

**UNDERSTANDING THE EFFECT OF NUTRITIONAL KNOWLEDGE,  
DIETARY INTAKE, PHYSICAL ACTIVITY AND ASSESSING THE  
ANTHROPOMETRIC MEASUREMENTS OF DLANGEZWA HIGH-  
SCHOOL LEARNER'S.**

**by**

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## **DEDICATION**

This dissertation is dedicated to:

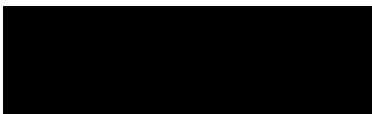
My late father, Nkosinathi Richman Gumede, and my beloved mother, Ntombifuthi Mavis Sithole, for their love, support, and raising me to be the woman I am today, and especially to my son, Nqubeko Divine Apocalypse Mkhize, whom I adore.

## DECLARATION

I, Noluthando Gumede, declare that:

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As research Co-supervisor, I agree to submission of this dissertation for examination:

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Date: \_\_\_\_\_

## **ABSTRACT**

The purpose of the study was to understand the effect of nutritional knowledge on physical activity, dietary intake, and anthropometric measurements in high-school learners. The study further underscored the value of healthy eating habits and nutritional education in relation to adolescents' overall health. The aim of the study was to understand the high school learners' nutritional awareness, determine their dietary consumption, assess their anthropometric measurements, and analyze whether high school girls are physically active or less active.

A total of 202 survey questionnaires were administered to teenage girls, from grade 10 to 12, who were purposefully selected to participate in the study. In-depth interviews were undertaken with various learners in order to evaluate their food consumption and dietary habits. We measured weight and height to determine body mass index (BMI). The growth reference data chart for ages 5 to 19 from the World Health Organization (WHO) was used to assess the weight classification of learners. Inference about the collected data was made using the Statistical Package for Social Sciences (SPSS).

The findings of the study showed that there was a strong association between age and food group consumption ( $p < 0.001$ ), which indicates that age has a significant effect on diverse food intake. Hence, it was noted that, as the learner's age increases, their food consumption also increases. It is noteworthy that the intake of healthy foods such as fruits and vegetables was noticeably poor for all the grades. With regard to consumption percentage, spinach and amaranth leafy vegetables were consumed at a rate below 2%, while consumption of vitamin A-rich vegetables such as butternut, carrot, beetroot, etc., was at a rate less than 5% amongst all the learners. Other vegetables, like cabbage and eggplant, were eaten at a rate of less than 30%.

The intake of sugar from chocolate, candy, and fizzy drinks such as soda and tonic water was significantly high for all learners. In general, confectionary sugar intake was 85% of all grades. Also, the rate of fat consumption by learners ranged from 48% to 72%, with grades 10 and 12 having the highest percentage of fat consumption, ranging around 72% and 53%, respectively. From the results of the study, it could be stipulated that learners studying in lower grades, such as grade 10 learners, have better nutrition knowledge and dietary intake when compared to grade 12 learners. Body Mass Index (BMI) measurements indicated that the majority of

learners are overweight, which was positively linked to the age of the learners at 25 kg/m<sup>2</sup> or higher for females aged 0 to 19 years.

The research found that as the age of learners or grade level increased, so did their BMI. The involvement of learners in all physical activities was tracked, and the percentage of participation was generally low in all grades, ranging from 1–26%. Physical activity participation, duration, and frequency all decrease as grade level rises. Generally, it could be inferred that as far as age is concerned, teenagers are at risk of becoming overweight and obese because they are not vigilant about their diets, so they eat high-fat content foods and sugary foods. On the other hand, the students consumed fewer fruits and vegetables and were not physically active. The findings reveal prevalent nutrition awareness in the grades, but also found a higher proportion of overweight students than is recommended. Programs from the government, community, and parents are required to encourage adolescent girls to improve their diet, level of physical activity, and weight control.

**Keywords:** anthropometric measurements, dietary intake, physical activity, nutrition knowledge, and youth

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## **ABBREVIATIONS**

<b>BMI:</b>	Body Mass Index
<b>CAPS:</b>	Curriculum and Assessment Policy Statement
<b>CDC:</b>	American Centres for Disease Control and Prevention
<b>CLASS:</b>	Children's Leisure Activities Study Survey
<b>CVDs:</b>	Cardiovascular diseases
<b>DBE:</b>	Department of Basic Education
<b>DoE:</b>	Department of Education
<b>IDP:</b>	Integrated Development Plan
<b>DoH:</b>	Department of Health
<b>FAO:</b>	Food Agricultural Organisation
<b>FFQ:</b>	Food Frequency Questionnaire
<b>HAKSA:</b>	Healthy Active Kids in South Africa
<b>HDSS:</b>	Health and Demographic Surveillance System
<b>Hr:</b>	Hour
<b>ISAK:</b>	International Society for the Advancement of Kinanthropometry
<b>Kg:</b>	Kilogram
<b>KZN:</b>	KwaZulu-Natal
<b>LMIC:</b>	Low- or Middle-Income Country
<b>MVPA:</b>	Moderate vigorous activity
<b>MRC:</b>	Medical Research Council
<b>N:</b>	Total number of repondents
<b>n:</b>	Number of respondents per grade
<b>NBS:</b>	Nutrient Based Standards
<b>NCDs:</b>	Non Communicable Diseases

<b>NESS:</b>	Nutrition and Exercise Survey for Students
<b>NFFSI:</b>	National Food Fortification Salt Iodization
<b>NKS:</b>	Nutrition knowledge scores
<b>NSNP:</b>	National School Nutrition Programme
<b>PA:</b>	Physical activity
<b>PSNP:</b>	Primary School Nutrition Programme
<b>QFFQ:</b>	Quantified Food Frequency Questionnaire
<b>SA:</b>	South Africa
<b>SADHS:</b>	South African Demographic and Health Survey
<b>SAFBDGs:</b>	South African Food-Based Dietary Guidelines
<b>SANHANES:</b>	South African National Health and Nutrition Examination Survey
<b>SANYRB:</b>	South African National Youth Risk Behaviour
<b>SPSS:</b>	Statistical Package for Social Sciences
<b>STATS-SA:</b>	Statistic South Africa
<b>WHO:</b>	World Health Organisation

## **CHAPTER 1**

### **THE PROBLEM AND ITS SETTING**

#### **1. INTRODUCTION**

The South African health system is undergoing an epidemiological transition from infectious to non-communicable diseases (NCDs) (Maher et al., 2010; Shisana et al., 2014). Declining dietary quality in recent years has been associated with increased levels of energy intake, higher consumption of soft drinks, salty snacks, and fast food, and a decreased intake of fruits and vegetables (Larson et al., 2007; Ronquest-Ross et al., 2015). In the teenage years, young people are identified as people between the ages of 10 and 19 who experience increased growth in terms of size and age (Das Gupta et al., 2014). High consumption of unhealthy food by teenagers can result in obesity and overweight in low and high-income countries (Legrand et al., 2017).

Overweight and obesity are growing in South Africa, but physical activity is on the decline due to urbanisation ( Kruger et al., 2005). Obesity is more common in those who are physically inactive and have a low income, and it is more prevalent in black South Africans (Negash et al., 2017). Therefore, food insecurity is turning out to be linked to the increased risk of obesity in South Africa, which is usually caused by under and overnutrition among adolescents (Shisana et al., 2014). However, it has been noted that in South Africa, women have an increased body weight during puberty, implying that girls and women require nutritional knowledge, which they currently lack (Otitoola et al., 2021; Vorster, 2010).

The National Food Fortification Salt Iodization (NFFSI), and the National School Nutrition Program (NSNP) have been introduced by the South African government for reducing malnutrition among school-age children, with more prevalent effects seen in secondary schools. The NSNP was developed in order to increase the nutritional awareness amongst high school learners, and help them to control their eating habits (Caballero et al., 2003; Gortmaker et al., 1999). Through the National School Nutrition Program, schools with low socioeconomic status can also have high-carbohydrate, high-protein food products, fruits, and vegetables (Steyn et al., 2008).

Despite the fact that such initiatives play a significant role, it has been estimated that teenagers (aged 13 to 15) spend two hours per day watching television and purchasing primarily popcorn, white bread, crisps, and soft drinks, which account for 62 % of their total purchases.. Furthermore, when both genders are compared teenage females prefer sugary and sweet-based products (Feeley, 2012). This raises a major concern about the teenagers, which are marked by

a decline in physical activity and alongside marked by consumption of unhealthy food that is of poor nutritional value. Hence the current study aims to understand the effect of nutritional knowledge of high-school learners on physical activity and dietary intake and to evaluate their anthropometric measurements.

## 1.1 PROBLEM STATEMENT

Some teenagers in South Africa consume various types of foods, but they do not have any adequate knowledge about how much or what types of food they should eat to maintain a healthy standard of living (Letlape et al., 2010). The South African National Health and Nutrition Examination Survey (SANHANES-1) found that 25% of adolescents aged 15 to 18 years were in the high fat intake category, while 27% of adolescents were in the high sugar intake group. Approximately 42% of South African high school learners are not involved in any physical activity or engaging in a small amount to have a meaningful effect on their wellbeing (Shisana et al., 2014).

In the South African National Youth Risk Behaviour (SANYRB) surveys, piloted in 2002 and 2008, female learners between the ages of 13 and 19 (grades 8 to 11) were more likely to be overweight or obese than males, and the percentage of overweight learners increased to 19%. (Reddy et al., 2009). Among all the South African provinces, female learners were nearly three times more likely to be obese compared to male learners. Additionally, the most overweight learners were found in KwaZulu-Natal (Reddy et al., 2009).

Lack of nutrition, exercise, and diet awareness is dangerous, resulting in damage that can never be reversed (Mamba et al., 2019). Recent research including Liang et al. (2015); Petkeviciene et al., (2015) has found that dietary deficiencies in childhood raise the risk of disease development in adolescence and the probability of acquiring cardiovascular disease, cancer and obesity in adulthood. Institutions of basic education such as National School Nutrition Programme( NSNP) and The National Food Fortification Salt Iodization (NFFSI), NFFSI can assist by taking steps to educate learners about the dangers of unhealthy eating and lack of physical activity, hence that can play a major role in reduction of morbidity and mortality which is caused by unhealthy life style (Anderson & Durstine, 2019).

Since teenagers are mostly motivated by peer pressure or peers to visit fast food chains and supermarkets, however, advertisements can also shape the basis of preferences, and the media affects dietary habits as well (Harris & Bargh, 2009). Additionally, as has been shown in previous research, weight gain and well-fed children tend to go hand in hand, which is attributed to smaller families, a high quantity of energy-dense food, and an increased parental

income (Kruger et al., 2005). According to Seidell & Flegal (1997), obesity is defined as a BMI of 30 kg/m<sup>2</sup> or higher. But, on the other hand, South Africa has a high degree of obesity as measured by a BMI of approximately 30 kilograms. Manning et al., (2016), states that obesity is one of the top risk factors for the high number of noncommunicable diseases (NCDs) in the country.

Furthermore, 37% of all-cause mortality is due to NCDs, primarily arthritis, some cancers, heart disease, and type 2 diabetes (Bradshaw et al., 2010; Puoane et al., 2013). According to Statistics South Africa (2015), cardiovascular disorders such as hypertension and diabetes were among the ten most influential causes of death in 2014. According to the WHO, the future of the country depends on the welfare of its children. Children who are safe are important to the overall health of the community. Children should develop an attitude and an appreciation for physical, mental, and social well-being in school (World Health Organization, 2007).

In addition to the family, no other social institution has as important an impact on children's well-being as a quality school atmosphere that fosters good nutrition and physical activity among adolescents (Neumark-Sztainer & Hannan, 2000; Story et al., 2002). As part of the Life Orientation curriculum, it is crucial that the Department of Basic Education (DBE) encourage nutrition education as part of the school curriculum and for parents to get involved to improve children's nutritional awareness (Berge et al., 2014; Liu et al., 2018; Oldewage-Theron & Egal, 2011).

## 1.2. THE AIM OF THE STUDY

The overall aim of the study is to understand the effect of nutritional knowledge of high-school learners on physical activity and dietary intake and to evaluate their anthropometric measurements.

### *1.2.1 Research questions*

- What is the nutritional knowledge of high school learners and what kind of nutritional information do they know?
- What is the relationship between nutritional knowledge and dietary intake of high school learners?
- What are the anthropometric measurements of high school learners and their BMI?
- What physical activity do school learners undertake, how often and for how long?
- What is the nutritional knowledge and dietary intake?

### *1.2.2 Specific objectives*

- To evaluate the nutritional knowledge of high school learners.
- To determine the dietary intake of high school learners
- To assess the anthropometric measurements of high school learners.
- To determine how physically active are school learners
- To assess the relationship between nutritional knowledge and dietary intake of high school learners.

## 1.3 HYPOTHESIS

**Dependent variable-** Nutrition knowledge and dietary intake- because it is the one that causes a change

**Independent variable-** anthropometric measurements and physical activity- the one expected to change

H<sub>1</sub> There is a relationship between Dlangezwa high school learners' nutrition knowledge and dietary intake.

H<sub>2</sub> There is no relationship between physical activity and anthropometric measurements of Dlangezwa High School learners.

## 1.4 THE SIGNIFICANCE OF THE STUDY

Adolescents aged 10 to 19, almost 90% of whom live in low-and middle-income countries (LMIC), constitute the largest generation in history today, numbering 1.2 billion (Sheehan et al., 2017; UN, 2017). Other demographics have become more or less stable, while it is projected that approximately 42% of youth growth (aged 15–24) in Africa between 2015 and 2030 will occur on the continent (United Nations, Youth Population Trends and Sustainable Development. 2015). The World Bank classified South Africa as an 'upper-middle-income country' by the World Bank, and the World Economic Forum referred to it as a lower-middle-income country (The World Bank, 2020).

