits, and to avoid consuming a large proportion of total energy from sweetened beverages or even to choose unsweetened drinks or water (Elmslie et al., 2012). Promoting consumption of foods high in complex carbohydrates, low in fat and low in energy density is likely to be important in preventing excessive energy consumption in children (Hill et al., 2012). It is important to encourage all children, whether overweight or not, to adopt healthy eating habits from an early age and to continue with this into adulthood (Krushnapriya et al., 2015). A modern approach to obesity treatment must focus on a healthy diet. Long-term changes in food choices and eating behaviour and lifestyle are necessary rather than a temporary restriction of specific foods (Makris & Foster, 2011). Introducing healthy dietary habits and promoting physical activity may be the two most relevant components of obesity prevention.

2.4.2. Physical activity and exercise management

A reduction of inactivity, an increase in ambulation and the development of an activity programme can increase the effectiveness of obesity therapy; even when these do not reduce obesity they can independently reduce morbidity (Lipnowski et al., 2012). It was found that low-fat diets resulted in average weight loss of 3.2kg over habitual eating. Studies have found that dieting lowered total body mass by 8% in the short-term and that low-carbohydrate, non-energy-restricted diets appeared to be at least as effective as low-fat, energy-restricted diets in inducing weight loss for up to one year. A combination of exercise and diet was, however, more effective than either method alone in promoting fat loss (Foster-Schubert et al., 2012).

Exercise also limits the proportion of lean tissue lost in slimming regimens and limited weight gain and physical activity may favourably affect body fat distribution (Després, 2012). Physical activity has numerous beneficial effects regardless of BMI and age as it increases energy expenditure and improves body composition (fat loss and reduction of visceral fat deposit) (Chaput et al., 2011). Furthermore, increased capacity of fat mobilisation and oxidation and control of food intake is associated with physical activity. The main aim of exercise management is to convert inactive children to a pattern of active living (Chan & Woo, 2010).

According to Von Tigerstrom et al. (2011), to promote physical activity the following should be done: Firstly, the implementation of measures to increase daily exercise, such as walking or cycling, where the energy expended amounts to 6–200kcal/hour, depending on the intensity of the exercise (Mansoubi et al., 2015). Overweight and obese people who are sedentary, an extra three hours daily of any activity involving standing rather than sitting increases the 24-hour energy expenditure from 49% to more than 70% above the basal metabolic rate. Secondly, the introduction of physiological fitness training with vigorous exercise of 45–50 minutes. There should be frequent professional contact for encouragement either by telephone or home visit. Social support, particularly from family members, and promoting walking as a form of exercise can encourage compliance (Kalra et al.; 2012). Obese children are particularly sensitive to peer attitudes towards body shape and exercise programmes. Increasing physical expenditure in children has been associated with other benefits than raising energy expenditure (Hills et al., 2014). For example, being active may compete with snacking and thereby make adherence to a diet easier (Simons et al., 2014).

Research has indicated that the amount of time spent engaged in sedentary behaviour or inactivity may have an even more important role than levels of physical activity in the genesis of children's weight problems (Katzmarzyk, 2010). The rapid rise in weight in childhood has been mirrored by an explosion of non-active leisure pursuits for children such as computers and video games. Television viewing has also been associated with increased intake of high-energy snacks (Ramos et al., 2013). It represented the principal source of inactivity for most children and adolescents in developed countries and has been linked with the prevalence of obesity (Raj & Kuamar, 2010). A study by Katzmarzyk (2010) clearly showed that short-term weight loss was greater in a group of children who were instructed to minimise sedentary activities and also resulted in improved maintenance of weight loss and a more positive attitude towards vigorous activity (Teixeira et al., 2012). Physical activity is, therefore, crucial in the management of obesity in children and adolescents.

2.4.3. Behaviour modification

The primary goal of behaviour modification is the improvement of eating habits (i.e. what to eat, where to eat, when to eat and how to eat) and the level of physical activity (Wadden et al., 2012). Behaviour treatment forms part of the behaviour change process and is considered to be an essential component of obesity treatment programme. It includes self-monitoring, which involves daily recording of food intake (Burke et al., 2011), and identification of personal and environmental influences that regulate eating and physical activity (Wadden et al., 2012). According to Greydams and Apple. (2011) the following should be practised and implemented during behaviour modification in adolescents and teenagers:

1. Learning to eat more slowly.
2. Omitting other actions such as watching television or reading while eating.
3. Eating only at specified times and places.
4. Using a reward system.
5. Using smaller plates.

Behaviour modification is based on behavioural analysis, which considers the behaviour that needs to change. The primary behaviour to be changed is eating, with efforts to slow the rate of eating. All dietary regimens should ideally be linked with some form of behaviour therapy. It is helpful to identify unproductive habits developed over time and to unlearn these habits by replacing them with adaptive patterns of behaviour. The main feature that behavioural

programmes have in common is an agreement to keep record of food intake and weight changes (Nakade et al., 2012). The key difference between behavioural methods and other forms of obesity treatment is that individuals must take personal responsibility for initiating and maintaining treatment rather than relying on external forces alone (Teixeira et al., 2012)

2.4.4. Pharmacological treatment

Pharmacological treatment has often been seen as a controversial option largely due to a misconception of its rational use. Since behavioural treatment alone has a limited effect, pharmacological treatment has to be considered especially for adolescents with severe obesity. Pharmacological treatments with direct focus on weight reduction are somatostatin analogues, which may serve as examples of conceivable anti-obesity drugs (Lughetti et al., 2010). There are a variety of treatments for obesity, including Orlistat, Sibutramine and Rimonabant, which have not been documented for adolescent usage (Sherafat-Kazemzadeh et al., 2013).

2.4.5. Gastric surgery

Gastric surgery is now considered to be the most effective way of reducing weight and maintaining weight loss in severe obesity (Rippe & Angelopoulos, 2012). It is usually followed by a strict dietary regimen, increased physical activity and behaviour modification to avoid weight relapse (Dwyer et al., 2015).

For people with very severe obesity (BMI>40 kg/m^2) and those with BMI or fewer life-threatening complications, surgical procedures are the treatments of choice. These can result in significant weight losses that are usually well-maintained for more than five years (Hurt et al., 2010). The most common operations are vertically banded gastroplasty and gastric bypass, which have been shown to radically reduce stomach volumes by creating a gastric punch of no more than 25ml in volume (Tinoco et al., 2015). Weight loss after surgery is rapid at first, slowing gradually over a period of two years. Obese adolescents could be eligible for bariatric surgery if they had a body mass index of more than 35kg/m^2 with or without comorbidity. Bariatric surgery was shown to be safe in adolescents and was associated with significant weight loss, correction of obesity comorbidity and improved self-image and socialisation (Hofmann, 2013).

2.5. PREVENTION OF OVERWEIGHT AND OBESITY

Prevention of overweight and obesity is an appealing concept given the prevalence, growth rate, relapses, morbidity and mortality of the disease (Kelly et al., 2013). Nevertheless, prevention has attracted fewer resources than treatment, leaving the field with an unfortunate lack of information on or commitment to public health approaches. Prevention programmes for obesity, now at the earliest stages of development, have yet to develop adequate conceptual models, identify the most likely intervention targets and confirm that the prevention of obesity is possible in the current environment (Chan & Woo, 2010). Research on obesity prevention is still in its infancy and even less is known about the impact of potential policy changes (Chan & Woo, 2010).

Huijun & Fengying, (2013) reports that understanding and promoting physical activity is also at an early stage (WHO, 2012a). School-based programmes are particularly promising. Over the past decades data have shown that physical activity has sharply declined during adolescence (Rees & Sabia, 2010). Childhood and adolescence may thus be pivotal periods for preventing sedentary behaviour among adults by maintaining the habit of physical activity throughout the school years and into adulthood (Umberson et al., 2010). To build on such successes, interventions targeting physical education in primary schools have led to substantial decreases in overweight and obesity in school children (Su, 2016). Communities can facilitate inducements such as accessible and attractive trails for walking and bicycling. They can also open schools for community recreation, form neighbourhood watch groups to enhance safety, encourage walks and other outdoor activities (Tremblay et al., 2015). The following guidelines can be useful in preventing overweight and obesity (Kelly et al., 2013):

2.5.1. Dietary guidelines

Prevention of weight gain can be addressed through education, e.g. restricting food choices to healthy food, reducing television-watching time and encouraging participation in vigorous physical activities. Other prevention strategies include reducing the number of high-energy food advertisements targeted at children and limiting the distribution of high-density foods, especially in schools (Karnik & Kanekar, 2012).

2.5.2. Public policy

Individuals in developed nations are exposed to a toxic food environment that provides access to and encouragement for consumption of a high-energy and high-fat diet (Davis, 2013). Legislation and regulations aimed at the price structure of foods, opportunities and incentives for physical activity and control of exposure to messages that promote unhealthy eating habits might have a considerable impact on public health interventions (Davis, 2013).

The goals of overweight and obesity prevention are shifting away from a focus on body weight to a broader health management perspective (Kelly et al., 2013). These goals are defined as the adoption of healthy and sustainable eating and exercise behaviour that can be followed every day and are highlighted as follows (Wilfley et al., 2011):

- A healthy eating lifestyle with increased intake of whole grains, fruits and vegetables.
- A non-restrictive approach to eating based on internal regulation of hunger and satiety.
- At least 30 minutes a day of enjoyable physical activity.

There is an urgent need to prevent or reverse unhealthy trends in diet and physical activity patterns in developing countries (Kelly et al., 2013). The fundamental causes of the obesity epidemic are societal, resulting from an environment that promotes a sedentary lifestyle and consumption of high-fat, energy-dense foods with decreased levels of physical activity (such as walking) (Hill et al., 2012).