South Africa has approximately 17 million young people ages 18–34 as part of its population, making them the third-largest group (behind the elderly population and the general population) (StatSA, 2019). Children and adolescents who are overweight, underweight, and micronutrient deficient are highly vulnerable to malnutrition, and this is particularly true in low- and middle-



income countries (Akseer et al., 2017; Bentham et al., 2017). In around 2015 and 2016, over 5% of young teenage girls had obesity and overweight as their diagnosis, while underweight existed in just 8% of them (Christian & Smith, 2018). There are more overweight and obese adolescents in Low- or Middle-Income Country (LMICs) than previously, highlighting the current situation in high-income countries and the strong link between increasing global food environments and rising rates of noncommunicable diseases (NCD) (Akseer et al., 2017; Bentham et al., 2017).

The level of nutrition awareness is a major determinant in determining nutritional habits and nutritional status, particularly among adolescents (Labban, 2015). During the teenage period, girls may exhibit signs of development, including their potential reproductive ability and physical development, both of which are affected by their dietary habits and intake. Schools' nutritional programmes may provide meals that include both an increase in the nutritional condition and dietary intakes of teenage girls who are boarding school students. However, it is reported that a small amount of research exists that is dedicated to researching the nutritional standards of school meals, eating patterns, and the nutritional status of teenage girls attending boarding schools in South Africa. This research will aim to address this awareness gap, which will also be used to provide data for suggestions on improving the BMI of teenage girls who receive meals in boarding school settings in South Africa.

### 1.5. STUDY LIMITS

The study results cannot be generalised because the sample is limited to Dlangezwa High School, which only has adolescent girls. The sample size in this study is relatively small due to being confined to one school in the study.

Meanwhile, the 24-hour recall makes use of the recalled information. It relies on the ability of the respondent to retrieve the desired information from memory and provide sensible responses, usually within a short time. This could affect the reliability of the data to be collected.

### 1.6. ASSUMPTIONS

The following assumptions were made while carrying out this study:

- Sample size N= 202 represents the study population.
- Participant's responses were truthful.

- Foods consumed on weekdays may differ from food consumed on weekends and may therefore not provide a true reflection of dietary intake
- The calibrated scale and stadiometer were accurately measured.

## 1.7 DEFINITION OF TERMS

### *1.7.1. Nutrition knowledge*

Nutrition knowledge, broadly defined, refers to knowledge of concepts and processes related to nutrition and health, including knowledge of diet and health, diet and disease, foods representing major sources of nutrients, and dietary guidelines and recommendations (Axelson & Brinberg, 1992; McKinnon et al., 2014; Moorman, 1996; Parmenter & Wardle, 1999). Although some have argued that a narrower definition of nutrition knowledge may be desirable (Axelson & Brinberg, 1992; Li et al., 2000; Parmenter & Wardle, 1999), others suggest that a broad definition of nutrition knowledge is needed to capture the complex and wide-ranging nature of the information used to inform dietary choice.

### *1.7.2 Dietary intake*

Dietary intake is generally considered to include all foods and beverages (hereafter referred to as "food") consumed by the oral route. Items that are not considered as foods, such as dietary supplements and condiments, which contain energy and/or nutrients, should be, but are not always, included as part of dietary intake. When such items are omitted from assessments of dietary intake, it is usually because of difficulties with identification, quantification, or lack of information about their composition (Rutishauser, 2005).

### *1.7.3. Anthropometric measurements*

Anthropometry is the single universally applicable, inexpensive and non-invasive method available to assess the size, shape and composition of the human body. It reflects both health and nutrition and predicts risk factors and survival (De Onis & Habicht, 1996).

### *1.7.4. Physical activity*

Is defined as any bodily movement produced by skeletal muscles that result in energy expenditure. The energy expenditure can be measured in kilocalories. Physical activity in daily life can be categorized into occupational, sports, conditioning, household, or other activities. Exercise is a subset of physical activity that is planned, structured, and repetitive and has as a final or an intermediate objective the improvement or maintenance of physical fitness. Physical

fitness is a set of attributes that are either health- or skill-related. The degree to which people have these attributes can be measured with specific tests (Caspersen et al., 1986).

## 1.8. ORGANISATION OF THE THESIS

**Chapter 1:** The problem and its setting, which provides the introduction and background to the study addressed.

**Chapter 2:** A literature review is given to provide a summary, classification, comparison and evaluation of articles based on nutritional knowledge, dietary intake, physical activity and anthropometric measurements.

**Chapter 3:** The methodology used to collect data from the study area and instruments used are addressed. The chapter will describe in detail how the study was undertaken.

**Chapter 4:** The data has presented a rendering of each objective in the study. The results are being discussed presented in tables and graphs

Chapter 5: The final chapter which concludes the study together with recommendations for future studies

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## **CHAPTER 2**

### **LITERATURE REVIEW**

In Chapter 1, the background and problem, purpose, objectives, research approach, and significance of the study were described. As part of the discussion of the background to the problem, the researcher referred to literature regarding the effect of nutritional knowledge of high-school learners on physical activity and dietary intake and to evaluating their anthropometric measurements. In this chapter, the literature is reviewed to provide an overview of factors influencing the nutritional knowledge of high school learners; determine the dietary intake of high school learners; assess anthropometric measurements; determine how physical activity impacts high school learners; and discuss the relationship between nutritional knowledge and dietary intake.

An electronic and manual literature search was conducted to identify the literature available on the various facets of the topic and to select relevant resources for the review. The search was performed using various electronic databases: Science Direct, Pubmed; and Elsevier. The Google scholar search engine was also utilised. The keywords used included youth, nutrition knowledge, dietary intake, anthropometric measurements, and physical activity. The search was limited to resources in the English language. The researcher also searched the reference lists of relevant articles, and particular resources were subsequently found online through an inter-library loan.

#### **2. INTRODUCTION**

South Africa is a developing country, where many households also struggle with food shortages. Around 35% of the population is plagued by food insecurity (Labadarios et al., 2011). When there is a reduction in the normal availability of food, there is a rise in food variability and food variety in the environment of low nutritional status amongst the population, which poses an added challenge to teenage nutrition (Naude et al., 2018; Steyn et al., 2006). Adolescence is the period during which teenagers' bodies undergo significant changes, such as changes in hormones, attitudes, social relationships, and psychological well-being (Crone & Dahl, 2012). These changes are usually associated with being independent of parents and including family members.

Often, with freedom comes additional problems such as peer pressure and an individual's right to determine whether and what they want to eat (Burkhart, 2010; Sigman-Grant, 2002). Also, throughout adolescence, teenagers are subjected to unhealthy habits such as the consumption

of sugar-rich drinks, the consumption of fast food, and take-away, and missing breakfast is becoming increasingly common (Lytle, 2002; Story et al., 2002). According to Weichselbaum & Buttriss (2014), during this period of accelerated growth and physical transition, there is also the creation of unwanted eating habits, which may involve missing meals.

It was further reported by Rossouw et al. (2012) that South Africa is amongst the top countries on the African continent with overweight and obesity. South Africa also has an increase in the prevalence of pre-obesity and obesity in childhood and puberty. Nevertheless, from a broad viewpoint, teens do not appear interested in healthy living or the long-term effects of healthy living (Pirouznia, 2001). Research has found that an unhealthy lifestyle behaviour is linked to the progression of many chronic illnesses and knowledge barriers are possibly causing people to consume unhealthy food (Berg et al., 2009; Wardle et al., 2000).

## **2.1. THE CONTEXTUALISATION OF LITERATURE REVIEW**

### *2.1.1. Challenges facing adolescents globally.*

Worldwide, poor dietary quality is the biggest contributor to poor dietary health (Sartorius et al., 2017; Scott, 2017). Adolescents require a high energy intake compared to any other age group (Akseer et al., 2017). Among adolescents, the low consumption of fruits and vegetables is the main source of emerging diseases at a global level (de Sa & Lock, 2008). Improving dietary quality and increasing food security among 10–19-year-olds had progressive effects on dietary habits towards later life stages. To improve dietary quality and food security, schools must offer opportunities such as school gardens to increase access to fruits and vegetables for adolescents and also promote awareness of healthy diets, which is also an effective method of disseminating knowledge to increase dietary diversity among adolescents (Schreinemachers et al., 2018).

Globally, overweight and obesity affect approximately one-third of adolescents and it is associated with poor dietary quality (Akseer et al., 2017). However, dietary interventions are required to encourage physical activity among adolescents. In Africa, overweight and obesity have a major impact on adolescent girls (World Health Organization, 2012). According to Akseer et al. (2017), approximately 15% of African adolescents are overweight or obese, and there is a growing risk of diabetes and other noncommunicable diseases later in life. South African adolescents, however, consume high-fat and calorie-dense foods with insufficient fruit and vegetable consumption, as a result, promoting overweight and obesity, especially among younger adolescents, particularly females. According to Hodson (2017), almost 35% of South Africa's approximately 14 million people were estimated to be vulnerable to food insecurity.

A General Household Survey conducted by reported that approximately 20% of households in South Africa have inadequate access to food and 23% of KwaZulu-Natal (KZN) households have the same problem (Ngidi & Hendriks, 2014). Furthermore, Machethe (2004) stated that food insecurity was more dominant in rural areas and 75% of those rural areas were chronically poor. What does this mean for the country? Young adolescents are being exposed to poor eating habits and a high rate of obesity can affect the economy of South Africa. The cost of improving their diets at school level and managing the chronic disease at a later stage is going to affect our country's economy. Before the problem gets worse, we should try to solve it and come up with solutions that could help the weakening health systems and the economy as a whole.

### *2.1.2. Challenges facing South African adolescents*

There has been a nutritional transition in South Africa since the dawn of democracy in 1994. The transition has increased significantly, with almost 27% of females and 9% of males overweight or obese between 15–19 years of age, with urban areas being particularly vulnerable (Wrottesley et al., 2020). In South Africa, it has been evidently demonstrated that there is a shortage of well-being and health-related knowledge in the republic, regardless of better-quality education levels in recent years (Steyn et al., 2000; Kruger et al., 2002; Steyn et al., 2000). In adolescence, being overweight or obese is rapidly becoming a universal problem (Zwiauer, 2000). School-going adolescents can be defined as being overweight in a broad-spectrum (Reddy et al., 2009). According to SANHANES-1, 16.7% of young female adolescents between the ages of 10 and 14 are overweight (Shisana et al., 2014).

This can be seen in current information about adolescent girls in South Africa. Adolescent girls (15-17 years of age) are increasingly overweight to 19.3 % (Shisana, Labadarios, Rehle, Simbayi, & Zuma, 2014). The South African Demographic and Health Survey (SADHS) conducted by Department of Health of South Africa in 2008 report agrees that 16.1% of adolescent girls aged 15-19 are overweight. The KZN provincial mean or average BMI for adolescents is 29.9% and the province is described as having the highest mean BMI scores of all the provinces in South Africa (Department of Health of South Africa, 2008). South Africa, like any other developing country, has seen a shift from low-fat foods, traditional high-fiber foods, to classic western foods high in sodium, fat, and low in unprocessed carbohydrates, milk products, vegetables and fruits, and added sugars, from traditional foods to extra-active habits, to increased inactive behavior.

These shifts have been related to the high popularity of obesity amongst Black South African individuals (Berkey et al., 2003; Bourne et al., 2002). While Silva et al. (2017) argue that in

Lagos, Nigeria, the consumption pattern and knowledge of vegetables and fruits among junior secondary school students should be evaluated, this study aimed to determine the consumption pattern and knowledge of vegetables and fruits among junior secondary school students. Eighty-five percent of the respondents indicated adequate nutrition awareness and health standards for fruits and vegetables, however in South Africa, a study including 15- to 18-year-olds was done in a high school in Pretoria with a student population of 485 individuals.

Oldewage-Theron & Egal, (2012) stated that training is so essential amongst educators in South Africa precisely associated with nutrition, and a variety of teaching aids must be available to support the educators in developing operative approaches for communicating the nutrition education messages to children, also with assistance from caregivers to promote healthy eating habits through nutrition education in schools. During adolescence, high school learners are seemingly beginning to take over their parents' dietary choices and behaviours. However, the learners are not fully ready to do so (Oldewage-Theron & Egal, 2012). A research article published by Milosavljevi et al. (2015) indicated that 30% of high school learners presented satisfactory knowledge of nutrition, and high school learners from non-urban areas indicated lesser results. Naser Al-Isa, (2018) conducted a study in Kuwait on fast and junk foods and their effects on the nutrition knowledge of high school male students and discovered that their nutrition knowledge was also low, and there has been a perception that Asian countries have good nutrition knowledge as compared to other continents.

The results can be influenced by the overall national percentage of school-going adolescents, about 26%, who do not want to participate in any physical activity and would avoid it if possible. There are 42% of South African high school learners who are not involved in physical activity enough to have a positive impact on health. The Medical Research Council (MRC) agrees that South Africa has the highest percentage of adolescents who do not meet physical activity recommendations (Reddy et al., 2009). The Gauteng province scores indicated that urban adolescent girls' public exercise included walking, cycling, and running, but it was observed that community safety played a role in whether the child would participate in exercise (Sedibe et al., 2014). (Letlape et al., 2010) found that 77% of high school students in Pretoria, Gauteng province, did worse than average on questions about physical activity, diet, and nutrition. The KZN provincial statistics showed more than 50% of female adolescents with no physical activity during a week (Statistics South Africa, 2018).

Joubert et al. (2007) and Reddy et al. (2009) reported that one in three South African learners watches television for more than three hours a day. Non-communicable disease studies in South

Africa indicate that a larger percentage of adolescents are observed in poor urban communities (Mayosi et al., 2009). The study by Kirsten et al. (2013) further demonstrates that there is a major link between improved physical activities and the avoidance of being overweight in the Stellenbosch area. In a research (Mciza, 2009) that measured the health, wellbeing, and health-related information and comprehension of pre-adolescent children and their mothers, assessments of food heavy in sugar, salt, and fat were found to be inadequate. The above statement was also revealed in the South African National Health and Nutrition Examination Survey (SANHANES-1) at a countrywide level. Only 14% of women and 7% of men used health considerations in their grocery shopping (Shisana et al., 2014).

The study by Kirsten et al. (2013) concluded that precautionary initiatives are required to proactively encourage and adopt a nutrition lifestyle and exercise in children at an early age. Furthermore, the state cabinet must speak on the larger framework. The dietary intake of Gauteng-based studies states that the top five foods bought and consumed by urban black African adolescents are "kotas" (a quarter loaf of white bread filled with deep-fried chips topped with processed cheese and processed meats), "magwinya" (deep fried cake dough), or "street-roasted chicken," which all contain high amounts of saturated fats and refined carbohydrates. Adolescents bought pies at school if pocket money was inadequate (Sedibe et al., 2014). In the Western Cape province, middle and high-income adolescents favoured a range of fat-rich items such as dairy products containing full-cream milk, cheese, cheese spread and butter daily, as well as creamy salad dressing, fried chicken, doughnuts, cold meats, for example, bacon and ham, red meat, condiments such as mayonnaise, and potato crisps three to four times a week (Steyn, 2010; Venter & Winterbach, 2010).

A study conducted by Whati et al. (2005) targeting 13 to 19-year-old South African adolescents to measure their nutrition knowledge based on the South African Food-Based Dietary Guidelines (SAFBDG) by Vorster et al. (2013) found that the knowledge of nutrition was less in underprivileged schools' learners that enrolled for the eighth grade as equated with multi-ethnic groups at an interracial school. The study was conducted by the Medical Research Council of South Africa to measure the nutrition knowledge of ninety-eight adolescents aged 14 to 18 years in Cofimvaba, Eastern Cape. In this study, socio-demographic data indicated that 19% of the participant's caregivers had no education; 46% only had a primary school education; and only three had a tertiary education (Oldewage-Theron et al., 2015).

A study by Steyn et al. (2000) indicated that among black female youths at the University of Limpopo, respondents were from both urban and rural areas. The researcher discovered that

the knowledge of nutrition was low and dietary initiatives were endorsed. Walsh et al. (2003) reported that the nutritional knowledge of the respondents was generally poor. The researchers highlighted the significance of nutrition education to be included in mechanism approaches. According to the author, how can individuals introduce nutritional interventions to learners when their nutritional, diet, knowledge, and physical activity practises are unknown (Letlape et al., 2010)? Good nutrition, health, and education are the most important elements worldwide. None of these three factors alone will accomplish social and economic development, but only in combination as well as with other factors stated in the Sustainable Development Goals (SDGs) to move towards progress and living in a world without poverty (Bongaarts, 2016; FAO, 2016). However, it is necessary to promote food intake among high school learners through, for instance, nutrition education. To be precise, nutrition education must express essential capacities such as the school environment, classroom curriculum, community and family setting to improve nutrition knowledge of learners (FAO, 2003).

### *2.1.3. Methods to improve nutrition knowledge of adolescents*

The prescribed syllabus should aim to provide learners with enough knowledge opportunities to improve their skills, attitudes, and knowledge for adopting nutritive eating habits (Valleau & Deane, 2004). Although it is the main aim of schools to provide quality education, it is possible to provide food through school meals to improve the diet and health of learners (FAO, 2003). The Department of Basic Education in South Africa initiated the National School Nutrition Programme (NSNP), which was meant to enhance the learning abilities of learners by providing them with a healthy meal (Department of Basic Education (DBE) (2009)).

Female high school learners are good in the selection of food groups that contain vitamins and minerals. Their nutrition knowledge is better as compared to male learners. Recent studies indicate that learners from rural areas have lower nutritional knowledge compared to urban areas. This does not indicate that their eating lifestyle is less healthy than that of metropolitan areas. Respectively, an individual has a different setting or background. It is anticipated that learners from rural areas mostly consume home-cooked meals compared to urban learners because urban learners are more exposed to fast-food outlets that sell junk food with low micronutrients and high in energy and fat (Nortje et al., 2017; Steyn et al., 2015). The study of Wardle et al. (2000) indicated that the participants who met the recommendation of knowledge for fruits, vegetables, and fat consumption were in the uppermost quintile almost twenty-five times more likely than those in the lowest quintile.

Phillips et al. (2016) highlight that in evolving republics such as South Africa, the weight gain percentage is often related to urban development and the adoption of Western habits. It is the dual characteristics of the western standard of living that subsidise the expansion of weight gain, the decline of sporting activity intensities, and the growth in the intake of foods with high-fat content and concentrated sugar. Knowledge of the frequency of increased body fatness in residents in evolution is rare but necessary for active training and interference. In their statement, Mokabane et al. (2014) stated that there are existing indicators that suggest there is a new trend toward non-nutritive practises among females in high schools in South Africa and globally. Schools can also play a significant role in the inhibition of overweight gain and obesity among schoolgirls. It is suggested that schools lead organisations take the curative action to prevent weight gain in children, particularly girls.



## 2.2. DIETARY INTAKE OF ADOLESCENTS

**Table 2.1: Summary of articles of nutrition knowledge of school-age children and adolescents**

Citation	Country	Aim	Sampling	Sampling method	Data collection	Key findings
Al-Isa, 2018	Kuwait, Western Asia	To discover the nutritional knowledge amongst secondary school male adolescents.	537 simple random sampled	Simple random	Nutrition knowledge questionnaires	There is a major relationship between starchy foods and calorie intake. The nutritional proficiency of fibres was mostly related to fats, sodium, and calorie food intake, but the relationship between cholesterol and sodium was low.
Oldewage-Theron et al. 2015	Eastern Cape, Cofimvaba	To evaluate the nutritional capability and nutrient intake and their relationship with adolescents attending five schools in rural Cofimvaba	552 learners stratified random sampled	Stratified random sampling	Food-frequency questionnaire (FFQ) Nutrition knowledge and dietary intake questionnaire	There were no major relationships were observed between nutrient consumption and diet knowledge of adolescents in the study.
Oosthuizen et al. 2011	Vaal, Northwest	To increase the food varieties and dietary consumption patterns and food varieties of 9-13 years in a semi-urban community.	91 leaners simple random sampled	Simple Random	24-hour recall	The relationship protein knowledge relates to vitamin C understanding and the eating of fruits and vegetables. The consumption of fruits and vegetable stayed very low. Fat and sugars were consumed were still ingested among the investigational group. The dietary intake for both groups was established on starches.
Letlape, 2010	Pretoria, Gauteng	To determine the knowledge of students on the arrangement of healthy food, day-to-day dietary requirements, and the importance of partaking in physical activities	500 students		Self-administered questionnaire	The study showed that many of the students at 77% did not have sufficient diet, exercise, and nutrition knowledge while 23% indicated adequate knowledge. Roughly 26% and 16% of students contributed on average to vigorous physical activity. The findings revealed that 77% of students lacked adequate knowledge of diet, nutrition, and exercise, while 23% had adequate knowledge. Approximately 26% and 16% of the students reported that they participated in rigorous and moderate exercise, respectively.
Wardle et al. 2000	England, London	To assess the correlation among fruit and vegetables, fat intake the relationship using nutrition knowledge questionnaire	1040 adult participants, purposive sampled	Purposive	Postal survey	Half of the respondents consumed five portions of fruit and vegetables per day, and 11% of those in the lowest knowledge quintile consumed less than five portions of fruit and vegetables per day.

**Table 2.2: The summary of dietary intake articles of school-age children and adolescents.**

Author (s)	Country	Aim	Sampling	Data collection	Key findings
Oluwakanyinsola et al. 2017	Nigeria, Lagos	To measure the intake pattern and the knowledge of fruits and vegetables among junior secondary school students	220 respondents multistage sampled	A questionnaire with open- and close-ended questions	The learners presented good knowledge of the dietary and health standards of fruits and vegetables at 84.99%; however, the intake of fruits and vegetables was correct in only 5.48% participants by consuming, having five portions of fruits and vegetables per diem.
Steyn et al. 2016	All South African provinces	To ascertain revisions done after 1999 in schoolchildren, 6–15 years old, to define whether dietary intakes revealed developments in micronutrients, namely: zinc, vitamin B6, riboflavin, niacin, thiamine, vitamin A, iron, and folate.	10 studies of electronic manual searching for peer-reviewed and get literature.	Nutrition knowledge using the numbered scale with a list. Dietary practices using food list in nine food groups a week.	There is a scarcity of dietary studies that include fortified nutrients. It is very challenging to detect whether fortification has increased the micronutrient intakes of schoolchildren. It is further difficult because dietary methods were used in three of the nine provinces in the study.
Nhlapo et al. 2015	Bloemfontein, Free State	To ascertain potential nutritional advantages or inefficiency of the products is provided by the South African National School Nutrition Programme (SANSNP)	10 schools purposive sampled	meal samples	The meal samples did not meet the recommended nutrient criteria for energy and carbohydrate content for each age group. The majority of learners met protein standards at 90%. Protein standards were met by 90% for learners aged 7–10 years and by 40% for individuals aged 11–18 years. Only 10% of meals met the recommendations for zinc and calcium, while 80% of those aged 7–10 years met the iron standards and 30% for those aged 11–18 years.
Sedibe. 2014	Soweto, South Africa	To explore the narratives related physical activity and dietary practices by high school girl's adolescents in Soweto.	29 females purposive sampled	Voice recorders	Many respondents did not consume breakfast at home but bought amagwinya ("fat" cakes) from hawkers before school. The lecturers usually prefer pocket money to lunch boxes. They usually work in the school canteen. With pocket money, they usually purchase snacks or "fat" cakes for their lunch choices because of their popularity, peer influence, convenience, and affordability. The learners were involved in minimal physical activities.

Belachew et al. 2012	Ethiopia	To plan food security interventions directed to most susceptible individuals	1911 adolescents stratified random sampled	Questionnaires	The adolescents were at 20.5% for transient food insecurity, while the group increased to 48.4% one year later. (54.8%) of the adolescents experienced one or more transient food shocks during the initial or subsequent round of assessment. Throughout the follow-up, approximately 14.0% of young people were chronically food insecure, i.e., they were food insecure in both examination sequences.
Samuel et al. 2010	Vaal, North West	To evaluate the possibility of zinc paucity in 7- and 11-years old children living, a peri-urban informal settlement in South Africa	113 leaners simple random sampled	Socio-demographic questionnaire 24-hour recall questionnaire Quantified food frequency questionnaire (QFFQ)	There is a huge threat of zinc deficiency and very low zinc status for most children, probably because of low intake of food sources with high bioavailability of zinc, which is always a direct result of poverty and food insecurity.

### *2.2.1. Trends in dietary intake of adolescents in South Africa*

Dietary intake refers to the daily eating patterns of an individual, including specific foods and calories consumed in relative quantities. Nutrition status refers to the availability of nutrients and calories in the individual's diet compared to nutrition recommendations for the individual's age group and overall health status (Encyclopedia, 2020). The majority of foods consumed by adolescents between the ages of 12 and 17 in Soweto, Johannesburg region were mainly carbonated drinks, chicken, tea, full cream milk, stiff porridge, maize meal, eggs, oils, and sweets (Pedro et al., 2008).

Another study found that teenagers eat sweetened beverages and fast food at least three times per week, with average intakes of 11 fast-food items per week in both sexes and 8 and 10 sweetened beverages per week in both sexes at age 17 years (Feeley et al., 2012). In addition, the consumption of sweets among 17-year-olds in Tlokwe municipality in the Northwest region and Soweto, Gauteng province, increased throughout all five provinces.

In the City of Cape Town, Durbanville and Bellville, it has been observed that a large number of adolescents consume high-fat containing foods such as potato chips, confectionery, pizza, popcorn, fries, etc. (Hamilton et al., 2000). Consumption of energy-dense products was also found to be dominant among adolescents, with 53% consuming butter or margarine, 30% consuming cheese spread or cheese and full-cream milk, and 24% consuming them at five or more weekly intervals (Pirouznia, 2001). Furthermore, other fat-containing foods mostly consumed in the Cape Town local area were red meat, salad dressing or mayonnaise, potato crisps, fried chicken, cold cuts, and doughnuts three or four times weekly (Venter & Winterbach, 2010).

Dietary intake is influenced by several aspects, such as nutritional knowledge, which is one of the influences that contribute to the dietary behaviour of adolescents (Pirouznia, 2001). Intrapersonal elements, for example, biological and psycho-social factors, instantly influence behaviour. Furthermore, interpersonal factors (social environment), the place where the adolescent resides matters, family members and peers, and community setting all play a significant part in influencing nutrition-related behaviour. Also, the availability and access of food in fast food outlets such as school tuck-shops, vendors, and food stores in a local area may contribute to the decision-making process. Lastly, the influence of advertising and mass media on mass media and advertising (Story et al., 2002).

Consumption of grains, dairy products, fruits and vegetables decreased, and consumption of meat and meat substitutes (e.g., chicken, cheese, and polony) and oil increased with age. Children and adolescents are also facing the huge challenge of micronutrient deficiencies and undernutrition due to household food insecurity. In a research study conducted by Belachew et al. (2012) in Ethiopia, after the increment of food prices during that year, 20% of the adolescents had transient food insecurity, which increased later in that year to 48%. In general, 44% of adolescents experienced transitory food shocks either during the initial stage or the subsequent stage of the investigation. Throughout the continuation time, approximately 14% of the adolescents were chronically food insecure for both survey rounds.

It was hypothesised that low-income inner-city families are more likely to face chronic food insecurity than rural households, which have constant access to agricultural produce. Adolescents are predominantly affected by food insecurity, as adolescence symbolises a period of rapid growth, and additional energy and nutrients are essential (Briefel & Johnson, 2004). Food and nutrition insecurity among South African adolescents can be a result of the high unemployment rate. Hence, young people from low-income families are more susceptible to experiencing chronic food insecurity (Belachew et al., 2012; Statistics South Africa, 2015).

In table 2.2 it is summarised that female adolescents in Soweto, South Africa reported that the intake of fast foods and energy-dense foods such as "Kota", cakes, and low consumption of fruits and vegetables in school and the home setting was more common amongst the adolescents. The intake of these foods is influenced by the country's current financial conditions, which mainly determines the accessibility and affordability of these foods, whereas the consumption of fruits and vegetables at the household level can be caused by inadequate earnings. The growing period and budget of food preparation for households might be essential in the changing of households' dietary behaviours to non-nutritive varieties (Sedibe et al., 2014).