Prevention is not just the responsibility of individuals but requires structural changes in societies. In other words it cannot be prevented or managed solely at the individual level. This partnership is required to ensure that effective and sustainable changes in diet and everyday levels of physical activity can be achieved throughout the community (WHO, 2012a). This approach will also allow obesity prevention and management strategies to be harmonised with existing public health policies and programmes for the control of all non-communicable diseases (WHO, 2011).

Prevention of overweight and obesity should begin early in life and it should be based on the development and maintenance of life-long eating habits and physical activity patterns (WHO, 2010a). Schools should promote physical activity by incorporating a variety of recreational

activities into their teaching curriculum. They should also encourage healthy eating through training in practical food skills and by adopting healthy nutritive standards for school meals (Singhal et al., 2010). However, overweight and obesity prevention and management intervention should be carefully designed so that they do not cause undue fear of fatness and precipitate eating disorders (WHO, 2012a). Consumers should be educated and encouraged to demand food products of high nutritional quality. The main emphasis in affluent societies should be to discourage existing patterns of sedentary behaviour (Gortmaker et al., 2011).

To prevent overweight and obesity, educational programmes that are nutrition oriented should be communicated to the community. The best hope for the prevention of obesity is through greatly expanded programmes of nutrition education directed particularly at school children, teenagers and mothers (Swinburn et al., 2011). The pattern of obesity is often set in infancy when the mother overfeeds the baby in the erroneous belief that a fat baby is a healthy baby (Hesketh & Campbell, 2010). During adolescent years, food is often used to address problems (such as height, body type and relative amount of muscle mass) that face teenage boys and girls. By recognising these trends, the mother can do much to redirect food habits.

Affluence, mechanisation and automation results in individuals becoming overweight because of lack of exercise. A pattern of activity is best taught during childhood and must also be emphasised during the school years (De Silva-Sanigorski et al., 2010). Prevention should be based on assessment of changes in the prevalence of overweight.

Obesity prevention efforts should focus on population-based public health strategies aimed at reducing obesity, thus promoting aspects of the environment such as obesogenic environments in which we live, providing incentives for healthy eating, increased level of physical activity and socioeconomic environment are the key targets of obesity prevention policies and improving the population's knowledge. Linking Television advertising to children's foods knowledge, preferences and consumption. Television advertising is associated with increased consumption of snacks and drinks high in sugar as well as excess calorie intake (WHO, 2012a). Strategies should be multi-sectoral and governments, regional authorities, the food industry, media, communities and consumers should view obesity as a serious medical condition and as a condition that can be treated with lifestyle modification and effective management (Sahoo et al., 2015).

Three key settings for implementing obesity management support programmes aimed at children can be identified as 1) family-based, 2) school-based and 3) primary care based (Gortmaker et al., 2011). As the family environment has one of the strongest influences on a child's risk for obesity, a logical context or childhood obesity prevention and management efforts would be the families of susceptible children (Mori et al., 2012). Indeed, the provision of appropriate education on eating and lifestyle behaviour to parents has been shown to significantly reduce the prevalence of obesity in children of participating families for periods of three months to three years when compared to families not receiving advice and support (WHO, 2012a). Parental attitudes, purchasing patterns, presentation of food, parental modelling of eating and exercise habits and support for active leisure pursuits can all affect a child's eating and exercising pattern (Waters et al., 2011).

In South Africa, the government is engaged in issuing bicycles to learners as a means of transport to schools with the hope of increasing physical activity in both rural and urban communities (Draper et al., 2010) and also through radio slot messages for promoting the use of food-based dietary guidelines (Vorster et al., 2013) and condemning bad lifestyle behaviours (Gortmaker et al., 2011).

There are a number of reasons that justify initiating obesity prevention programmes through schools. A large proportion of children attend school and a great deal of a child's eating and exercise is carried out in this setting. Schools can also assist in identifying children who may be at risk for obesity through educational programmes and visits to schools by health practitioners at key developmental stages (Singhal et al., 2010). Furthermore, the commencement of schooling correlates with a period of increased risk for excessive weight gain as children begin to exert independence and vary their diet and activity patterns in line with their new circumstances (WHO, 2012a).

The following policies can help, if implemented by the government, to reduce the prevalence of obesity in adolescents (Novak & Brownell, 2012):

1. Education, by funding health promotion campaigns, training health education teachers in obesity prevention, by restricting consumption of foods of low nutritional value in schools and discouraging food commercials in schools.
2. Health care and training, by funding research on methods of promoting healthy dietary habits and activity patterns and revising health insurance regulations to reimburse

health care providers for obesity intervention. Nutrition education should also be introduced during medical and nursing training and require medical practitioners to learn how to counsel patients needing behaviour changes.

3. Food labelling and advertising, by requiring nutrition labelling on fast food containers, restricting advertising of high-energy, low-nutrient foods during children's programmes and, lastly, requiring that food advertisements disclose energy contents.
4. General policy development, by funding a national monitoring system to track rates of obesity and fund current research on obesity prevention and treatment and also by funding a coordinated, national campaign to prevent obesity, involving all relevant stakeholders.
5. Taxes, by taxing high-energy, low-nutrient foods to generate funds for anti-obesity campaigns, by subsidising the costs of low-energy foods and by providing tax incentives for weight management programmes.

According to Kruger et al. (2014), there are three issues that need to be addressed in the nutrition education of South African consumers in order to lower the prevalence of overweight and obesity in the country: 1) the importance of limiting dietary variety with certain food groups where energy intake is adequate and emphasising the importance of fruit and vegetable consumption, 2) the importance of including information about portion sizes and 3) the importance of introducing guidelines on physical activity.

Physical inactivity is one of the vital factors that contribute to the development of overweight and obesity reported in most studies in South Africa and rural communities (Mokobane et al., 2014). In the Western Cape, between 30% and 40% of men and women reported no physical activity (Dalais et al., 2014). In another survey conducted in the North West province of South Africa, it was demonstrated that inactivity, independent of the degree of urbanisation, was associated with increasing obesity levels (Micklesfield et al., 2013).

2.6. ASSESSMENT OF OVERWEIGHT AND OBESITY VARIABLES

Assessment of overweight and obesity values is done by determining BMI, fat distribution, waist circumference, waist-to-hip ratio and to assess risk factors and prevention of obesity-related diseases. While BMI has been shown to predict abdominal fat and abdominal

subcutaneous fat, waist circumference has been shown to predict visceral fat, thus reinforcing the use of both BMI and waist circumference in clinical practice (Dalvand et al., 2015).

2.7. CONCLUSIONS

Overweight and obesity should be viewed as a serious health conditions. People should be informed that overweight and obesity can be treated with lifestyle modifications and effective management. Health care professionals need to have positive attitudes towards obesity and obese patients, since stigmatisation of individuals adds to the existing burden of this disease (Malterud & Ulriksen, 2011). The effectiveness of all public health programmes set up to prevent weight gain in the population should be evaluated.

Media should not induce eating disorders or encourage the stigmatisation of obese individuals in society. Factors such as dietary energy density and behavioural aspects of eating also contribute to the epidemic (Rolls, 2014). It is true that obesity should be regarded as a modern-day neglected public health problem, but the influence of socio-economic status, including education level on the risk of becoming obese (Adeboye et al., 2012) should be considered and addressed.

The prevention and management of obesity and associated comorbidities require the synergism of national health policies on nutrition and non-communicable disease control. Appropriate strategies for integrated approaches to the prevention and management of obesity and overweight should include consumer education, development and implementation of dietary guidelines, food labelling, nutrition and physical education in schools, altered feeding programmes and efforts to ensure truth in advertising (Chan & Woo, 2010).

The process of nutrition transition and its impact on average body weight must also be considered as an influential factor (Popkin et al., 2012). The relationship between obesity and sedentary behaviour such as television viewing, video watching and computer work was found to be strong (De Jong et al., 2013). People should be able to distinguish between energy-dense drinks and lower-energy drinks. Media, including television, radio and print, play a major role in information dissemination in modern consumer societies. They are part of informal education and both reflect and influence public attitudes (Ritland & Rodriguez, 2014). National commitment to overweight and obesity control should therefore be the shared responsibility of

consumers, government, the food industry and the media. All have important roles in promoting effective changes in the diet and everyday levels of physical activity.

Overweight and obesity are problems in South Africa due to lack of information on the impact of overweight, management of overweight and education on risk factors. Culturally, overweight and obesity have always been considered a sign of wealth, mainly in African communities (Rossouw et al., 2012). Behaviour modification and lifestyle management should be practised and implemented from the onset of life to avoid this epidemic.

Combating the prevalence of obesity and factors that contribute to its development should be in line with the South African food-based dietary guidelines (SAFBDG) to achieve a healthy-minded community (Steyn & Temple, 2012). Subjecting the body to physical activity and eating plenty of vegetables and fruit everyday should be encouraged and promoted through nutrition education in schools and public areas as these might be the remedies for this lifestyle disease (Taylor et al., 2013). Lifestyle patterns that support the development of chronic diseases are established in childhood (Sylvetsky-Meni et al., 2015). Therefore, guidelines may be extended to school-going children. The most important concern is the successful and widespread adoption of these guidelines, which can be facilitated by identifying and addressing barriers within countries and characterised by readiness to change in individuals. As such, in order to understand the overweight and obesity epidemic, especially in South Africa, it is important to investigate the eating and lifestyle habits of overweight female teenagers.

CHAPTER 3: METHODOLOGY

3.1 STUDY DESIGN

The study was a descriptive cross-sectional quantitative survey as it described personal attributes such as body composition, dietary intakes and lifestyle habits. In this case my study is a cross-sectional study which was aimed at an investigation of eating and lifestyle habits of overweight and obese teenagers. Quantitative research focuses on asking questions that pertain to what, where or when? A Survey is a method of gathering information from individual and it has a variety of purposes, and it can be conducted in many ways in a different modes. Surveys may be conducted to gather information through a printed questionnaire (Vannette and Krosrink, 2014).

3.2 STUDY POPULATION AND SAMPLING

3.2.1 Population and area

The study population comprised of school-going female adolescents from Thulamela Municipality in Vhembe District of Limpopo province. Thulamela Municipality has the features of a rural community, including high levels of illiteracy, bad roads connecting adjoining communities and perennial scarcity of water for both domestic and industrial use (Thulamela municipality 2009/10-2011/2012, IDP). Its boundaries spread from the boarders of Kruger National Park to areas around Thohoyandou town. The municipality has a population of 584,563 individuals, including all population groups and genders (Statistics SA, 2006). The female population in this age group is 49,271 (Statistics SA, 2006). In 2011, the school attendance for 5–24-year-olds was 233,822, with 48.8% being females.

3.2.2 Sampling design and size

In this section, sampling designs, sampling size, inclusion and exclusion criteria and procedures are discussed. The secondary or high school was used as a sampling frame.

3.2.2.1 Sampling design

Non-random sampling was used to select schools and clustering was applied. Purposive sampling was then used to select female teenagers. A list of schools was obtained from the

Department of Education regional offices in Thohoyandou. The municipality was divided into four clusters (North-West, North-East, South-East and South-West). Schools were randomly selected by using a map of Thulamela Municipality and a compass was put at the centre of the map to circle the required schools. Two schools per cluster were selected according to the circuit for budgetary and logistical reasons. This constituted eight of the total number of schools in Thulamela Municipality with an estimated 4,200 pupils. Female subjects were grouped and screened according to the required classifications (normal weight, overweight and obese teenagers) from the list obtained from the teachers.

3.2.2.2 Sample size

From each cluster, two schools were randomly selected and 30 subjects from each cluster were randomly chosen to make up the required target number of 120 subjects. The final sample size was 125 subjects recruited and were distributed into four clusters (43 normal weight, 18–25kg/m^2; 49 overweight, 25–30kg/m^2; and 33 obese, above 30kg/m^2). The reduction in numbers was due to non-consent from some of the subjects.

3.2.2.3 Inclusion and exclusion criteria

Female teenagers aged between 13 and 18 years were eligible to participate in the study and those falling outside this age range were excluded, as were underweight teenagers (BMI below 18kg/m^2). Only those who attended school were included in the study.

3.3 DATA COLLECTION

3.3.1 Measured variables

Socio-demographic data, anthropometric data (weight and height) and perceived body composition of the female teenagers were assessed.

3.3.1.1 Socio-demographic data

A self-reported questionnaire was used to collect demographic data of the subjects (Appendix B). The data included gender, ethnic group, age, family income, qualification level, household characteristics and medical history.

3.3.1.2 Anthropometric measurements

Weight and height were measured to determine body composition. All anthropometric measurements were done according to the standard procedures described by the International Society for the Advancement of Kinanthropometry (Mamabolo et al., 2014). Weight was measured on a portable electronic scale (TBF-680E, Tanita) to the nearest 0.1 kg. Height was measured to the nearest 0.5 cm with a stadiometer (IP1465, Invicta), with subjects standing upright with their heads in the Frankfort plane. BMI was calculated as weight divided by height squared (kg/m^2). This is the recommended screen for body fat in routine office practice despite imperfections (Hill et al., 2012). This was recorded on Section B of the questionnaire.

Circumferences were measured with the cross-hand technique, with the tape at right angles to the body segment being measured and with no indentation of the skin. Waist circumference was measured to the nearest 0.1 cm with a 7-mm-wide flexible steel tape (Cooper Tools, Lufkin) at the midpoint between the lower rib margin and the iliac crest. Hip circumference was measured to the nearest 0.1 cm at maximum extension of the buttocks. Waist-to-hip ratio was calculated from waist and hip circumferences.

3.3.1.3 Social and lifestyle

Data were collected using a self-reported questionnaire to assess the teenagers' understanding and knowledge of all determinants. The questionnaire focused on assessment of behaviours that have the strongest association with energy balance (Hill et al., 2012). Those were recorded in Appendix B and Section C packages of the questionnaire. The researcher personally delivered the questionnaires and dropped then in the principal office when visiting schools.

3.3.1.4 Dietary habits/patterns

A standardised food frequency questionnaire was used to collect dietary intake data (Appendix C) and for the reliability of the data subjects were given a self-administered questionnaire in their own language. It was designed in English and translated to both Tshivenda and Xitsonga (Appendix B).

Subjects were asked about the frequent consumption of selected food; frequency and other questions were developed from the food frequency table, which included information on meal

compositions including starches, chicken, meat and fish, vegetables and fruits, bread and snacks and soft drinks (Appendix C).

3.3.2 Data collection procedure

Schools were visited in the afternoon to avoid disruption of the school programme as agreed upon with the Department of Education. School visits were conducted three times, initially for introduction, then screening, followed by data collection. Subjects were selected randomly, screened according to the list identified and classified according to their BMI values. The two female field workers were trained nutritionists responsible for anthropometric measurements. The anthropometric data were collected in the presence of the researcher. The questionnaires (Appendixes B and C) were self-reported.

3.4 VALIDITY AND RELIABILITY

Validity refers to the degree to which a study accurately reflects or assesses the specific variables that the researcher is attempting to study (Leung, 2015). Reliability refers to the consistency of measurement or the degree to which an instrument measures the same variable each time it was used under the same conditions with the same subjects in the study (Leung, 2015).

In order to ensure the reliability and validity of this study, data triangulation was done. Validity of the study was ensured by including a variety of questions on knowledge that subjects should have on determinants of overweight and obesity (Fincham & Dranglis, 2013). Questions on various aspects of the determinants, based on extensive review of the literature, were included to ensure content validity. Reliability was ensured by consistency in administering questionnaires. All questionnaires were distributed to subjects by the research assistants and no single question was answered by either researcher or research assistant. To ensure validity of these variables, all anthropometric measurements were done in duplicate and the averages were used for data analysis. Measurement tools were calibrated every morning before school visits.

3.5 ETHICAL CONSIDERATION

Approval was obtained from the ethics committee of University of Venda, Provincial Health Research Committee and the Department of Education. Permission to conduct the study of the schools was obtained from the provincial Department of Education, the provincial health and research committee and the school authorities (Appendix D). A written consent form was designed and every participant was requested to complete it prior to the interview, after the researcher had explained the purpose and aim of the study (Appendix A). Parents of the children under 18 years were requested to provide consent.

3.6 PILOT STUDY

Before data were collected, the questionnaire was pre-tested on nine first entering students of the University of Venda. This was done to increase practical experience with the administration of the questionnaire and to identify areas that required improvement. The pilot subjects were grouped as three Tshivenda-, three Xitsonga- and three English-speaking students. The questionnaires were subsequently improved – the Tshivenda and Xitsonga versions in particular –to make the tool user-friendly. The two field workers (Tshivenda- and Xitsonga-speaking respectively) measured anthropometric parameters on the nine pilot subjects.

3.7 LIMITATIONS OF THE STUDY

The data collection was done from October to November 2006 because of school holidays, which caused disruptions in data collection. Some subjects feared to participate or consent as they had an impression that they were going to be asked HIV/AIDS-related questions.

3.8 DATA ANALYSIS

The data were organised and analysed using SPSS 21.0 (IBM Corp., 2012). Pre-coding of questions was done for all questionnaires. Cluster, subject and school coding were also done. Data were captured in Microsoft Excel and imported into SPSS for further analysis. Descriptive statistics were used to describe the observations made using mean values, standard deviations and percentiles. Inferential statistics such as the t-test, Pearson correlation for continuous data and chi-square test for categorical data were used to test for significant differences; a p-value

of less than 0.05 was considered statistically significant. A statistician was consulted during the development of the questionnaire, data analysis and interpretation.

The chi-square test was only applied to BMI and the following variables:

- Type of physical activity
- Frequency of exercise
- Number of meals per day
- Type of snack consumed
- Carrying lunchbox to school
- Travelling time to school
- Chicken preparation
- Chicken skin consumption
- Red meat preparation methods
- Entertainment/hobbies
- Carrying of pocket money
- Amount of money carried

CHAPTER 4: RESULTS

4.1 INTRODUCTION

This chapter focuses on the presentation of findings. The results are presented using tables and figures. This chapter incorporates socio-demographic details, dietary intake as well as social and lifestyle habits.

4.2 SAMPLE DESCRIPTION

Overweight was defined as BMI being equal to or more than 25kg/m^2 and obesity as BMI being equal to or more than 30kg/m^2. From the sample description, it was found that 34.4% had BMIs of 18–25 kg/m^2, which was normal, 39.25% were found to be overweight with BMIs of 25–29.9 kg/m^2, while 26.4% had BMIs of more than 30kg/m^2, which was considered as obese. More subjects were overweight and obese, at 65.6% of total sample (Table 4.1.)

Table 0.1.The classification of subjects by their body mass index (BMI) values.

BMI (kg/m^2)	**Interpretation**	**Number**	**%**
18–25	Normal	43	34.4
26–30	Overweight	49	39.2
>30	Obese	33	26.4
Total		**125**	**100**

4.3 SOCIO-DEMOGRAPHIC CHARACTERISTICS OF SUBJECTS

Tables 4.2 to 4.4 focus on the socio-demographic characteristics of subjects. Teenagers in Grades 8–11 accounted for the largest proportion (83.2%) of subjects (Table 4.2).

Table 0.2.Educational status of subjects.

Educational status	**Number**	**%**
Grade 8–11	104	83.2
Grade 12	10	8
Grade 5–7	8	6.4
No response	3	2.4
Total	**125**	**100**

Table 4.3 shows that 56% of subjects stayed with both parents, whilst 32.8% stayed with single parents. The data indicated higher percentage of both parents headed households.

Table 0.3. Family structure of subjects.