A study conducted in Bloemfontein, South Africa to measure the classification of food served by a South African school feeding organization found that the meals did not meet the endorsed nutrient ranking for starch and energy standards for each age group. Protein classification was met by 90% of foods for participants aged seven to ten, and 40% of foods for those aged eleven to eighteen. The participants who met the calcium and zinc standards were 10%, while the iron standard was 80% for those aged seven to ten years and 30% for those aged eleven to eighteen (Nhlapo, 2013). The statement above agrees with findings of the study conducted in the North

West of South Africa where the majority of the children are below the recommended standard of zinc and at high risk of zinc deficiency, which may result in poverty and food insecurity (Samuel et al., 2010). Another study also conducted in North West province among kids aged nine to eighteen years in a peri-urban community reported that there was a relationship between protein consumption and an understanding of proteins and between vitamin C consumption and an understanding of vegetables and fruits, but the consumption of vegetables and fruits was low (Oosthuizen, 2011).

A semi-structured interview was conducted in Soweto, South Africa, among fifty-eight female adolescents with a mean age of 18 years, showing that school-based food purchases were mainly determined by accessibility and affordability (Voorend et al., 2013). With respect to food purchases, it has been discovered that low-income households tend to pinpoint shelf-life and ease of preparation in the calculation of price (Nackers & Appelhans, 2013). This may lead to the intake of more processed foods with lower nutritional value (Nackers & Appelhans, 2013). Florence et al. (2008) indicate that the intake of a balanced diet helps the child concentrate in class and has fewer disruptions throughout the year. Correa-Burrows et al., (2016); and MacLellan et al., (2008) agree that nutrition is associated with good performance on exams and healthy eating programmes also improve children's academic test scores.

The study of Ochola & Masibo. (2014) reported a dietary consumption of schoolchildren and teenagers aged six to nineteen. A sum of fifty readings from forty-two developing countries reported on the dietary intake of schoolchildren and adolescents is inadequate in the variety, mainly including, but not limited to plant-based foods, inadequate vegetables, and fruits consumption. There are little energy intake and deficient macronutrient consumption. There is a growing pattern of energy intake dense snacks and drinks mostly in city areas.

#### *2.2.2. Factors that influence the food and beverage purchases and intake of learners.*

It has been reported that the popularity of nibble food among children is greater than before, from 78% in 1998 to 94% in 2006 (Wang et al., 2012). The era of urbanisation and westernisation has had an impact on young people and older people consuming more convenience and snacking on foods with a high concentration of sugar, fat, energy, and salt, with misleading and unclear dietary information (Vorster et al., 2013). Several non-fee schools have nutrition schemes or feeding schemes where children receive, at a minimum, a single dish per day at school (Langsford, 2012). The dishes are arranged in the school premises and the set of food choices is frequently decided by what is available rather than what creates a good

standard of living. The choice of refreshments is likely to be based on status rather than a nutritional advantage. As a result, urbanisation and westernisation in SA are creating a phase of increasing appreciation for weight gain or an increase in body size, with the related dangers of growth of a multiplicity of prolonged illnesses later in life (Reardon et al., 2021; Vorster et al., 2013).

South African schools have tuck shops where food is sold to learners with low micronutrients and high energy and fat (Steyn et al., 2015). Research indicates that pubescent girls in SA agree that healthy and nutritious foods are not constantly delivered at school premises snack shops and that girls are more likely to purchase cheap and available takeaway items than vegetables and fruits, which are not always accessible at school properties and home-based settings (Sedibe et al., 2014)..

## 2.3 ANTHROPOMETRIC MEASUREMENTS OF ADOLESCENTS

**Table 2.3: The summary of anthropometric measurements articles of school-age children and adolescents.**

Author (s)	Country	Aim	Sampling	Data collection	Key findings
edibe et al. 2018	Mpumalanga and Gauteng province, South Africa	To investigate dissimilarities/likenesses in dietary practices and eating habits among urban and rural South African adolescents (older and younger) surroundings, community, school, and home setting) and their relationship with overweight and obesity	3098, mean age = 14 years) adolescents using Health and Demographic Surveillance System (HADSS)	Questionnaires	The increased risk of overweight and obesity was associated with eating habits and dietary practices only in a home setting.
Ngwenya & Ramukumba. 2017	Tshwane, South Africa	To define the occurrence of obesity among adolescents attending City of Tshwane high schools.	175 scholars stratified randomly sampled	weight scale and a measuring tape	There is a gradual rise in obesity levels among young people. The results specified that the occurrence of obesity was at 8.57% among adolescents.
Gitau et al. 2014	Soweto, Johannesburg	To determine the changes in body esteem weight loss practises and eating behaviours among adolescents and define their views about their body shapes at 13-17years.	1435 Birth-to-Twenty longitudinal birth cohort	EAT-26 questionnaire Height and weight body esteem scale	The probable eating disorders were at 11% for 13- year-old and at 13.1% for year olds. There is a steady increase in BMI and poor eating order among black female adolescents. More girls were involved in weight loss practices whereas, males in muscle gain practices demonstrating that Western customs of slimness are starting to be more communal in South Africa.
Kimani- Murage, 2010	Mpumalanga province, South Africa	To investigate the commonness and overweight, obesity and stunting patterns and metabolic diseases risks	34775 stratified random sampled	Anthropometric measurements	The popularity of overweight and obesity among boys was almost non-existent whereas in among girls the occurrence of obesity increased, the sexual



		and hence risk in a group of adolescents and children in rural South Africa.			maturation also increased reaching a peak of 35% at Tanner Stage 5, showing bigger threat for metabolic disease.
Petersen et al. 2006	South Africa	To discover and define eating habits in the early pubescent stage in black and white South African girls that are 11 years old in an urban setting experiencing transition.	168 girls cross-sectional baseline initiative	24-hour recall Questionnaires Structured retrospective interview	In this age group, the black girls were adopting Western ideals of beauty and thinness. There is primary evidence signifying the influence of social transition on young black girls pertaining to eating attitudes.

### *2.3.1. The influence of socioeconomic status on overweight and obesity of adolescents.*

Socioeconomic status (SES) has an impact on all health factors, preparing health for life. SES is therefore considered to be a contributing factor that can regulate the presence of overweight in children, adolescents, and adults (Arias et al., 2018). The World Health Organization (WHO) stated that the countries most affected are low-and middle-income countries, and the prevalence of overweight and obesity among pre-school children living in these countries with developing economies is in excess of 30% (World Health Organization, 2012). There has been a relationship between two distinct factors in overweight and obesity: diet and physical activity. For example, adolescents from a low SES ethnic group consume more fatty and high-calorie foods (Tate et al., 2015) and have poor eating behaviours across a broad spectrum (Palenzuela Paniagua et al., 2014; Villagran Pérez et al., 2013). In the interim, the link between SES and physical activity is directly proportional: the lower the performance, the fewer results are achieved (Borraccino et al., 2009).

However, another study obtained different results, showing a directly proportional relationship between overweight and SES among Brazilian adolescents, whereby the greater the SES, the greater the occurrence of overweight among adolescents (Silva, 2013). Zhang et al. (2016) found similar results among Chinese adolescents in Zhang. One possible explanation for these results is that adolescents in these countries are highly exposed to junk food outlets and the use of computers and videogames is high, endorsing physical inactivity and obesity (Arias et al., 2018). Several studies found an inverse relationship between overweight and SES, with the higher the frequency of weight, the lower the SES (Cooke et al., 2015; Frederick et al., 2014).

A brief description of this finding is that SES may influence the purchasing power or intake of certain foods (Palenzuela Paniagua et al., 2014; Tate et al., 2015). For example, the high expense of purchasing healthy foods (Frederick et al., 2014; Otero et al., 2015), the availability of a variety of foods in grocery stores (Frederick et al., 2014), or the likelihood of consuming homemade food (Zarnowiecki et al., 2014). Nevertheless, other pointers suggest that BMI status can be influenced by factors such as parental educational level by simplifying or limiting recommended evidence on this matter (Zarnowiecki et al., 2014). The development of obesity is related to low educational levels in parents (Sánchez-Cruz et al., 2014; Wolfenden et al., 2011).

BMI status may be influenced by family structures such as large families, separated parents, single-parent families, etc. (Chen & Escarce, 2014). Additionally, it is evident that the greater

the level of physical activity, the higher the SES (Borraccino et al., 2009). Aside from the character of the parents in this regard (Kantomaa et al., 2007), the physical structure of certain areas, including their restrictions, such as the lack of playgrounds or recreational areas (Frederick et al., 2014), the lack of attractive low-traffic zones with green capacities (Giles-Corti & Donovan, 2002), and physical insecurity when performing alfresco sports (Frederick et al., 2014), can Overweight amongst African girls may increase with age but decrease with age amongst white or western girls (Armstrong et al., 2006). The studies of Clark et al. (1999; Mvo et al., 1999) found that weight gain in some African nations was understood as an indicator of fortune and joy.

### *2.3.2. BMI classification according to race*

A study was done on a group of females that consisted of white and black participants. While their black peers presented more trends concerning reducing food intake, whites demonstrated more verbal adjustment. Girls that recorded a greater reduction in food intake had a bigger figure or plus size and those that were more sedentary than those on low-calorie diets. The correlation between plus-size dimensions and food consumption was conveyed only in black females (Petersen et al., 2006). The dissimilarities and similarities in nutritional lifestyles and consumption patterns among inner-city and non-urban youths and between younger and older adolescents, in particular societal surroundings, and their relations with overweight and obesity, In early and mid-adolescence, more girls had extreme body physique and weight gain categories as compared to boys in an urban and rural background, and the quantity of bigger-sized girls was greater in the urban setting (Sedibe et al., 2018).

Mciza et al. (2005) piloted a study in the Western Cape, South Africa and stated that black African girls have more body image dissatisfaction than white or western girls. Black African girls, on the other hand, do not face pressure from their families or friends to change their current body weight. Another South African study of fifteen to eighteen-year-old adolescents between black African, white and mixed ancestry girls found that most of the girls experienced body dissatisfaction (Caradas et al., 2001). The author reported that black African Americans are likely to be more susceptible to eating disorders in the near future than white girls. Nevertheless, the black adolescents still desired body shape with a higher body mass index (BMI) than their white counterparts (Gitau et al., 2014).

### *2.3.3. BMI classification according to gender*

A survey carried out in 2008 reported that female learners were more likely to be obese or overweight than boys, and the calculation of overweight learners has risen to 19%. The national prevalence of obesity was 5%, with more obese female students at 7% than males at 3%. Among all the South African outlying areas, learners that were residing in KwaZulu-Natal (KZN) had the biggest number of learners that were overweight (Reddy et al., 2009). According to the South African National Health and Examination Survey (SANHANES-1) there is a double liability of young people malnutrition on a national scale, and it is clear that overweight and obesity are major alarms on the anthropometric nutritional status of young people in South Africa (Shisana et al., 2014). In table 2.3, it is indicated that the study conducted amongst adolescents in the City of Tshwane, South Africa reported that the youth are currently facing an instant growth in obesity (Ngwenya & Ramukumba, 2017). Sartorius et al. (2017) also stated that there was a rapid increase in BMI among young people transitioning from 2008-2015. Wrottesley et al. (2020) further indicated that adolescents, mainly girls, are gradually encumbered by obesity as an end result of urbanisation-associated shifts in eating behaviour and dietary intake in SA.

The study conducted by Moselakgomo et al. (2012) agrees with the study (Mkhonto & Mabaso, 2012) that among school-going adolescent boys and girls, there is a high rate of blood pressure (BP) and it is linked to greater body weight as measured by the selected anthropometric parameters. An increase in body weight, such as being overweight or obese, can increase the possibility of non-communicable diseases (NCDs) during puberty (Rossouw et al., 2012). Peer & Ganie (2016) state an important fact currently in South Africa: we are already experiencing a disaster of NCDs. The level of endangerment of obesity in this country can be demonstrated by the fact that nearly one in every five SA boys and one in every four girls is obese. This is the most serious concern for cardiometabolic diseases (such as type 2 diabetes, dyslipidaemia, and high blood pressure), gastrointestinal disease, and musculoskeletal disease. conditions (obstructive sleep apnoea), social difficulties (stigmatisation) and psychological problems (depression) have a large effect on healthcare provision and the quality of life of the next age group of adults. Sedentariness is the main contributor to weight gain in young people, like the overconsumption of energy-dense foods.

The findings of Mathunjwa et al. (2013) specified that a 10-week, 30 session Tae-bo exercise programme was productive in decreasing related to cardiometabolic disease in obesity and

overweight university pupils. Therefore, the intervention was recommended for increasing physical activity levels. Obesity is caused by the interaction of inherited factors and environmental or standard of living influences. Consumption practises related to global obesity are prevalent in high energy intake, low quality food intake in dairy, fruit, and vegetables, lack of breakfast, and lack of physical activity (Gee et al., 2008; Kirk et al., 2010; Ledikwe et al., 2006). The study conducted in Cape Town to investigate the dietary intake of adolescents revealed that among learners that bought food items at school, 70% of the food items were unhealthy, and 73% of the learners bought two or more unhealthy foods daily (Temple et al., 2006). The popularity of obesity among young people in developing countries is more closely linked to their socioeconomic background and lower than that of their economically fortunate counterparts.

According to Rossouw et al. (2012), significant published articles are scarce in more socioeconomically developed areas within SA, but most academics have directed their studies towards publishing undernutrition in rural areas. The study was conducted on learners aged 13–18 in Cape Town. The results revealed that almost half of the sample size children were underweight, the 15-year olds were considered to be obese, and the popularity of both being obese and overweight was discovered in the 18-year olds (Van Niekerk et al., 2014). In the Western Cape, the national electrification in the post-apartheid era (as well as an increase in household income) has possibly added to a general rise in the accessibility of televisions in households. This may have led to the reduction of bodily activities amongst Western Cape adolescents (Abrantes et al., 2003; Naude et al., 2009).