Family structure	**Number**	**%**
Staying with both parents	70	56
Staying with one parent	41	32.8
Staying with relatives	7	5.6
Staying with non-relatives	1	0.8
Staying with parents and relatives	3	2.4
Combination	3	2.4

Table 4.4 shows that 38.4% of households relied on the father, 27.2% reported that their mothers were responsible and 24.8% were supported by both parents.

Table 0.4. Main household contributor for food provision

Food provider	**Number**	**%**
Father	48	38.4
Mother	34	27.2
Both parents	31	24.8
Grandparents	4	3.2
Brother	3	2.4
Sister	1	0.8
Social grant	2	1.6
Combination	2	1.6
Total	**125**	**100%**

Table 4.5 illustrates where subjects stayed and the majority (96%) of subjects were from rural villages.

Table 0.5. Location of subjects' households.

LOCATION	NUMBER	%
Rural	120	96
Semi-rural	5	4
Total	**125**	**100**

4.4 LIFESTYLE AND SOCIAL HABITS OF SUBJECTS

Tables 4.6 to 4.19 describe lifestyle habits of subjects in terms of sleeping hours, hobbies, physical activity, exercise, meals, snacks, money to school and lunchboxes. Habits selected were those considered as per the literature to influence BMI. Table 4.6 shows that 88% of the subjects spent 6–9 hours sleeping. This is within the expected normal sleeping hours for teenagers, i.e. around 8 hours.

Table 0.6. Sleeping hours of subjects.

Sleeping hours	%
6–9	88
0–6	2.4
Not answered	9.6
Total	**100%**

Table 4.7 shows the form of entertainment that the subjects enjoyed and 38.4% of the teenagers preferred reading books as part of entertainment, 27.2% reported watching television and 24% used a combination of activities.

Table 0.7. Entertainment enjoyed by subjects.

Entertainment	%
Reading	38.4
Watching television	27.2
Singing	4.8
Playing soccer	1.6
Combination	24
All of the above	4

Total	**100%**

Table 4.8 shows that 66.4% of subjects preferred walking as part of physical activity and 16% enjoyed jogging.

Table 0.8. Physical activity pattern of subjects.

Type of physical activity	**Number**	**%**
Walking	83	66.4
Jogging	20	16
Swimming	4	3.2
Skipping	1	0.8
Aerobics	2	1.6
Combination	3	2.4
None	12	9.6
Total	**125**	**100%**

Table 4.9 shows that 42.4 % of teenagers exercised daily and 21.6% exercised three times a week.

Table 0.9. Frequency of exercise done by subjects.

Frequency of exercise	**Number**	**%**
Daily	53	42.4
5 x week	27	21.6
3 x week	22	17.6
Occasionally	21	16.8
Never exercise	1	0.8
Not answered	1	0.8
Total	**125**	**100%**

Table 4.10 shows that 70.4% of the subjects ate three meals per day, 12% reported that they had two meals per day and 19% had more than three meals per day.

Table 0.10. Meals consumed per day by subjects.

Number of meals consumed	Number	%
Two	15	12
Three	88	70.4
Four	15	12
Five	7	7
Total	**125**	**100%**

Table 4.11 shows that 83.2% of subjects consumed snacks between meals. The time of the snack was not determined.

Table 0.11. Snacks consumption by subjects.

Snack consumption	Number	%
Yes	104	83.2
No	19	15.2
Not answered	1	0.8
Missing system	1	0.8
Total	**125**	**100%**

Table 4.12 shows that 52.8% of subjects consumed a snack every day and only 35.2% consumed snack occasionally.

Table 0.12. Frequency of snack consumption.

Frequency of snack consumption	Number	%
Everyday	66	52.8
Sometimes	44	35.2
Not answered	3	2.4
Not applicable	12	9.6
Total	**125**	**100%**

Table 4.13 shows that 72.8% of subjects indicated to be eating snacks at home.

Table 0.13. Snack consumption of subjects at home.

Snack consumption	**Number**	**%**
Yes	91	72.8
No	31	24.8
Not answered	1	2.4
Total	**125**	**100%**

Table 4.14 shows that the most-consumed snacks were starchy (23.2%) and sweet (7.2%). The results further revealed that the majority of subjects (61.6%) preferred a combination of different types of snacks.

Table 0.14. Types of snack consumed by subjects.

Type of snack	**Number**	**%**
Starchy	29	23.2
Sweet	9	7.2
Fat-based	1	0.8
Protein-based	1	0.8
Fruit	1	0.8
Combination	77	61.6
Not answered	7	5.6
Total	**125**	**100%**

Table 4.15 shows that 57.6% of subjects carried a lunchbox to school, but the contents were not determined.

Table 0.15. Carrying of lunchbox to school by subjects.

Lunchbox to school	**Number**	**%**
Yes	72	57.6
No	52	41.6
Not clear	1	0.8
Total	**125**	**100%**

Table 4.16 shows that 44% of subjects carried lunchbox to school every day. Furthermore, they were asked whether they carry money to school and Table 4.17 indicates that the majority of subjects did carry money to school. The frequency and amount of money carried to school were established and are reported in Tables 4.18 and 4.19.The results showed that the majority (69.4%) of subjects carried money daily, which ranged from R2.00 to R5.00.

Table 0.16. Frequency of carrying lunchbox to school by subjects.

Frequency of lunchbox	**Number**	**%**
Daily	55	44
Weekly	12	9.6
Monthly	4	3.2
Never	11	8.8
Not answered	3	2.4
Not applicable	40	32
Carrying of pocket money to school by subjects.		
Carrying of pocket money	**Number**	**%**
Yes	116	92.8
No	9	7.2
Total	**125**	**100%**
Frequency of carrying pocket money to school by subjects.		
Frequency	**Number**	**%**
Daily	86	69.4
Weekly	5	4
Never	24	19.4
Occasionally	1	0.8
Not answered	2	1.6
Not applicable	6	4.8
Missing system	1	-
Total	**125**	**100%**
Amount of pocket that subject carry to school.		
Amount	**Number**	**%**
R2.00	73	58.4
R3.00	18	14.4
R5.00	23	18.4
More than R 5.00	3	2.4
Never	8	6.4
Total	**125**	**100%**

Subjects were asked about what they bought at school and Table 4.17 shows that 40.8% preferred starchy snacks, probably bread and a filling, and 47.2% only bought protein-based snacks. These were bought from hawkers.

Table 0.17. Food items subjects bought at school.

Food items	**Number**	**%**
Starchy snacks	51	40.8
Sweet snacks	7	5.6
Fat-based snacks	3	2.4
Protein-based snacks	59	47.2
Not answered	4	3.2
Not applicable	1	0.8
Total	**125**	**100%**

4.5 DIETARY PATTERNS

In this section the dietary patterns of subjects in terms of meals, snacks and preparation methods are reported. Subjects were asked what meals they ate at school and Table 4.18 shows that 42.4% were not sure of meals per week at school, while 21.6% had one meal, of which 8.8% also consumed a snack, and 27.2% reported that they consumed two meals, of which 4.8% also included a snack.

Table 0.18. Meals at school per week by subjects.

Meals at school	**Number**	**%**
One	27	21.6
Two	28	22.4
One and snack	11	8.8
Two and snack	6	4.8
Not sure	53	42.4
Total	**125**	**100%**

Subjects were asked how many meals they ate at home and Table 4.19 shows that 71.2% ate more than four meals per week at home.

Table 0.19. Meals at home per week consumed by subjects.

Meals at home	Number	%
Two per week	9	7.2
Four per week	8	6.4
More meals per week	89	71.2
Occasionally	10	8
Never	8	6.4
Not answered	1	0.8
Total	**125**	**100%**

Subjects were asked about the time they spent travelling/walking to school. Table 4.20 shows that the distance travelled varied and 36% walked between 15 and 20 minutes, while 37.6% walked for 30 minutes or more.

Table 0.20. Time spent by subjects when travelling to school.

Time	Number	%
5–10 minutes	27	21.6
15–20 minutes	45	36
30 minutes	30	24
> 30 minutes	17	13.6
Combination	1	0.8
Not answered	4	3.2
Not applicable	1	0.8
Total	**125**	**100%**

Subjects were asked about the person who was mainly responsible for preparing meals and 45.6% reported that they themselves were, 20.8% said their mothers did the preparation and 18.4% reported that the responsibility was shared among household members.

Table 0.21. Food preparation in subjects' households.

Responsible cook	**Number**	**%**
Self	57	45.6
Mother	26	20.8
Sister	6	4.8
Caretaker	9	7.2
Grandmother	3	2.4
Combination	23	18.4
Not answered	1	0.8
Total	**125**	**100%**

Subjects were asked how often they engaged in food preparation at home and 75.2% indicated that they were involved daily (Table 4.22).

Table 0.22. Frequency of food preparation by subjects.

Frequency	**Number**	**%**
Everyday	94	75.2
Once per week	5	4
Twice per week	11	8.8
Three times per week	7	5.6
Four times per week	5	4
Five times per week	2	1.6
Combination	1	0.8
Total	**125**	**100%**

Table 4.23 shows that 96% of subjects reported that most food was prepared for home consumption. It was not further indicated which meals they prepared and when they did so.

Table 0.23. Where food was consumed by location

Locality	Number	%
Home	120	96
Restaurant	1	0.8
All of the above	2	1.6
Combination	2	1.6
Total	**125**	**100%**

Subjects were asked whether there were vegetable gardens at home and 45.6% of household had vegetable gardens (Table 4.24). They were, however, not asked what was cultivated in those gardens.

Table 0.24. Availability of vegetable gardens at subjects' homes.

Vegetable garden at home	Number	%
Yes	57	45.6
No	68	54.4
Total	**125**	**100%**

Subjects were asked whether they had been exposed to nutrition education and Table 4.25 shows that 52% had access to health-oriented talks. Furthermore, the source of health talks was established and radio/television (27.1%) were identified as major sources, followed by information from the clinic (15.2%), while a dietician (3.2%) and nutritional advisor (2.4%) played small roles in the nutritional information received by subjects.

Table 0.25. Source of nutritional information obtained by subjects.

Source	Number	%
Radio/television	34	27.2
Clinic	19	15.2
Dietician	4	3.2
Nutrition advisor	3	2.4
Others	1	0.8
Combination of the above	4	3.2
Not answered	1	0.8
Not applicable	59	47.2
Total	**125**	**100%**

4.6 FOOD CONSUMPTION

In the following section, dietary data in terms of consumption of starch, protein, vegetables and fruits, meat preparation method are presented. With respect to starchy food, Table 4.26 shows that both mealie-meal porridge, bread and rice were consumed about almost equally.

Table 0.26. Consumption of starchy foods by subjects.

Starch	Number	Yes	No	No answer
Mealie meal	125	95.2%	4%	0.8%
Rice	125	94.4	5.6%	0
Bread	125	96%	4%	0

Subjects were asked what types of spreads they used on bread and data indicated that 68% ate brown bread and used mainly margarine (25.6%) or a combination of spreads (Table 4.27).

Table 0.27. Bread spread types consumed by subjects.

Bread spreads	Number	%
Margarine	32	25.6%
Butter	10	8
Jam	4	3.2
Avocado	5	4
All of the above	16	12.8
Others	1	0.8
Combination	35	28
Not answered	5	4
Not applicable	17	13.6
Total	**125**	**100%**

Subjects were asked about preparation methods for chicken and the results showed that frying and stewing were most commonly used (Table 4.28).

Table 0.28. Preparation method for cooking chicken used in the subjects' households

Cooking method	Number	%
Fried	44	35.2
Stew	42	33.6
Boiled	22	17.6
Combination of methods	13	10.4
Grilled	3	2.4
Not answered	1	0.8
Total	**125**	**100%**

Table 4.29 shows that chicken skin was reportedly always eaten by 29.6% of subjects; 40.8% mentioned eating chicken skin occasionally and 26.4% indicated they never eat chicken skin.

Table 0.29. Chicken skin consumption by subjects.

Chicken skin consumption	Number	%
Always	37	29.6
Occasionally	51	40.8
Never	33	26.4
Combination	3	2.4
Not answered	1	0.8
Total	**125**	**100%**

With regard to red meat consumption, Table 4.30 shows that the majority of subjects (78.4%) consumed red meat, but the type was not indicated.

Table 0.30. Consumption of red meat by subjects.

Red meat consumption	Number	%
Yes	98	78.4
No	26	20.8
Not answered	1	0.8
Total	**125**	**100%**

Subjects were asked about red meat preparation methods and 29.6% reported cooking meat with fat or fried (24%), whereas only 14.4% reported trimming the fat before cooking.

Table 0.31. Red meat preparation methods used in the subjects' households

Red meat preparation method	Number	%
Cooked with fat	37	29.6
Fried	31	24.8
Trimmed fat	18	14.4
Combination of methods	11	8.8
Stewed	9	7.2
Not applicable	19	15.2
Total	**125**	**100%**

Table 4.32 shows that the majority of subjects (92.8%) consumed eggs and the preferred preparation method was frying.

Table 0.32. Consumption of eggs by subjects.

Consumption of eggs	Number	%
Yes	116	92.8
No	5	4
Not applicable	4	3.2
Total	**125**	**100%**

Subjects were asked about the milk or milk substitute in a tea and the results showed that cremora was commonly used (69.6%)

Table 0.33. Type of milk or substitute used in tea by subjects.

Type of milk or substitute	Number	%
Cremora	87	69.6
Combination of the above	19	6.2
Freshmilk	4	3.2
Condensed	2	1.6
Nespray	1	0.8
Not answered	7	5.6
Not applicable	1	0.8
Total	125	100%

4.7 NUTRITIONAL STATUS AS ASSESSED BY ANTHROPOMETRIC MEASUREMENTS

Table 4.34 details the findings of all anthropometric parameters measured.

Table 0.34. Measured anthropometric parameters in subjects (n=125).

Item	Mean	Standard deviation	Minimum	Maximum
Age (yrs)	16.30	1.36	13	18
Height (m)	158.42	5.25	147	171
Weight (kg)	67.6	12.65	44	105.9
Hip (cm)	56.48	8.68	32	97
WHR	102.79	10.14	83	135
Waist(cm)	38	12.42	44	105.9
Body fat (%)	33.60	8.67	16	99

WHR stand for waist hip ratio

Mean percentage body fat was 33.60±8.67 and mean age was 16.30±1.36 years. Therefore, more subjects had high body fat as confirmed by the mean of above 30%. Maximum hip circumference was found to be 97 cm and the minimum was 32 cm, with the mean being 56.5%.

Table 1 shows that the majority of subjects were overweight and obese (65.6%). From the sample of 125 teenagers, 34.4% were found to have BMIs of 18–25, which is normal according to classification table below, but 39.2% were found to be overweight and 26.4% of the remaining teenagers were obese.

4.8 COMPARISONS OF RELATIONSHIP BETWEEN DEMOGRAPHIC, LIFESTYLE, SOCIAL HABITS AND DIETARY PATTERNS.

There was no significant relationship between BMI and all socio-demographic variables. However, an inverse relationship was observed with frequency of exercise and chicken preparation method ($p < 0.01$). A positive correlation was also observed with red meat preparation methods and chicken preparation method ($P<0.01$). Carrying of pocket money was also correlated with carrying a lunchbox to school and chicken preparation method with p

<0.000 and p <0.05 respectively. The amount of money carried was also correlated with chicken preparation method with p =0.00 and p <0.01 respectively. Carrying a lunchbox to school was correlated with carrying of pocket money and amount of money carried with p <0.05. Furthermore, carrying of pocket money correlated with the amount of money carried.

All participants answered questions on demographic data and there was no statistically significant influence on BMI with p <0.05. Frequency of meals showed some significance with p =0.000. There was a significant association identified between BMI and carrying money to school (p =0.000), which indicated that pocket money influenced BMI. Eating snacks had a significant association (p =0.000) with BMI. Number of meals consumed and frequency of meal preparation was significantly associated with BMI (p=0.000). Preparation method, frequency of carrying a lunchbox to school and number of meals at school showed significant relationships (p<0.01) and therefore influenced BMI. Carrying a lunchbox to school and its frequency had an influence on BMI (p =0.05). Snacks frequently consumed and snack intake significantly influenced BMI with p =0.001. Waist circumference and body fat showed association with BMI (p <0.05).

4.9 **SUMMARY OF THE MAIN FINDINGS**

The summary of main findings are made below:

- 65.6% were overweight and obese.
- 56% of subjects stayed with both parents and 32.8% stayed with single parents.
- 88% of subjects spent 6-9 hours sleeping which is within the expected normal sleeping hours.
- 66.4% of subjects preferred walking as part physical activity.
- Majority of subjects which are 70.4% consumed three meals per day.
- Majority of subjects which are 83.2% consumed snacks between meals whilst 52.8% and 35.2% consumed snacks occasionally.
- 72.8% consumed snack at home and whilst 40.8% consumed starchy snack. The study further revealed that 61.6% preferred combination of types of snacks.
- 71.2% consumed more meals at home per week, whilst 75.2% indicated frequency of participation in food preparation.

CHAPTER 5: DISCUSSION

In this section, the findings are discussed under the subheadings of demographic details, environmental and socio-economic factors related to the development of overweight and obesity. Eating too much may result from having to maintain social relationships, which may include consuming rich party food in addition to usual mealtime eating. This contributes to their overweight and obesity (Martin-Biggers et al., 2014). Excessive amounts of carbohydrates are sometimes eaten because they are cheaper (Tremblay, 2016). A reduction of dietary energy intake while maintaining or increasing physical activity will reduce relative body weight in teenagers (Hill et al., 2012). Several benefits can be achieved through dietary controls, but negative consequences may also arise. Education of overweight and obese teenagers about foods and eating habits that facilitate weight control is an essential component of all weight management strategies (Todd et al., 2015). Dietary intake and pattern should be assessed to identify the area(s) requiring special attention, such as meal size, meal frequency and meal timing (Soederberg Miller & Cassady, 2015).

Limiting take-away and ready-to-eat food, which tend to be energy-dense and particularly high in fat, may also help to control energy intake. It is important to encourage all children, whether overweight or not, to adopt healthy eating habits from an early age and to continue into adulthood. The modern approach to obesity treatment must focus on a healthy diet. Introducing healthy dietary habits and promoting physical activity may be the two most relevant components of obesity prevention (Karnik & Kanekar, 2012)

5.1 DEMOGRAPHIC DETAILS

Most of the subjects (96%) were from a rural background, with the majority staying with both their parents and a few with a single parent. Whilst their educational status was predominantly Grades 8–11, the socio-economic level was indicative of inconsistent household food security as 1.6% of the teenagers depended on grants to put food on the table. The prevalence of obesity and overweight in the present study was high (65.6%), congruent with previous studies (Govender et al., 2016) that have shown obesity and overweight among rural black females in Kwazulu Natal in South Africa, a higher incidence of over-nutrition, both overweight and obesity was observed among black African females.

The prevalence of overweight and obesity is increasing in South Africa and is becoming more rapid in adolescents (Pienaar, 2015). Prevalence of childhood obesity is associated inversely with socio economic status, in contrast wealthier children in most developing countries are at a greater risk of obesity (Meko et al., 2015). Majority of leaners were coming from low level of income families, but also graduated professionals like teachers, skilled individuals like retail workers, clerks or unskilled individuals like cleaners and domestic workers.