## 2.4 PHYSICAL ACTIVITY OF LEARNERS

**Table 2.4: The summary of physical activity articles of school-age children and adolescents.**

Author (s)	Country	Aim	Sampling	Data collection	Key findings
van Biljon et al. 2018	All province in SA	To examine the physical activity levels of learners in primary school living in urban areas, South Africa.	7 348 learners cluster sampled	Physical Activity Questionnaire	There were differences in physical activity among provinces. Levels of PA decreased by 14% for 11–14-year-old girls and by 20% for boys in a similar age group. Black girls had a higher PA level than white girls. The learners that engaged in moderate to vigorous levels of physical activity were at 57%, and 31% did not encounter the internationally recommended standard of physical activity.
Moselakgomo & Van Staden. 2018	Limpopo Mpumalanga, South Africa	To investigate the linkage among risk factors of cardio-metabolic diseases and physical activity levels in South African children.	1361 simple random sampled	International Society for the Advancement of Kinanthropometry (ISAK) protocol electronic BP monitor International physical activity questionnaire	Low physical activity levels were detected in the studied group. Boys were at 14.5% low for average to vigorous physical activity levels and girls were at 15% low for moderate to high-intensity physical activity standards.
De Vos et al. 2016	NorthWest, South Africa	To assess the levels and type of physical exercise including inactive practises among learners in a Senior Phase group in South Africa	230 learners purposive sampled	Children's Leisure Activities Study Survey (CLASS) questionnaire	<p>The results showed that boys were more active than girls, mostly at weekends. Moderate to vigorous physical activity levels of between 334 and 361 min per week were established, and inactive practises were observed, which indicates that between 70.7% and 71.9% of the participants did not meet the endorsed health-based standard. Private-school adolescent eating habits were 60.2% unhealthy, while public-school adolescent eating habits were 68.7% healthy.</p> <p>The majority of the private school learners were living an inactive lifestyle at 64.2%, and those in public schools were living a healthy lifestyle at 64%. The BMI measurements revealed that most of the females from private schools were overweight at 4%, obese at 1.2% and underweight at 52%, whereas among public school females, almost half of the respondents were at a healthy weight at 55.46%, overweight at 2.3% and none was obese.</p>
Ojofeitimi el al.2011	Osun State, Nigeria	To evaluate the causes and patterns among adolescent girls attending public and in	16,450 students	semi-structured questionnaires	at a healthy weight at 55.46%, overweight at 2.3% and none was obese.

		private schools in the Olorunda Local Government Area of Osun State, Nigeria	multi- sampled		
Aggazi et al.2010	Florida	To investigate the frequency of physical activity levels and overweight among economically underprivileged and smaller middle- and high-school children in a district in Florida	535 learners purposive sampled	Nutrition and Exercise Survey for Students (NESS)	The results showed that boys were more active than girls and physical activity levels were decreasing among grade 6 and 9 learners among minor girls. In general, 42% of learners were overweight or obese. Less than 45% of students reported participating in physical activity every day. A shortage of time was identified as the paramount obstacle to participating in physical activity.

#### *2.4.1. Physical activity levels of South African adolescents*

The researchers noted that adolescents from non-urban areas are likely to be more physically active than adolescents from inner-city areas, particularly in walking, but the concentration of physical activity is constantly inadequate to fulfil recommended value (Craig et al., 2013). The Healthy Active Kids in South Africa (HAKSA) report card, reporting the outcomes of a systematic evaluation of the nutritional status and physical activity of South African young people in the system of rankings, specifies that South Africa has declined in its overall physical activity from ranking "C" in the year 2010 to ranking "D" in the year 2014 (Draper et al., 2014). The sedentary lifestyle has been awarded an "F" ranking. Consequently, readings specify that South African youngsters between the ages of 10 and 17 years are likely to spend three hours or more per day viewing television, according to the report card (Draper et al., 2014). In addition, the report card indicated that 72% of boys partake more in physical activities than 43% of girls (Draper et al., 2014).

Draper et al. (2018) reported that participation in physical activity among South African learners is not enough to avoid protracted diseases and inspire healthiness amongst citizens. South African According to the 2014 Report Card on Physical Activity for Children and Youth, less than half of learners (6–18 years) meet the recommended daily rate of sixty minutes of moderate-to-vigorous physical activity moderate vigorous activity (MVPA). The recommended standard of physical activity for children and adolescents (6–17 years) according to the Organização Mundial de Saúde, 2015. The American Diabetes Association (ADA, 2013) states that at a minimum, exercise should be sixty minutes per day from average to high intensity.

If it is properly used and given attention to equalising the energy input with the energy output, it will give good results. Positive actions like household chores, regular hiking, biking, dancing, and a host of other energy-sapping accomplishments, mostly implemented by young people, bring health advantages across an age group (Jimoh, 2016). Recent research has found that children who participate vigorously in school physical activities have lower blood lipid, well waist adiposity physique mass, lower cholesterol subfractions, and the chances of being obese or overweight are very low in children who ride bicycles to school (Cooke et al., 2015).

Revisions piloted in Kenya and Florida specified that the majority of young people did not encounter the WHO suggested one hour of MVPA per day (Agazzi et al., 2010; Muthuri et al., 2013). Additionally, the results of an Osun State, Nigerian study among private and public-



school learners showed that 64% of the girls from private schools were practising inactive behaviour as opposed to the girls from public schools who practised active behaviour (Ojofeitiimi et al., 2011).

#### *2.4.2. Factors influencing physical sedentariness in adolescents.*

The Potchefstroom evaluation piloted to examine the physical activity level, types, and sedentary lifestyles of Senior Phase learners concluded that between 70% and 72% of the respondents did not encounter the suggested health-based guidelines (De Vos et al., 2016). Factors such as socioeconomic status, inadequate sleep, television watching, inactive behaviour, gender, and others promote physical sedentariness in young people (Muthuri et al., 2013; Ortega et al., 2010; Vik et al., 2013). There is a shortage of levels of physical activity in young people and non-fulfilment of physical activity guidelines has remarkable penalties (Davison & Lawson, 2006; Reilly & Kelly, 2011; Rangul et al., 2011). In South Africa, roughly 26% of scholars did not want to participate in any form of exercise and could avoid it if allowed (Shisana et al., 2014).

Publishers in South Africa have publicised that there is a shortage of nutritional knowledge at a national level regardless of better-quality education levels in current age groups (Mciza, 2009; Steyn et al., 2000). It is motivating to note that the study conducted in Stellenbosch presented a significant connection between the prevention of obesity and improved physical activity. The knowledge scores of pre-adolescents and their mothers were low in foods that had high salt, sugar, and fat content to measure their health (McHiza et al., 2011). Mokabane et al. (2014) recommend that schools must announce and endorse physical activity vents during school hours and after hours through sports activities to reduce weight gain in adolescents, particularly in girls. Children who are obese or overweight should get therapy to help them lose weight and keep it off. Additionally, school tuck-shops must also offer good substitutes for confectionaries.

Approximately 42% of South African high school students do not participate in physical activities if possible or do so in limited quantities to have a progressive effect on their well-being. South Africa, adolescent girls have the highest rate of people that do not encounter the recommended physical activity guidelines across the country (Reddy et al., 2009). According to the figures from the KwaZulu-Natal (KZN) province, more than half of the girls participate in insufficient physical activity or do not participate at all during the week. Research also shows

that youth in South Africa view television as more important than participating in physical activity (Joubert et al., 2007).

In South Africa, there is a significant increase in the BMI of adolescents in a population in transition. 14% of boys and 15% of girls were severely inactive in physical exercise in 2018. (Sartorius et al., 2018). Physical sedentariness is also linked with the growth of NCDs such as obesity, which can affect the youth in South Africa (Mayosi et al., 2009). The result has shown that it is improving the recommended physical activity guidelines, but the results also revealed that 35% of those who were sedentary had pointed out that inactivity is a hazardous cause that could contribute to the increase of NCDs or chronic lifestyle diseases, which indicates that they are knowledgeable about the risks of being physically inactive (Frantz, 2006). The National Curriculum and Assessment Policy Statement (CAPS) in South Africa has created physical education to encourage learners to take part in physical activities which support movement and physical development (Department of Basic Education (DBE), 2011).

Physical activity (PA) has to be a public requirement and a public health priority, hence there is a need to know the factors that may influence the contribution to recommending physical activity among youth efficiently (Mota et al., 2007). In South Africa, learners between 8 and 14 years participate at an average physical activity level. Thirty-one percent did not encounter the worldwide endorsed intensity of physical activity ranging from moderate to vigorous physical activity. In total, boys showed greater physical activity levels than girls (PA levels decreased by 14% in boys and 20% in girls between 11 to 14-year-old participants). In a study conducted by Van Biljon et al. (2018), it was outlined that black learners had greater physical activity levels compared to white learners. South Africa is ranked as the fourth country with the highest popularity of physical sedentariness in Africa when evaluated by universal surveillance surveys (Lambert, 2012).

The SA youth risk behaviour assessment stated that less than a third of adolescents measured contributed to sports activities, and 42% was considered the lowest standardised recommendation (Reddy et al., 2012). SA youngsters have the highest prevalence of overweight and obesity globally and in sub-Saharan Africa (Rossouw et al., 2012).

The National Heart, Lung, and Blood Institute Growth and Health Study described that girls' average scores declined extremely between 9 and 18 years old (Cohen et al., 2006; Davison & Lawson, 2006; Pate et al., 2005). Puberty is a dangerous age in the study of physical activity (Duncan et al., 2007). Physical activity behaviours vary in adolescence as well as an enhanced

understanding of perceived physical activity barriers and behaviours (Katzmarzyk et al., 2008). In South Africa, actions were taken to promote physical activity through the introduction of cycle lanes with pedestrians and beach walkways for the improvement of road safety for cyclists (Labadarios et al., 2005). Story et al. (2009) recommend schools increase the duration, intensity, and frequency of physical activities.

## **2.5 SUMMARY OF THE LITERATURE REVIEW**

The study covered the main themes such nutritional knowledge, dietary intake, physical activity and anthropometric measurements of adolescents. The reason of this chapter is to supply an outline of the writing on the subject of the nutritional status and dietary admissions of pre-adult young ladies in Dlangezwa. This chapter reviews literature on the significance of nourishment circumstance of adolescents in SA. An outline of past overview discoveries of adolescent dietary status in South Africa was given. Most nutrition-related studies have examined the dietary status of younger children within the nation, but not much has been detailed approximately wholesome and wellbeing status of adolescents. Destitute wholesome status amid youth is an critical determinant of health outcomes at a afterward organize of life. South Africa like numerous other nations in Sub-Saharan Africa proceeds to combat the issue of malnutrition. The lack of healthy sustenance that wins is mainly a result of lacking nourishment utilization, need of information on knowledge of nutritious, physical activity, food processing and planning and destitute dietary propensities. Malnutrition, subsequently, an ultimate manifestation of the interaction of different variables in society.

The next chapter discusses the methodology of this study, as informed by the literature review.

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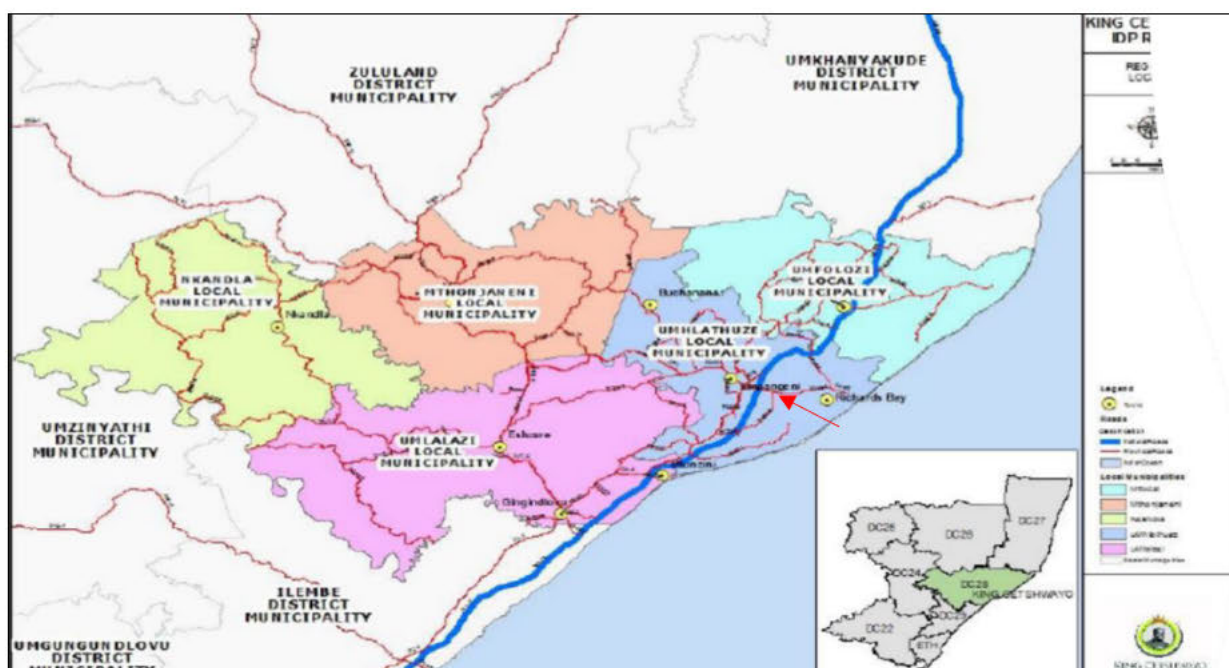
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## METHODOLOGY

This chapter outlines the techniques and methods used for data collection to define the nutrition knowledge, dietary intake, anthropometric measurements, and physical activity of teenage girls schooling at a middle-class income high school in Dlangenzwa.

### 3.1. THE DESCRIPTION OF THE STUDY AREA

The study was conducted between February March 2019 at Dlangezwa High School in Empangeni (uMhlathuze Municipality) in the northern part of KwaZulu-Natal Province, South Africa. The school is classified as a quintile 4 fee-charging school. In the year 2016, the school had 855 learners served by 38 teachers, with a student-teacher ratio of 23:1 (Department of Basic Education, 2017). The uMhlathuze land area covers 123 359ha and incorporates Richards Bay, Empangeni, eSikhaleni, Ngwelezane, eNseleni, Felixton, Vulindlela, Bhucanana, Heatonville, and the rural areas under Traditional Councils, namely, Dube, Mkhwanazi, Khoza, Zungu (Madlebe), Somopho, Obizo, and a small portion of Obuka. The population is estimated at 410,456 as per the Community Survey 2016. An assessment conducted in 2016 state that the population of youth under 15 was 34.7%, education pupil above the age of 20 years that has no schooling was 5.9% with matric at 44.3% and with higher education at 13.5% (UMhlathuze Local Municipality draft review, 2019).



**Figure 3.1:** Map of King Cetshwayo Regional contexts indicating the study area (South African .gov, 2020).

### 3.2. RESEARCH DESIGN

This section outlines the broad framework that states the total design used for conducting the research project. It specifies the approach, research population, sampling, data collection, and analysis methods.

Interpretivism lends itself well to studies that have a lot of grey areas, like society, for example. Understanding why or how somebody feels or behaves cannot be achieved through the analysis of numbers. Instead it requires an in-depth assessment of words, actions and behaviours. This philosophy is appropriate for the current study, which aims to understand the effect of nutritional knowledge of high-school learners on physical activity and dietary intake and to evaluate their anthropometric measurements.

#### *3.2.1. Approach*

This study has adopted a inductive mixed-method research approach, which was a suitable methodology for conducting research that involves collecting, analysing, and integrating quantitative through experiments, surveys, and tools and qualitative through focus groups, interviews, and other research tools. One of the reasons for conducting mixed methods research was the possibility of triangulation, i.e., the use of several means (methods, data sources, and researchers) to examine the same phenomenon. Triangulation allows one to identify aspects of a phenomenon more accurately by approaching it from different vantage points using different methods and techniques. Combining qualitative and quantitative research components is to expand and strengthen the study's conclusions and therefore contribute to the body of literature in the area of study. The study was attentive to teenage girls that were attending a public school in a peri-urban area regarding their dietary intake, anthropometric measures, knowledge of nutrition and physical activity. The study used a case study by means of cross-sectional design was used in the study is a type of observational study design. In a cross-sectional study, the investigator measures the outcome and the exposures in the study participants at the same time. A cross-sectional study to refer to this particular research design and the term questionnaire to refer to the data collection form that is used to ask questions of research participants. Data was using instruments other than questionnaires, such as stadiometer, which measures the height and scale to measure weight. However, most cross-sectional studies collect at least some data using questionnaires.

### *3.2.2 Sampling Method*

Purposeful random sampling, which is a combination of both probability and non-probability sampling methods, was utilised to draw up a sample of participants who provided adequate information for the study. Purposeful random sampling is a method whereby the researcher identifies the population of interest and develops a systematic way of selecting cases that is not based on advanced knowledge of how the outcomes will appear (Etikan, 2017). Although the researcher was referred to participants, they randomly selected participants in which each sample had an equal probability of being chosen. A random sample is supposed to be a fair representation of the whole population and the right size for the study.

### *3.2.3. Population and sample*

The sample was drawn from grade 10 to 12 learners between the ages of 15 and 20 years old at Dlangenzwa High School, KwaZulu-Natal. Dlangenzwa High School is categorised as quantile four, which the government classifies as fee-charging, and South African schools are categorised as national and provincial quintiles ranging from one to five. The school consists of only females, predominantly African students, and a few Coloured girls. The categorization is based on socioeconomic evidence from the area or community where the school is situated, as well as employment status, education level, and parental income. This school was chosen to draw a sample from because it is accessible and has a significant number of black South African learners.

After prospective participants were identified, the researcher approached and invited them to participate in the study. They were presented with the information sheet and were further informed about their right to refuse participation and that participation was voluntary. When they agreed to participate, they were also made aware of their right to withdraw from the survey. They were further informed that the information that they provided in the survey would also be treated with confidentiality; they were not required to disclose their identifying details. Finally, they were presented with consent forms for their participation.

The sample consisted of 202 participants between the ages of 15 and 20 who were learners at Dlangenzwa High School. Learners from grades 10–12 were included in data collection from both boarding and day scholars. Each student and their parents were needed to sign a consent form. Learners from grades eight and nine as well as pregnant learners were excluded from the study.

### 3.3. DATA COLLECTION

This study employed multiple data collection methods such as questionnaires, 24hr recall, focus group discussion and anthropometric measurements and physical activity which emphasised nutritional well-being of adolescent learners.

#### *3.3.1. The Focus Group Data Collection*

The researcher outlined the purpose of the focus group discussions (FGD's) and its aims and objectives. The researcher directed the learners throughout the discussion and keeps the group attentive on the topics for discussion. A focus group discussion is bringing together people with comparable backgrounds or experiences to explore a particular topic of interest. It is a sort of qualitative research in which respondents are questioned on their views, attitudes, beliefs, or ideas (Baral et al., 2016) . They allow the researcher to collect rich information in the participants' own words. They give information from a group of persons more rapidly than individual interviews. Focus groups are versatile in their usefulness for researching a variety of issues. A note-taker who is an observer and does not participate with the group during FGDs. The notes contained a summary of what each individual said, a description of how their remarks were made, and a log of when the conversation shifted from one topic to the next. The note taker was accountable for recording the discussion using a recorder. The recording was used to make a copy of the occasion. The focus groups questions are indicated on appendix 5. The FGDs questions were piloted with a smaller group of 10 of learners per grade who participated in questionnaires and antropometric measurements. The sample size was determined by the half of the learners per grade participated in questionnaires for the the overall FGDs questions. Textual analysis was used for FGDs questions.

#### *3.3.2 Data collection method*

Table 3.1 illustrates all the objectives of the study. Each objective has to align with its data to be collected, data collection tool and data analysis.

**Table 3.1: Data collection methods and analysis**

Objectives	Data to be Collected	Data collection techniques & tools	Data Analysis
1. To understand nutritional knowledge of high school learners	Knowledge of nutrition, physical activity and dietary diversity practices.	<ul style="list-style-type: none"> <li>○ Questionnaires 202 x Learners in Grade 10-12</li> <li>○ Focus group Discussion</li> </ul>	<ul style="list-style-type: none"> <li>○ Descriptive analysis (mean, percentages)</li> <li>○ Content and theme Analysis</li> </ul>
2. To determine the dietary intake of high school learners	Portion sizes Snacks Beverages Meals	<ul style="list-style-type: none"> <li>○ 24hr recall 202 x Learners in Grade 10-12</li> </ul>	<ul style="list-style-type: none"> <li>○ Descriptive statistics (deviation and confidence interval)</li> </ul>
3. To assess the anthropometric measurements of high school learners.	Height Weight BMI Index	<ul style="list-style-type: none"> <li>○ Observation and recording sheet 202 x Learners in Grade 10-12</li> <li>○ WHO growth Reference for girls 5-19 years</li> </ul>	<ul style="list-style-type: none"> <li>○ Descriptive analysis</li> </ul>
4. To determine how physical active girls are	Time Types physical of activities	<ul style="list-style-type: none"> <li>○ Questionnaires 202 x Learners in Grade 10-12</li> </ul>	<ul style="list-style-type: none"> <li>○ Regression model Descriptive statistics</li> </ul>
5. To assess the relationship between nutritional knowledge and dietary intake.	Knowledge of nutrition, physical activity and dietary diversity practises.	<ul style="list-style-type: none"> <li>○ Nutrition knowledge data</li> <li>○ Dietary intake data</li> </ul>	<ul style="list-style-type: none"> <li>○ Correlations</li> </ul>

### 3.3.3. Questionnaire: Nutrition knowledge

The nutrition knowledge questionnaire adapted from (Letlape et al., 2010; Whati et al., 2005) for 13-19 years old, it is based on the dietary guidelines. The learners answered questions based on the eleven South African Food Based Dietary Guidelines namely indicated on appendix 8.

The questionnaire was in English with instructions. The questionnaire was administered in a classroom situation. On the day of conducting data collection, the consent forms for learners were issued and the researcher addressed the study to the learners. The researcher explained the consent form and briefly communicated the objective of the study to the learners. On the day of the data collection, the learners were requested to complete a questionnaire and give a true reflection of their knowledge of nutrition and diet.

The estimated time was 2 hours. The first hour is for finalising the questionnaire, and the remaining 1 hour is for collecting data on weight and height. The educator was asked to discern

rules and regulations as stipulated by the Department of Education. The researcher outlined that the learner will not be exposed to any invasive procedure and will not be exposed to any emotional or physical harm.

There were 202 learners who participated in the study from grades 10, 11 and 12. The researcher selected the respondents according to grades for the 24hr recall, nutrition knowledge, physical activity and BMI measurements. The input of the life orientation educator was required because the researcher had to adhere to the stipulated time slot. The teacher in charge must read the cover page and the objective of the study to communicate the objective to the learners. The nutrition knowledge questionnaire is a quiz with simple questions "true or false" and a multiple-choice and physical activity questionnaire with time and type of physical activity that the learner participates in.

#### *3.3.4. The 24-hour recall*

A designed 24-hour recall model was used in the study. The instrument entails the food and beverages that the learners have consumed in 24 hours. To obtain a complete picture of their eating habits, the students were asked to recall foods consumed in the previous 24 hours, including quantities, including snacks and beverages consumed between meals, restaurant foods, portion sizes, time food was consumed, and location of consumption (Brown et al., 2009; Margetts & Nelson, 2009). Food quantity, quality, habits, and eating patterns are determined by using this type of interview (Gills et al., 2017).

According to Ma et al. (2009), it is suggested that once the 24-hour data has been collected, two or more days must be collected to have decent confirmation of consumption patterns. When the dietary pattern has been identified, implementation of strategies to improve the situation of individuals is recommended for study goals, such as educating learners about the importance of health and wellbeing through healthy dietary changes (Brown et al., 2008). Hence, it is essential to consider the techniques of preparing food such as roasting, frying, and food composition (fresh milk, 100% fruit juice, and fried chicken). A description must be given.

#### *3.3.5. Weight measurements*

The weight measurements were taken using a portable weight scale with a standardised mass measure in kilogrammes to the nearest 0.5 kg. The pre-calibrated scale was used to measure all participants. It was placed on a hard-concrete floor (Scales et al., 2000). There was a method that was used for recording measurements for each participant. It was as follows: the scale was

placed on a hard, flat, concrete floor in the classroom at the school. Each participant was asked to remove a scarf and gloves, shoes, and any other additional clothing such as a jersey, blazer, or jacket. To ensure the safety of the personal items, they were placed in a box that could be seen by participants.

The researcher switched on the scale and waited for the 0.0 kg digit to display, after which the participant was asked to stand in the middle of the scale with bodyweight equally distributed on both feet and with arms held straight down at the sides of the body. The participants were requested to stand flat-footed with their feet away from each other in a comfortable position. The participant was requested to remain constant until all weight digits were displayed and captured on the recording sheet. The participant asked to take a step back and take a sideways stance. For the second reading, the scale was reset at “0.00” for a second time, and the respondents were asked to step on the scale and repeat the procedure. The flash figure was displayed two times to show the last reading. The weight dimensions were documented to two decimal places on the recording sheet. The weight dimension was documented to help in the BMI calculations.

### *3.3.6. Height measurements*

For each participant that took part in the study, it was required to take height measurements using a portable stadiometer with a sliding headpiece (Scales et al., 2000). The height measurements were rounded off into two decimal places, and the procedure was repeated twice to acquire an average measurement (WHO, 1995). The method for determining height was as follows: everyone was asked to take off their shoes. The respondents were requested to stand on the stadiometer under the headpiece facing outwards and looking straight ahead without lifting the chin or overstraining the spine to seem taller. The participants' heels were positioned together, legs facing forward, and shoulders relaxed, arms held at the sides. The shoulder edges, backsides, and heels of the respondents must be placed so as to touch the measuring rod. The respondent's head should be placed in the Frankfort plane position. This is achieved when the lower edge of the eye socket (the orbitale) is horizontal with the trignon. The vertex will be the highest point on their heads. If their head was not aligned properly, they were asked to raise or lower their chin until it was in the Frankfort plane. The researcher pulled down the sliding headpiece onto the uppermost angle of the participants' cranium, with a small force being used to level the hair.



The descending headpiece must be held in the position and the participant's height was noted down in centimetres to two decimal places. The respondent was requested to step aside from under the stadiometer headpiece and then the procedure was repeated for a second reading for verification. An average score dimension was documented to help calculate the BMI that were from the two recordings (De Onis et al., 2006).

### *3.3.7. Body Mass Index (BMI)*

Following the verification of weight and height arithmetic means, a BMI overall was developed. BMI is mostly used as a symbol of a commonly used gauge to estimate a person's general health by finding where one lies within the continuum of groups ranging from severely wasted to morbidly obese (Nambiar et al., 2009). The authors (Quadros et al., 2015; Shisana et al., 2014), stated that the method can be used to classify whether the individual is approaching the possibility of emerging heart disease, likewise describing BMI, saying it can define the number of fatty deposits around the body according to the ratio of weight and height, while also bearing in mind overall body construction. This was a deep-rooted procedure that was mostly used in global measurement for academic purposes, such as the Canadian and American gathering of adolescent profiles (Tjepkema and Shield, 2005)..

Nevertheless, BMI alone cannot precisely define a person's general health status and there is a need for assessment of other complementary nutritional examination tools such as the 24-hour recall and Food Frequency Questionnaire (FFQ). BMI is articulated as a percentage of weight (kg) over height in centimetres (cm) (WHO, 2008).

### *3.3.8. Physical Activity*

The kind of physical activity evaluation method that was used in the data collection was specified as a 'short-term recall'. There were questions formulated that were to create a physical activity questionnaire. There were eight questions formulated for the sample participants.