According to the study family structures indicated that 56% of subjects stayed with both parents. Whilst 38% indicated father as main income contributors and 24.8% both parents as contributors. According to the sample description the majority were overweight and obese. However no association could be established with overweight and obesity and socio-economic status. This was due to the fact that the sample characteristics was homogenous. In South Africa, both urban and rural teenagers of the lower classes suffer from overweight and obesity (Meko et al., 2015). In the past, overweight or obesity was considered a sign of wealth in African populations and the idea has not changed (Muthurin et al., 2014). Teenagers participating in this study were from lower classes and yet overweight or obese. The study was conducted in a rural set-up and during the time of data collection the national school nutrition programme was not yet implemented in secondary and high schools.

5.2 LIFESTYLE AND SOCIAL HABITS

The majority of subjects sleeping time were within the recommended number of hours for sleeping and more subjects indicated that they preferred to watch television. As indicated in the literature, technological advancement, including television, has led to a marked reduction in the amount of human energy extended in engaging in other aspects of daily life (Schalkwijk, 2015). Childhood obesity is linked primarily to unhealthy eating habits, but also to the fact that children are less active than in the past (Sahoo et al., 2015).

The majority (66.4%) of subjects preferred walking as part of their physical activity and this should be encouraged throughout all stages of life as part of social changes. Fewer people are involved in manual work and their lives becomes sedentary (Owen et al., 2010). It is not necessarily the amount of food that is excessive, but the extra food beyond the energy need that accounts for the gradual increase in weight (Hall et al., 2012). In this study, the majority (70%) of subjects ate more meals in a day, which contributed to them putting more weight. In this

study, the majority of subjects consumed snacks almost every day based on their affordability. These snacks were consumed at home and most of them were starch-based. This is due to the fact that starchy snacks are often cheaper this exposed them to consumption of more meals per day which will make them victims of poor weight management especially overweight and obesity. The principle is that if more is consumed than less energy expenditure it means more in body mass which will influence more BMI results.

5.3 DIETARY PATTERNS AND CONSUMPTION

Majority of subjects which was 70.4% indicated to be eating three (3) meals per day and this might have had some significance on overweight and obesity development. As part of their eating habits subjects preferred starch snack than any other snack. Lunch box even though its content was not analysed, was carried to school by 57.6% everyday supplemented with pocket money. By implication it means subjects themselves were more prone or expose to food because of the environment they found themselves in.

Obesity is attributed to a reduced energy expenditure and high consumptions of excessive snacks and food (Wang et al., 2016). Consuming food beyond energy need could therefore result in a gradual increase in weight

The majority of respondents had meals at schools. Overweight and obesity have long been considered as the result of an imbalance of energy irrespective of whether the energy is derived from fats, carbohydrates and protein (Hill et al., 2012). The majority of respondents ate more meals per week at home.

Traditionally, girls are expected to help with home tasks, as observed in this study, where respondents reported to participate in food preparation (Grantham et al., 2014). Eating too much may result from having to maintain social relationships including rich fatty food in addition to usual meal time. Participating in food preparation and home tasks will result in doing more of manual work to address metabolic imbalances. Dietary intake and patterns should be assessed to identify areas requiring special attention, such as meal size, meal frequency and meal timing. In this study there was no consistency when it comes to frequency of meals and meal timing. Very little can be said on food quantity and nutrient content. It is generally recommended that only small reductions in energy intake be made to the diet of the overweight child. Carrying pocket money to school and lunch box increases frequency to meals

and interfere with meal timing. Reducing obesity will require modifying both energy intake and energy expenditure (Hill et al., 2012). Measures need to be put in place to control or regulate issue of lunchboxes to school and pocket money especially for learners who are already classified as overweight and obesity. But this needs strict monitoring and parental support. Limiting intake of a ready-to-eat food, which tend to be particularly energy dense and high in fat, may help to control energy intake (Hill et al., 2012).

Food is making an increasing contribution to the energy intake of adolescents around the world (Drewnowski et al., 2015). Children should be encouraged to eat low energy snacks and to avoid consuming a large proportion of high-energy sweetened beverages (Popkin et al., 2012). It is important to encourage all children, whether overweight or not, to adopt healthy eating habits from early age and to continue with that practice into adulthood. Results indicated that more subjects eat high energy foods with less energy expenditure. So there is a need to prevent this at an early age as we are faced with nutrition transition. Long-term changes in food choices, eating behaviour and lifestyle are necessary, rather than a temporary nutrition restriction.

The majority of respondents used bread spreads such as margarine and a combination of spreads such as jam and margarine. Promoting consumption of food high in complex carbohydrates, low in fat and low in energy density is important in preventing excessive energy consumption in children. Frying involves cooking food in a large amount of fat usually oil. Method of food preparation influences the fat content of foods. Food prepared in high fat particularly saturated fat and in refined carbohydrates can lead to weight gain. Utilisation of fat during preparation also influences eating habits and lifestyle (Gadiraju et al., 2015).

Evidence suggested higher risk of developing chronic diseases when fried food are consumed more frequently (i.e. four or more times per week). It remains advisable to the public to consume fried food in moderation while emphasizing an overall healthy diet. This study lacked detailed information on the type of oils used for frying food, frying procedure, temperature and duration of frying, how often oils were reused and a lack of consideration of overall dietary contributions overall, the majority of subject preferred using fat and eating food high in fat. Evidence suggested that excessive consumption of energy dense food high in fat, particularly saturated fat and refined carbohydrates can lead to weight gain, obesity and poses an increased risk for non -communicable diseases (Gadiraju et al., 2015). This study reported a positive association between fried food intake and being overweight. Frequent fried food consumption

has also been linked or associated with a higher risk of incident overweight and obesity. Frying and stewing of food in this study were mostly used in food preparation, which means fat is being added. It remains a habit by many to add fat when preparing food. Its implication is less reported in the literature and this study did not explore this further.

5.4 OVERWEIGHT AND OBESITY PREVALENCE

Of the subjects, 34% had normal BMI, whereas 39% were found to be overweight and 26% obese. Prevalence of overweight and obesity was found in female teenagers in another study and more in adolescent (Rossouw et al., 2012a). Prevalence of overweight of 39.2% was found in this study as compared to the 26.7% found in an African study on teenagers aged 15 years and older (www.hrsc.ac.za/.../01%). In this study, 26.4% prevalence of obesity was also found as compared to 31.8% of African women aged 15 years in Cape Town by Puoane et al. (2002). Therefore, the prevalence of overweight and obesity in this study were found to be in line with other studies. According to the RUSK study, 31% of urban black female were reported to be obese (Kassier et al., 2015). The prevalence of overweight and obesity among black female teenagers in Thulamela Municipality, Vhembe District is, therefore, high. An earlier study of African women in Limpopo province found that between 30 and 32% of women were overweight and between 12 and 28% were obese (Chukudwi, 2016). This current study suggested higher rates of overweight and obesity.

Waist to hip ratio is an additional measure of body fat distribution. This variable correlates with age and is a better indicator of both intra- abdominal fat. Waist is a measure for identifying overweight and obesity. It correlates with weight and BMI. Changes in body weight significantly correlates with changes in waist $p<0.001$. Waist and waist hip ratio are significant as they both being superior in predicting health risk and both measure abdominal obesity (Dalvand et al., 2015). These variables in this study correlated with BMI as they are all determinants of obesity and overweight. Changes in body weight significantly correlates with changes in waist as they showed a positive correlation of $p<0.000$ as weight was significantly correlated with waist hip ratio. Body fat was significantly correlated with waist hip ratio $p<0.000$. BMI was significantly positively correlated with waist hip ratio $p<0.05$. Height significantly correlated with waist hip ratio as statistical significant was observed at $p<0.05$. All $p<0.000$ in dietary patterns or practices and dietary habits determinants showed a significant independent association with higher weight, waist hip ratio and waist. Changes in

lifestyle with urbanisation are the most contributing factors to obesity and overweight (Dinsa et al., 2012). This findings support the need for developing a strategy for childhood obesity and implementing targeted intervention, prioritizing the higher social class and involving communities (Dinsa et al., 2012). Waist provides information about regional adiposity and it usually correlates with weight (Dalvand et al., 2015). Weight was significantly correlated with waist hip ratio $p<0.000$.

5.5 COMPARISON OF DEMOGRAPHIC, LIFESTYLE FACTORS, ANTHROPOMETRY AND DIETARY PATTERNS

The majority of participating teenagers came from rural area at 96%. Extra food beyond energy need accounts for the gradual increase in weight. In this study, the majority of subject ate more meals in a day, which contributed to putting on more weight. Most of the subjects consumed mostly cheaper, starch-based snacks almost every day. Imbalances of macronutrient consumption that occurred contributed to weight gain.

Snacking and frequent eating of more meals also contributed to overweight and obesity as majority of subjects were found to be snacking and buying fat dense snacks. Snacking is one of the eating habits that more subjects practiced.

A study by Oldewage-Theron and Egal, (2010) found that nutrition knowledge is a significant predictor of dietary intake and is needed for better dietary intake habits. Teenagers are becoming more autonomous and behavioural patterns acquired during this phase of life, such as dietary intake behaviour, may influence long-term behaviour. Considering the frequency of snack intake in this group, this is interesting and a possible indication that the participants did not realise that there is relationship between snack intake, increase energy intake and obesity.

5.6 SUMMARY OF THE STUDY FINDINGS

Most of the participating teenagers were found to be overweight (39.2%) and obese (26.4%). South Africa is a country of many contrasts, in which various communities are undergoing dietary transition. Increasing energy dense foods could potentially lead to increased energy intake and further increase in the prevalence of obesity and associated problems. People seem to have problems with food selection and use variety of high energy dense food instead.

However, a high variety of sweets, snacks, condiments and carbohydrates coupled with a low variety of vegetables promote long-term increase in energy intake and body fat.

Obesity and overweight was attributed to a reduced energy expenditure and high consumption of snacks food while watching television. A study by Braith Waiter et al. (2013) also confirmed that in teenagers aged 12–17 years, the prevalence of obesity increased by 2% for each additional hour spent watching television.

CHAPTER 6: CONCLUSIONS AND RECOMMENDATIONS

6.1 CONCLUSIONS

The primary aim of this research was the investigation of eating and lifestyle habits of overweight and obese teenagers aged 13–18 years in Thulamela Municipality. This aim was achieved as most of the teenagers were found to be overweight (39.2%) and obese (26.4%). The majority of the teenagers were from rural areas (96%). The study revealed high prevalence of sedentary behaviour and a low physical activity. Unhealthy dietary habits were also widely found.

In conclusion, different aspects of teenagers' eating behaviour may be influenced by different factor, which need to be considered in designing nutrition promotion programmes. The following is the list of factors identified in this study:

- Social determinant factor such as peer influences, meal pattern, culture, attitudes
- Physical determinant factor such as skills like cooking, access to food, time
- Economic determinant factor such as availability of food, income, food outlets and food knowledge about food
- Food advertisements and marketing

Nutrition and health professionals should tailor educational and treatment strategies according to specific desired dietary outcomes. Interventions should help to make healthy eating easy for teenagers to apply. The consequences of unhealthy eating, stressing meaningful short- and long-term benefits for health, providing knowledge, increasing consciousness of healthy eating and, lastly, supporting teenagers in the adoption of a healthy lifestyle should be promoted.

Eating well, exercising regularly and incorporating healthy habits into daily life will model a lasting healthy lifestyle. Teenagers should be educated about the importance of eating healthily and being active. Teenagers often lack knowledge about foods, rather than dietary habits, therefore foods should be a focus for nutrition education programmes. The study suggested that teenagers' eating habits are also largely determined by their social network. Surprisingly children eat more when they are with friends instead of parents, because friends act as permission-givers. Safety concern is also limiting our teenagers to do outdoor activities as they

remain indoors by sitting in front of televisions and computers. Thus education on healthy eating and physical activity is vital.

6.2 LIMITATIONS

- The inclusion criteria of overweight and obese teenagers, instead of all teenagers irrespective of BMI was a limitation.
- The sample size was also small.
- The geographic location was rural or semi-rural.
- The information on lifestyle and dietary patterns was self-reported.

6.3 RECOMMENDATIONS

Social and lifestyle

- Strong social support of dietary intervention from others should be involved in preparing food.
- Additional reduction of television and other screen time to less than one hour per day should be encouraged.

Physical activity

- Teenagers should be encouraged to be active and exercise.
- Sport for recreation should be made compulsory at school.
- Effective programmes to increase the number of students walking to and from school should be developed.

Economic factors

- Communities and businesses should be encouraged to support physical activity and nutrition programmes for young people.

Food patterns

- Meals served at or brought to school should be healthy and low in fat and energy.
- Harness social norms to promote healthier eating and weight loss by reinforcing new behaviour patterns associated with overeating and weight gain.

- Social eating norms need to be targeted to encourage healthier eating.

School curriculum

- Promotion, protection and support of sound nutrition should form part of the curriculum.
- School health councils that include community representation to guide school health programmes should be developed and implemented.
- Regular physical activity should be prescribed, including social support.

Research

- Urgent need for more research as well as a national policy promoting active living and healthy eating and discouraging sedentary behaviour in adolescents stage.

CHAPTER 7: REFERENCES

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APPENDIX A

CONSENT FORM

THIS IS TO DETERMINE THE EATING HABITS AND LIFESTYLE OF OVERWEIGHT AND OBESE FEMALE TEENAGERS IN THULAMELA MUNICIPALITY SCHOOLS AGED BETWEEN 13-18 YEARS. IN THIS STUDY YOU WILL BE EXPECTED TO ANSWER TO QUESTIONS ON DEMOGRAPHIC, SOCIO-ECONOMIC, ENVIROMENTAL AND DIETARY HABITS ON YOUR OWN. THERE WILL BE SOME MEASUREMENTS (WEIGHT, HEIGHT, WAIST AND HIP CINCUMFERENCE) THAT WILL BE PERFORMED ON YOU BY A FEMALE RESEARCH ASSISTANTS. THE INFORMATION WILL BE TREATED CONFIDENTIALLY. IF YOU AGREE TO PARTICIPATE, I AM THEREFORE REQUESTING YOU TO FEEL THIS CONSENT FORM BEFORE WE START WITH DATA COLLECTION. THANK YOU.

I ……hereby give consent for the proposed procedure to be performed on me as a part of the research project.

Mr …… has given me a full explanation of the probable advantages and possible dangers inherent in the procedure below.

My consent is freely given on the understanding that it may be withdrawn at any time

Name of the subject……..

Signature:……

Witness:…….

Project leader:……

Date:…….

APPENDIX B

QUESTIONAIRE

Subject code: School code: Cluster:

INTRODUCTION:

IN THIS STUDY WE WILL BE ASKING YOU QUESTIONS ON THE DEMOGRAPHIC, ENVIROMENTAL, SOCIO-ECONOMIC AND DIETARY DATA AND TAKE MEASUREMENTS OF THE FOLLOWING (WEIGHT, HEIGHT, HIP AND WAIST CIRCUMFERENCE)

Interviewer ----------

Name of the school: ----------

SECTION A

DEMOGRAPHIC INFORMATION

(Information about personal details)

2. Name:----------
3. Address:----------
4. Age (years):----------
5. Sex:----------
6. Ethnic group:

A. Venda	1
B. Tsonga	2
C. Northern sotho	3
D. Zulu	4
E. Swati	5
F. Others	6

6. Educational status:

A. Grade 5-7	1
B. Grade 8-11	2
C. Grade 12	3
D. Tertiary	4

7. What type of house do you live in:

A. House	1
B. Shack	2
C. Hut	3
D.A &B	4
E. A &C	5
F.B &C	6
G. Other	7

8. Numbers of rooms available:

A.1	1
B.2	2
C.3	3
D.4	4
E.5	5
E.6	6

9. Family structure:

A. Stay with both parents	1
B. Stay with one parent	2
C. Stay with relatives	3
D. Stay with non-relatives	4
E. Parents &relatives	5
F. B &C	6
G. Others	7

10. How many other people do you stay with at home?

A.1	1
B.2	2

C.3	3
D.4	4
E.5	5
F.6	6
G.7	7
H.8	8

11. What is the source of income?

A. Father	1
B. Mother	2
C. Both parents	3
D. Grandparents	4
E. Brother	5
F. Sister	6
G. Self	7
H. Social grant	8
I. Other	9

12. How long have you been staying there? ----------

13. How do you view the standard of living here?

Rural	1

Urban	2
Semi-urban	3

SECTION B

ANTHROPOMETRIC DATA

(Information about body composition)

14.Height (cm)----------

15.Weight (kg) ----------

16.BMI (kg/m) ----------

17. Recent weight changes:

Yes

No

18. Usual weight----------

19. Body frame

A. Small	1
B. Medium	2
C. Large	3

20. Waist (cm) ----------

21. Hip (cm) ----------

22. Waist hip ratio----------

SECTION C

SOCIAL HABITS / LIFESTYLE

(Information about personal lifestyle, behaviour and hobbies)

23. How many sleeping hour do you normally have? ----------

24. What are your hobbies?

A. Watching TV	1
B. Reading	2
C. Singing	3
D. Playing soccer	4
E. Two of the above	5
F. Three of the above	6
G. All of the above	7
H. Others	8

25. What kind of physical activity do you usually do?

A. Walking	1
B. Jogging	2

C. Swimming	3
D. Skipping	4
E. Aerobics	5
F. None	6
G. Others.	7

26. Activity level

A. Sedentary	1
B. Moderate active	2
C. Active	3
D. None	4

27. Do you smoke cigarette?

A. Yes	1
B. No	2

28. If yes, how many cigarette do you smoke per day? ---------

29. Do you prefer to drink alcohol?

A. Yes	1
B. No	2

30.If yes, how often?

A. Yes	1
B. No	2

31. How many meals do you eat per day?

A. One	1
B. Two	2
C. Three	3
D. Four	4
E. Five	5
F. Six	6
G. More	7

32. Do you have some snacks?

A. Yes	1
B. No	2

33. If yes, how often do you have snacks?

A. Everyday	1
B. Sometimes	2

34. Types of snacks?

A. Niknaks	1
B. Sweets	2
C. Fat-cake	3
D. Atchaar	4
E. Biscuits	5
F. Potato chips	6
G. Two of the above	7
H. Three of the above	8
I. Four of the above	9
J. Five of the above	10
K. All of the above	11
M. Others	12

35. Do you bring lunch box to school?

A. Yes	1
B. No	2

36. If yes, how often?

A. Everyday	1
B. One per day	2
C. Twice per day	3

D. Three per day	4
E. Four per day	5
F. Sometimes	6

37.Do you carry pocket money?