An authentic and logical physical activity questionnaire established by the University of Canada (Kowalski et al., 2004) was adopted in this study. The questionnaire was used to pinpoint what types of physical activities the adolescents participated in, how much and how long they devoted to the activities.

In order to know how much energy was utilised by the adolescents, this information was incorporated into the general well-being status examination in combination with the health

evaluation approaches. Physical activity has a solid relationship with health risks and physical stature (Joubert et al., 2007; Kruger et al., 2002). The participants completed the questionnaire in the presence of a researcher in a prearranged area, and they were helped only when necessary.

### 3.4. DATA ANALYSIS

This study employed multiple data collection methods such as questionnaires, focus group discussion and observations. A detailed discussion for data analysis methods

#### **Objective 1: To evaluate the nutritional knowledge of high school learners.**

Descriptive statistics, including frequency and percentage, was used to determine the nutrition knowledge of respondents.

#### **Objective 2 : To determine the dietary intake of high school learners**

The respondents were asked to recall all food items/commodities consumed in the previous 24 hours before the interview. A scale of twelve food groups was used in assessing the dietary diversity of the respondents. The dietary diversity scores for the respondents are to be estimated using information collected from the 24-hour dietary recall. A single point is awarded to each of the food groups consumed over the reference period, giving a maximum total dietary diversity score of 12 points for everyone, if their responses were positive to all food groups.

#### **Objective 3 : To assess the anthropometric measurements of high school learners.**

Logistic regression methods are widely used to define a child's nutritional and stunting status. The most commonly used regression methods that have been used regarding children's nutritional status studies are binary, multinomial, and ordinal logistic regression. Researchers accept that multinomial logistic regression is the most suitable method to employ because it can provide more specific results, such as "malnutrition", "undernutrition", "normal nutrition", and "obese". With a p-value of less than 0.001, the regression model was used to show that there was a statistically significant link between nutrition knowledge and food intake.

#### **Objective 4: To determine how physically active are school learners**

Functions for analysing data at multiple levels include within and between-group statistics, including correlations such as correlations between anthropometric measurements, dietary

intake and physical activity. The correlations between the level of performance, age, and time spent sitting show how it has a significant effect on the food groups.

**Objective 5 : To assess the relationship between nutritional knowledge and dietary intake of high school learners**

Due to the nature of the study, only the girls who were in Grades 10–12 participated in the study. The respondents were 202 in total. In grade 10 there were 57 learners, in grade 11 there were 52, and in grade 12 there were 93 learners who participated. The data was collected on particular dates that were assigned by the Deputy Principal to best suit the learners' academic programme. Data gathering was executed for 6 weeks of the first term of the teaching and learning programme, from the 23rd of January 2019 to the 22nd of February 2019. Time schedules were different each day because girls' data collection must hinder academic programmes and learners had to participate in extramural activities mostly on Wednesday afternoon. Dietary intake data collection was also different because each day the learners consumed different food groups based on their two-week menu.

Questionnaires were grouped and classified in an orderly setting. The data were also clean, according to the primary investigator, who checked it for accuracy and completeness. The nutrition knowledge data was prearranged and captured on a Microsoft Excel® spreadsheet and then analysed for descriptive statistics (means, frequency) and related against reference standards.

The researcher grouped all the food items consumed by the participants from the 24hr recall and listed which food group was consumed most by the participants and the last item consumed. group the popular preparation method used, the type of meal taken, and the amount used. The correct and fully completed 24hr recalls are going to be used for statistical purposes. The food consumed by the participants was selected by the researcher from the food groups to determine the type of food group taken by participants for data analysis using the FAO dietary diversity questionnaire.

*3.4.1 Anthropometric data*

The weight and height measurements were captured on an Excel® spreadsheet. The data was converted into Z-scores using the WHO Growth Reference Chart for girls 5-19 years. For participant's  $\geq 20$  years the WHO BMI classification for adults was used (Ochola & Masibo, 2014).

The BMI was calculated using the formula below:

$$\text{BMI} = \frac{\text{Weight (kg)}}{(\text{Height})^2 \text{ (m)}}$$

The physical activity data were coded and entered on Microsoft Excel® spreadsheet which was then analysed by the researcher for descriptive statistics. The data was then analysed using SPSS version 23.0 for statistical regression.

### 3.5. LIMITATIONS AND ETHICAL CONSIDERATIONS

#### *3.5.1. Limitations*

The results from this study cannot be generalised because the sample is limited to Dlangezwa high school, which has adolescent girls only. The sample size in this study is relatively small due to the study confinement to one school. Data collection time was problematic; lunchtime was too short to complete the questionnaire; and afternoons were busy as learners would rush to get transport back home or did not want to stay behind after school or wanted to rush to prepare for evening study. The reliability of the data collected is dependent on the participants' disclosure.

Since the 24-hour recall makes use of recalled information, it relies on the respondent's ability to retrieve the relevant information from memory, process it, and provide reasonable answers, usually within a short period. This could impact on the reliability of the data collected. Some of the respondents may not be willing to have their anthropometric measurements taken. They had to be persuaded and assured that information would be treated confidentially.

#### *3.5.2. Ethical considerations*

##### ***3.5.2.1 Informed consent***

An informed consent form was issued to the participants, requesting that they indicate whether they accepted participation in the study. Permission to conduct the current research study was sought from the Department of Education to conduct research for a study. Research at Dlangezwa High School was permitted by the Department of Education (King Cetshwayo District). The study was approved by the Biomedical Research Centre (REF: BE650/18) at the University of KwaZulu-Natal .

### ***3.5.2.2 Right of their privacy***

Participants were assured of their confidentiality, anonymity and voluntary participation in the study as no identification was required during the biographical questionnaire completion.

## **3.6. VALIDITY AND RELIABILITY OF THE STUDY**

To provide accurate data, measurement instruments are frequently assessed for validity and reliability.

### **3.6.1. Validity**

The degree to which a measurement instrument measures what it is intended to measure is known as validity. If attributes of a single person or group are consistently measured below their true value, the measurement tool is invalid (Joubert and Ehrlich, 2008:117). A new instrument might be devised and built or existing apparatus can be used to collect data. Utilizing pre-existing instruments provides some benefits, such as saving money and time and avoiding the need for additional measurement if the validity and dependability of the instrument can be established.

Information about the construct validity and reliability of an existing instrument must be provided if it is to be used. The study's instrument of choice must be appropriate for and usable in the South African setting (Mouton, 2001).

### **3.6.2. Reliability**

When the measurement is repeated on the same people or the same group, a research tool is considered reliable if the results show some degree of consistency. When an instrument is used again in the same situation with the same participants, it will measure in a consistent manner, which is known as reliability. In a nutshell, it is the measurement's repeatability (Mouton, 2001).

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## **CHAPTER 4**

### **RESULTS AND DISCUSSION**

#### **INTRODUCTION**

This chapter contains the findings for each objective, which are described in the form of tables, graphs, and statistics. Numerous criteria were analysed, including nutritional knowledge, food consumption, physical activity, and anthropometric assessments of Dlangezwa high-school learners.

#### **4.1. CHARACTERISTICS OF PARTICIPANTS**

The sample population included Grade 10–12 learners aged 20–40 years old from Dlangezwa High School in Empangeni's peri-urban district. Empangeni is a town in the South African province of KwaZulu-Natal. It is located approximately 157 kilometres north of Durban in hilly countryside with views of a flat coastal plain and the main port town of Richards Bay, 16 kilometres away. The research was limited to borders (learners that are staying at the school hostel). The school is classified as a quintile 4 school in South Africa, where schools are classified according to national and provincial quintiles ranging from 1 to 5. Dlangezwa High School is classified as a Quintile 4 school, which means it charges fees. The school is mostly for females, with most black students and a few coloured girls. Categorization is dependent on demographic data from the neighbourhood or community area in which the school is located, as well as on job status, educational attainment, and parental income.

It is not unusual to see a 20-year-old adult studying Grade 10 in South Africa. There is no question or conflict with the South African Basic Education programme about grade 10 learners who are considered adults at the age of 20. There are youth between the ages of 17 and 21 who are enrolled in Grade 8 and 10 classrooms for children with an average age of between 13 and 16. "It's disturbing," said Tom Stokes, a member of the KwaZulu-Natal education portfolio committee, on the issue of age limits in schools. Anthony Pierce, the National Professional Teachers' Organisation of South Africa's provincial CEO, said: "The government did not stipulate what the cut-off age is." The discussion at the time was about adult basic education and keeping young adults off the street "(Barbeau, 2010). This statement above confirms the reason why there are grade 10 learners that are aged 20 years old in the study.

## 4.2 NUTRITION KNOWLEDGE OF LEARNERS

The study examined the participants' nutrition knowledge using a norm-referenced performance-rating scale. Their right responses are classified using (Whati et al., 2005)'s rating scale.

**Table 4.1: Norm referenced performance rating for nutrition knowledge questionnaire.**

Stanine Performance	Score%	Interpretation
<b>1</b>	<34	Very poor
<b>2-4</b>	34-51	Fair/below average
<b>5</b>	52-57	Good/average
<b>6-8</b>	58-75	Very good/above average
<b>9</b>	76+	Excellent

The ratings are categorised as follows: very poor, fair/below average, good/average, very good/above average, and excellent. The published findings included only accurate answers to 30 nutrition awareness questions. The norms in Table 4.2 show the results of how grades correlate using a similar questionnaire to indicate levels ranging from very poor to excellent in order to understand the nutrition knowledge of each grade using to indicate their performance expectations based on their known knowledge levels and whether the performance-rating from each grade has differed significantly.

In Table 4.2 the performance assessment for nutrition knowledge questions is summarized.

**Table 4.2: Performance assessment for nutrition knowledge questions of all grades.**

Score%	Grade 10 (n=57)		Grade 11 (n=52)		Grade 12 (n=93)	
	No.	%	No.	%	No.	%
<34	1	2	0	0	4	4
34-51	16	28	13	25	17	17
52-57	12	21	9	17	10	11
58-75	26	37	20	38	46	49
<b>(Excellent) 76+</b>	<b>2</b>	<b>4</b>	<b>10</b>	<b>19</b>	<b>16</b>	<b>17</b>

\*\*N=Total number of respondents; n=number of respondents per grade

According to the study's findings, the response seems to be that the learners were sufficiently taught about nutrition. On all grades, most responses were rated as excellent or above average. Question 15 and 24 were excluded because learners had difficulties recognising that lettuce is a kind of green leafy vegetable and that it is impractical to obtain all the vitamins and minerals from food or a vitamin and mineral tablet. The findings indicate that learners were more

knowledgeable than students in other classes, at 19% of the overall percentage. As shown in Table 4.1, they earned the highest scores and attained a minimum of 30% in comparison to the other grades. The findings demonstrate that the students comprehended nutritional knowledge. Nutritional knowledge can help adolescents improve the quality of their food intake. It must also increase adolescents' fruit and vegetable consumption. Adolescents in the current sample have a better awareness of nutrition but a lower consumption of fruits and vegetables, indicating the need for prevention programmes that can improve adolescents' eating habits when they are still growing. Adults can acquire knowledge about leading a healthy lifestyle. Thelen & Cormier (1995) discovered that female learners eat well not because of improved nutritional knowledge but because they compete with their parents' eating habits, implying that parental guidance is often critical. The study of (Mahmood et al., 2021) emphasizes the need for greater research on parental child-feeding practices as modifiable risk factors, which could aid in developing future dietary treatments and regulations to prevent dietary-related disorders. Nevertheless, the current study did not examine the nutritional knowledge of gatekeepers (parents, guardians) (Oldewage-Theron & Egal, 2011). Reinehr et al. (2003) reported that nutrition awareness can be affected by the form of schooling received and the child's age, and that there is little gap in nutrition knowledge between obese and non-obese children.

### 4.3. DIETARY INTAKE OF LEARNERS

The dietary intake of the adolescent girls (N=202) was analyzed and conferred. The valuation was completed by using 24hr recall questionnaires and focus group discussions.

#### 4.3.1. Dietary Diversity

**Table 4.3: Dietary Diversity of Dlangezwa High school of learners (FAO.2013)**

Description		Grade 10		Grade 11		Grade 12		TOTAL	
		(n=57)		(n=52)		(n=93)		(N=202)	
No.	Group	No.	%	No.	%	No.	%	No.	%
1	Cereals	54	95	52	100	91	98	197	98
2	White roots & tubers	6	11	7	13	18	19	31	15
3	Vitamin A rich veg	1	2	2	4	4	4	7	3
4	Dark green leafy vegetable	0	0	1	2	0	0	1	0.49
5	Other vegetables	10	18	14	27	26	28	50	25
6	Vitamin A rich fruit	0	0	1	2	7	8	8	4
7	Other fruits	18	32	17	33	31	33	66	33

8	Organ meat	4	7	1	2	4	4	9	4
9	Flesh meat	37	69	42	81	79	85	158	78
10	Eggs	9	16	5	10	16	17	30	15
11	Fish & seafood	0	0	0	0	2	2	2	1
12	Legumes & nuts	9	16	10	19	9	10	28	14
13	Milk & milk products	18	32	17	33	23	25	58	29
14	Oils & fats	41	72	25	48	49	53	114	56
15	Sugars & sweets	49	86	47	90	76	82	172	85
16	Spices & condiments	42	74	39	75	70	75	151	77

\*\*N=Total number of repondents; n=number of respondents per grade; No=Number of food groups

In Table 4.3, the results of the dietary diversity score are presented. The researcher examined the food intake of 202 adolescent females (N = 202). A 24-hour recall questionnaire was used to conduct the assessment. As seen in Table 4.4, the majority of respondents ate cereals such as bread, pasta, rice, and maize meal. Sugary foods such as sweetened juice, cookies, and chocolate were extremely common at all grade levels. Similar findings were made by Napier & Oldewage-Theron's (2015) research, where cereals and sugary food groups were rated maximum.