A. Yes	1
B. No	2

38. If yes, how often?

A. Everyday	1
B. Once a week	2
C. Twice times a week	3
D. Three times a week	4
E. Four times a week	5
F. Sometimes1	6

39. How much do you normally carry?

A. R2.00	1
B. R3.00	2
C. R5.00	3

D.More	4

40. What do you normally buy at school?

A. Sweets	1
B. Chips	2
C. Fat-cake	3
D. Simba chips	4
E. Two of the above	5
F. Three of the above	6
G. All of the above	7
H. Others	8

41. Do you eat substances like chalk or soil ?

A. Yes	1
B. No	2

SECTION D

MEDICAL HISTORY

(Information about personal health status)

42. Do you suffer from any disease?

A. Yes	1

B. No	2

43. If yes, specify----------

44. Have you had any operation?

A. Yes	1
B. No	2

45. If yes, specify----------

46. Do you use any medications or tablets at home?

A. Yes	1
B. No	2

47. If yes, specify----------

SECTION E

NUTRITIONAL RELATED PROBLEMS

(Information about nutritional aspects)

48. Changes in appetite?

A. Yes	1
B. No	2

49. If yes, specify----------

50. Changes in the food taste?

A. Yes	1
B. No	2

51. If yes, specify----------

52. Any chewing difficulty?

A. Yes	1
B. No	2

53. If yes, specify----------

54. Do you experience any constipation?

A. Yes	1
B. No	2

55. If yes, how often?

A. Once a week	1
B. Twice a week	2
C. Once a month	3
D. Twice a month	4

SECTION F

DIETARY PATTERNS

(Information about dietary intake)

56. Meals at school per week?

A. One	1
B. Two	2
C. Three	3
D. Four	4
E. More	5

57. Meals away per week?

4	1
6	2
8	3
10	4
12	5
14	6
More	7

58. Hours at school?

7 hrs.	1

8hrs	2

59. Travelling time to school?

5 Min	1
10 Min	2
15 Min	3
20 Min	4
30 Min	5
More	6

60. Any meal that you normally skip? ----

A. Yes	1
B. No	2

61. If yes, which one?

A. Breakfast	1
B. Lunch	2
C. Supper	3

62. How often do you skip the meal?

A. Everyday	1

B. Once a week	2
C. Twice a week	3
D. Sometimes	4

63. Are you a snacker?

A. Yes	1
B. No	2

64. Are you receiving any supplements?

A. Yes	1
B. No	2

65. If yes, specify----------

66. What are the facilities you use for food preparation?

A. Pan	1
B. Pot	2
C. Both	3

67. Who buys food for you?

A. Father	1
B. Mother	2

C. Brother	3
D. Sister	4
E. Self	5
F. Grandparents	6
G. Two of the above	7
H. Three of the above	8
I. Four of the above	9
J. Five of the above	10
K. Others	11

68. Who prepares food for the family?

A. Self	1
B. Mother	2
C. Sister	3
D. Caretaker	4
E. Grandmother	5
F. Two of the above	6
G. B &C	7
H. Other	8

69. What do you use to prepare food at home?

A. Electric stove	1
B. Hot plate	2
C. Paraffin stove	3
D. Gas stove	4
E. Fire wood	5
F. Coal stove	6
G. Two of the above	7
H. Three of the above	8
I. Four of the above	9
K. Five of the above	10
I. All of the above	11
L. Others	12

70. How often do you prepare food at home?

A. Once per week	
B. Twice per week	
C. Three per week	
D. Four per week	
E. Five per week	
F. Six times per week	
G. Everyday	

71. Where are most of your meals prepared?

A. Home	1
B. Restaurant	2
C. Cafes	3
D. Fast food	4
E. All of the above	5
F. Others	6

72. How often do you eat at the restaurant/ fast food?

A. Daily	1
B. Weekly	2
C. Monthly	3
D. Never	4
E. Others	5

73. Who prepare food at home?

A. Mother	1
B. Yourself	2
C. Sister	3
D. Caretaker	4
E. Grandmother	5

F. Two of the above	6
G. All of the above	7

74. How many meals do you usually have per day?

A. One	
B. Twice	
C. Three	
D. Four	
E. Five	
F. Six	
G. More	

75. At what time do you usually eat your meals?

	TIME
A. Breakfast	
B. Lunch	
C. Supper	
D. Mid snack	

76. Do you usually eat these meals on most week days?

A. Yes	1

B. No	2

77. Who buys food for you?

A. Mother	1
B. Father	2
C. Yourself	3
D. Brother	4
E. Sister	5
F. Two of the above	6
G. Three of the above	7
H. Four of the above	8
I. Others	9

78. Where do you buy your food?

A. Supermarket	1
B. Café	2
C. Spazashop	3
D. Hawkers	4
E. Others	5
G. Two of the above	6

H. Three of the above	7
I. All of the above	8

79. How long does to take to get to the place you buy food?

A. Less than 15 minutes	1
B. 15 to 30 minutes	2
C. 30 to 60 minutes	3
D. More than 1 hour	4

80. Do you have vegetable garden at home?

A. Yes	1
B. No	2

81. How often do you buy food at home?

A. Everyday	1
B. 3-5 times a week	2
C.Less than 2 times a week	3
D. Fortnight	4
E. Once a month	5

82. Do you have a refrigerator at home?

A. Yes	1
B. No	2

83. How is your appetite?

A. Bad	1
B. Good	2
C. Poor	3

84. Do you have any chewing problem?

A. Yes	1
B. No	2

85. Have you ever attended any educational talk on nutrition?

A. Yes	1
B. No	2

86.If yes, through which type of source?

A. Dietician	1

B. Clinic	2
C. Care group worker	3
D. Radio / TV	4
E. Nutrition advisor	5
E. Others	6

APPENDIX C

DIET HISTORY

(Information about meal compositions)

SUBJECT NO----------

INSTRUCTIONS: CIRCLE THE SUBJECTS. I SHALL NOW ASK YOU ABOUT THE TYPES OF FOOD YOU HAVE BEEN EATING IN THE LAST FEW MONTHS.

87. Do you eat maize meal stiff porridge?

A. Yes	1
B. No	2

88. Do you eat stiff mabella porridge?

A. Yes	1
B. No	2

89. Do you eat fine mabella porridge?

A. Yes	1
B. No	2

90. Do you eat rice?

A. Yes	1
B. No	2

91.Do you eat oats?

A. Yes	1
B. No	2

92.Do you eat cereals?

A. Yes	1
B. No	2

93. If yes, which one?

A. Cornflakes	1
B. Oats	2
C. Weetbix	3
D. None of the above	4

94. Do you eat macaroni / spaghetti?

A. Yes	1

B. No	2

CHICKEN, MEAT AND FISH

95. How is your chicken cooked?

A. Stewed	1
B. Fried in butter	2
C. Boiled	3
D. Roasted	4
E. Two of the above	5
F. B &C	6
G. A &B	7
H. All of the above	8

96. Do you eat chicken skin?

A. Always	1
B. Sometimes	2
C. Never	3

97. Do you eat red meat?

A. Yes	1

B. No	2

98. If yes, how is your red meat cooked?

A. Cooked with fat	1
B. Trimmed fat	2
C. Fried	3
D. Stewed	4
E. Grilled	5
F. A &B	6
G. None	7

99. Do you eat offals?

A. Yes	1
B. No	2

100. If yes, how often

A. Once a week	1
B. Twice a week	2
C. Two times a week	3
D. Once a months	4

E. Twice a month	5
F. More	6

101. Do you eat worse / sausages?

A. Yes	1
B. No	2

102. If yes, how is it prepared?

A. Fried	1
B. Grilled	2
C. Boiled	3

103. How often do you eat it?

A. Everyday	1
B. Once a day	2
C. Twice a week	3
D. Once a month	4
E. Twice a month	5
F. More	6
G. None of the above	7

104. Do you eat pork?

A. Yes	1
B. No	2

105. If yes, how is it prepared?

A. Fried	1
B. Grilled	2
C. Boiled	3

106. Do you eat eggs?

A. Yes	1
B. No	2

107. How is your eggs prepared?

A. Fried	1
B. Scrambled	2
C. Poached	3
D. Without butter	4

108. How is your pilchard prepared?

A.Mashed with fried	1

tomato and onion	
B. Unmeshed	2

VEGETABLES AND FRUITS

109. How is your vegetables prepared?

A. Boiled	1
B. Fried	2
C. Boiled, fat added	3
D. Raw	4
E. Salad	5
F. Cooked in fat &sugar	6
G. A &B	7

110. Do you eat the following vegetables?

1. Yes 2. No

110A. Cabbage

110B. Spinash

110C. Carrots

110D. Muroho

110E. Potato

110F. Sweet potato

110G. Beetroot

111. Do you use the following fruits? 1. Yes 2.No

111A. Banana		
111B. Apples		
111C. Mangoes		
111D. Oranges		
111E. Watermelon		
111F. Peach		
111G. Pear		
111H. Pawpaw		
111I. Others		

BREAD, SPREADS AND SNACKS

112. Which bread do you usually use?

A. Brown	1
B. White	2
C. Whole wheat	3

113. Do you spread anything on the bread?

A. Yes	1
B. No	2

114. If yes, specify?

A. Rama	1
B. Butter	2
C. Jam	3
D. Avocado's	4
E. Two of the above	5
F. Three of the above	6
G. All of the above	7

115. Do you eat the following snacks?

	1. Yes	2. No
114A. Peanuts		
114B. Chips		
114C. Biscuits		
114D. Sweets		
114E. Scones		
114F. Cake		
114G. Fat-cake		

114G. Chocolate		
114H. Ice cream		
114I. Others		

TEA AND SOFT DRINKS

116. Do you take tea?

A. Yes	1
B. No	2

117. What type of milk do you normally use in a tea?

A. Cremora	1
B. Goldcross	2
C. Condense	3
D. Nespray	4
E. Freshmilk	5
F. All of the above	6
G. None	7

APPENDIX D

RESEARCH DATES AND PROGRAM OF ACTION:

Appendices A: SEPTEMBER / OCTOBER 2006.

AGE GROUP 13-18YRS

Schools	Dates	Hours
Cluster 2	Tshivhase High	18.09.2006	09h00-12h00
Cluster 2	Thinashaka High	19.09.2006	09h00-12h00
Cluster 3	Azwifarwi High	20.09.2006	09h00-12h00
Cluster 3	Madanzhe high	21.09.2006	09h00-12h00

Appendices B: SEPTEMBER / OCTOBER 2006

Schools	Dates	Hours
Cluster 4	Fhatuwani High	22.09.2006	09H00-12H00
Cluster 4	Dlamani High	02.10.2006	09H00-12H00

Appendices C: SEPTEMBER / OCTOBER 2006

Schools	Dates	Hours
Cluster 1	George Sonto	03.10.2006	09h00-12h00
Cluster 1	Nkatini High	04.10.2006	09h00-12h00