It may therefore be inferred that starch-rich foodstuffs are the primary diets eaten among all grades. The research also discovered a decrease in vegetable and fruit intake, legume consumption, and milk consumption. This trend is also evident in an analysis of (Kruger et al., 2005). Consumption of dark green leafy vegetables such as amaranth and spinach was less than 2% for all students, almost non-existent, and even other vegetables such as tomato, cabbage, and eggplant were consumed at a rate of 25% for all grades.

Narring (1999) discovered similar results among female adolescents in Switzerland, namely that the daily intake of fruits and vegetables was low, especially among the older group of adolescents. The study's findings are consistent with those of European and American studies. The Minnesota Teenage Health Survey, undertaken in 1986-1987 in the United States of America by 30,000 teenagers, also discovered an insufficient consumption of dairy products, fruits, and vegetables (Muoz et al., 1997). Similar findings were observed in the study of (Ronca et al., 2020) whereby the consumption of dairy products, fruits and vegetable was very low.

Milk and milk product intake was less than 35% for all adolescents in all grades. Maria Dymytrenko, (2009) discovered a similar pattern, with the girls failing to meet the prescribed

daily intake minimum (Farthing, 1991; Gutierrez & King, 1993), stating that it is normal for adolescents to consume a low amount of fruits and vegetables, as well as dairy products, similar behaviour was also recognized in the study of (Ronca et al., 2020) which was also found in the study of which contributes to weight problems and may result in poor dietary practises, especially among girls. Given that the data were collected by adolescents who do not live at home, it is reasonable to assume that the low intake of fruits and vegetables was caused by their residence on school grounds. Sugar and sweet intake was very high, averaging 85%, which is against the WHO regulated standard of sugar intake for both children and adults (Organização Mundial de Sade, 2015).



#### 4.3.2. Eating behaviour

The tuckshop, school menu, food consumed at home and taken to school, and intake of indigenous and conventional foods were used as focus group topics to determine adolescents' eating behaviours. The purpose of the focus group was to gain a broader understanding of the food the adolescents mostly consume, perceptions about traditional/indigenous food, barriers to healthy eating, and eating practises at school and home.

In Table 4.4 the highlight of findings of focus group discussions of all grades are presented.

**Table 4.4: Theme that emerged from the Focus Group Discussion with respondents**

Question	Discussion
<b>Tuckshop theme</b>	
How many of you buy at the school tuck shop? When is it open?	All leaners in all grades purchase some food items in school tuck-shop. The tuckshop usually opens during lunch break at 11h15 am to 12h00 pm and sometimes in the even at 05h00 pm during weekdays.
What kind of food do you buy at the tuck shop?	Some of the grade 10 learners mentioned that they usually purchase snacks, vetkoeks, hotdogs, and ice blocks. Cold drinks and homemade potato pie were mentioned as common food items purchased by grade 11 students. The grade 12 learners mentioned fruits, polony, cheese, and fried chips.
What kind of foods and beverages would you like to see there?	The items that they mentioned that they wanted to see in the tuckshop were fruits, sandwiches, cakes, salads, 100% fruit juice, water (still), regular pies, and bread.
<b>School menu theme</b>	
What kinds of foods are you currently eating at the school menu?	The leaners stated that the foods that they usually served at school were beef, chicken, wors, maltabella porridge, jungle oats, and for vegetarians they usually served soya mince, amaranth (from the school garden), cabbage, baked beans, amasi, vegetarian salsa, boiled eggs,

What changes would you like to see in the school menu?	The changes that they stated that they wanted to see was a reduction in serving meat, e.g., wors, beef, chicken, burger patty. addition of fish, beans, fruits, improved vegetarian menus, more amaranth, and increased opening hours in the kitchen.
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### Food eaten at home and brought to school from home theme

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What is the difference between the foods you eat school and the foods you eat at home?	The difference between the school menu and the food from home was that the learners stated that at their household, days pass without consuming meat. At home, food smells good and doesn't smell as oily as it does at school. They have a choice at home to not eat spicy foods at school because it's always spicy.
What kinds of foods you don't like eating at home and why?	They stated that they don't like to consume meat at home because over consumption of meat at school makes you hate meat. The same statement was indicated by the vegetarians that over consumption of cabbage at school makes you hate cabbage.
What food you like eating at home?	The learners identified that they liked to consume at home were macaroni and cheese, mince, spaghetti, fresh milk, muesli, liver, yoghurt or custard, mixed vegetables, fruit, 100% fruit juice, and biscuits because of the preparation, nutritional content, and they serve their own portion sizes.
What kinds of food do you bring from home?	The respondents said that they usually brought cereals, chocolate spreads, powdered milk, canned beetroot, noodles, condiments, fruits, tinned fish, and junk such as chocolate slabs and franchise meat such as KFC or Nando's.

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### Consumption of indigenous and traditional food's theme

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What is (your understanding of) indigenous food and traditional foods? Difference?	They said indigenous food is food from a specific place, and traditional food is food passed from generation to generation in between cultures.
Which indigenous foods /traditionally/locally/available foods you know?	The local indigenous/traditional foods they knew were mopane worms, samosa, umgxambiso (tripe), briyani, inhloko, sweet potatoes, amadumbe, umdumbulu (cassava), mealie meal bread, samp mixed

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	with beans, amatabunga, isijingi, inkobe (boiled maize), isithwalaphishi amaranth with peanuts On August 1, 2010, this entry was published.
What do you dislike/like (preferences) about indigenous foods	What they dislike about indigenous foods is that they are not easily accessible, their smell has traces of soil, and umbhaqanga (maize meal mixed with beans) causes constipation and heartburn.
What will make you eat more indigenous/traditional foods?	The reasons that can make them consume indigenous foods were: moving to rural areas or environment, more accessibility, corporation of agriculture and consumer studies students to make it available in the school garden, background, more nutritious and most of them are vegetables. They are good for vegetarians. In addition, indigenous and traditional foods are also good substitutes of staple foods such as 'ujeqe' and as a preference for Sabbath day for the respondents that attend Nazareth Baptist Church (Shembe).
What do you think about including some of these in the school menu?	Grade 11 learners said that they don't want to see some of the indigenous/traditional foods on the school menu, but grade 10 and 12 learners would like to see indigenous foods on the school menu.

#### *4.3.2.1 Theme 1: tuckshop*

Both students, regardless of age, buy food products from the school tuck shop. On weekdays, the tuckshop is usually available during the lunch break from 11:15 a.m. to 12 p.m. and sometimes in the evenings before 5:00 p.m. They usually buy snacks like vetkoeks, hotdogs, and ice cream from some of the grade 10 students. The grade 11 students reported that they usually buy cold drinks and homemade potato pies. The students in grade 12 referred to vegetables, polony, cheese, and fried chips. They listed bananas, burgers, cookies, salads, 100% fruit juice, still water, daily pies, and bread as things they would like to see in the tuckshop. They reported spending an average of more than R10.00 a day on unhealthy foods such as snacks and ice blocks.

The findings of the focus group corroborate the (Steyn et al., 2015) analysis that reported South African schools have tuck shops where food with low micronutrient content and high energy and fat content is offered to students, as found in the current report. Additionally, (Prasad, 2013) discovered that inexpensive foods with a high caloric content were often used in tuck shops at institutions of higher education. It is recognised that the excessive intake of sugary snacks advertised to children is a substantial contributor to childhood obesity, which persists throughout adolescence and adulthood.

#### *4.3.2.2 Theme 2: School menu*

The learners reported that they typically served beef, chicken, wors, maltabella porridge, and jungle oats at school, while vegetarians received soya mince, amaranth (from the school garden), cabbage, baked beans, amasi, vegetarian salsa, and hard-boiled eggs. They preferred fried chicken, fruits, amasi, and braai on the school menu throughout the year. They suggested that one aspect of the school menu they disliked was the fact that fruits were served only twice a week, on Wednesdays and Fridays.

Grade 12 students go to class early in the morning without having eaten breakfast, and they are suspended for eating in class. The current study's findings corroborate those of South African authors who reported on breakfast behaviour among adolescents caused by reduced morning time, which caused them to frequently miss breakfast (Kruger et al., 2002; Temple et al., 2006). Learners in grades 10, 11, and 12 were served food with castor oil in it without their permission.

For example, when they consumed beef or chicken, they had diarrhoea (characterised by loose, watery stools or a frequent need to have a bowel movement) twice a month, but vegetarians were unaffected. Similar incidents happened when college students consumed dining hall

meals that had been spiked with laxatives to ease digestion (Anderson, 2016). Additionally, they claimed that their academic success was harmed as a result of their occasional absences. They are unaware of the amount of castor oil they drank.

Occasionally, they discover worms in porridge that has passed its expiration date, as well as traces of plastic in beef curry. The vegetarians claimed that they sometimes eat cabbage between Monday and Thursday since they are not fed a variety of foods. Additionally, they reported that they dislike eating a whole meal for lunch while they still have class; this results in fatigue and drowsiness in class. The other learners reported that they ingest meat on a nearly daily basis.

This point is also confirmed by Table 4.3, which shows that more than 80% of grade 11 and 12 students consumed meat in the preceding 24 hours, while only 69% of grade 10 students did. A similar pattern was seen in the (Cripps & Thiagarajah, 2018) survey, which found that teenagers ate a lot of meat. When asked why they ate meat four or more times a week, they said it was easy, went well with their meals, and tasted good.

They claimed that they wanted to see a decline in the amount of meat served, such as wurs, beef, chicken, and burger patties. addition of fish, beans, and vegetables; enhancement of vegetarian menus; addition of amaranth; and expansion of kitchen hours after one of the learners said, "I normally knock on other domes asking for food due to hunger." They eat supper at 17h00 and then must study and return during the late hours, which meant that the majority of them were not eating the required meal sizes. "Everything begins in the kitchen," they said, adding that they would like to see kitchen workers adhere to proper hygiene practises.

#### *4.3.2. 3 Theme 3: Food eaten at home and brought to school from home*

The respondents who normally bring franchise meat as a sign that they are home, such as KFC or Nando's, South Africa is described as a country with a "high meat intake" and a "strong eat-out culture," both of which are driving factors for fast-food companies. Purchasing prepared foods, especially from well-known brand names, has become a status symbol. "For instance, a South African user can visit a KFC once a month as a treat" (Holmes, 2016). The distinction between school meals and home food is that they get to consume a wider range of foods; they do not have to eat the same thing every day. They do not get adequate food at school due to the insufficient serving sizes served. The learners claimed that they eat more nutritious, perfectly cooked, and delicious food at home than they do at school.

They claimed that they dislike eating meat at home because excessive meat intake at school teaches students to despise meat. Additionally, vegetarians suggest that excessive cabbage intake at school makes us despise cabbage. The learners described the foods they enjoy eating at home as macaroni and cheese, mince, pasta, fresh milk, muesli, liver, yoghurt or custard, mixed vegetables, fruit, 100% fruit juice, and biscuits due to their ease of cooking and ability to feed themselves. All respondents reported that they carry food from home to their schools after weekends or holidays. Their parents usually spend between R1500 and R2000 on food for them to take to school during the holidays.

#### *4.3.2.4 Theme 4: Consumption of indigenous and traditional foods.*

The questions are, "How do you define indigenous and traditional foods? "What is the distinction?" They said that indigenous food is food from a specific location, such as mopane worms, which are commonly eaten in the Limpopo province, while traditional food is food passed down through generations or has a history, such as briyani in Indian culture. Mopane worms, samosa, umgxambiso (tripe), briyani, inhloko, sweet potatoes, amadumbe, umdumbulu (cassava), mealie meal bread, samp mixed with beans, amatabunga, isijingi, inkobe (boiled maize), isithwalaphishi, amaranth with peanuts were among the indigenous/traditional foods they were familiar with.

They didn't consume most of the foods mentioned above. What they dislike about indigenous foods is that they are not readily available, have a strong odor, contain traces of mud, and that umbhaqanga (maize meal combined with beans) can cause constipation and heartburn. According to Sedibe (2016), teenagers avoid indigenous foods because they see them as a sign of poverty. (Dlamini, 2015) also discovered that adolescents who live in urban suburbs in the Tshwane Metropolitan area dislike indigenous foods; others claim that they are unfamiliar with indigenous foods and avoid them due to their preparation time and low status.

The reasons for eating conventional foods are that they are nutritious, have beneficial sensory properties, and show cultural identity. The reasons that can make them consume indigenous foods were moving to rural areas or the environment because indigenous foods are easily accessible and to corporates in the school's National School Nutrition Programme by planting indigenous food in the school garden as well as doing practical consumer studies students using indigenous foods.

Another reason that can make learners consume indigenous foods is the matter of who prepared them at home as well as at school. The family background does make them consider eating indigenous foods. For instance, indigenous and traditional foods are also good substitutes for staple foods such as ‘ujeqe’ and as a preference for Sabbath day for the respondents that attend Nazareth Baptist Church (Shembe). Although grade 11 students expressed a desire for certain indigenous/traditional foods to be included on the school menu, grade 10 and 12 students expressed a desire for indigenous foods to be included on the school menu. According to a report undertaken by Claasen et al. (2016), South Africa has a low consumption of traditional meals and indigenous foods across ethnic groups, which has a negative effect on existing food and nutrition recommendations and programmes.

#### 4.4. ANTHROPOMETRIC MEASUREMENTS OF LEARNERS

There were 202 female adolescents in all. They were both weighed and counted, and the BMI was determined based on their height and weight measurements (weight [kg] divided by height [m] squared). The data is classified using the WHO’s child and adolescent growth reference chart (5-19 years). BMI-for-age was used as the anthropometric predictor. The data collected was used to classify adolescents as underweight, medium weight, overweight, or obese.

In Table 4.5 BMI classification for all three grades is illustrated

**Table 4.5: BMI classification of all learners**

<b>Grades</b>	<b>Normal</b>	<b>%</b>	<b>Overweight</b>	<b>%</b>	<b>Obese</b>	<b>%</b>
10 (n=57)	20	35	23	40	14	25
11 (n=52)	17	33	27	52	8	15
12 (n=93)	19	20	56	60	18	19
<b>Total</b>	<b>56</b>	<b>46</b>	<b>106</b>	<b>52</b>	<b>40</b>	<b>31</b>

\*\*N=Total number of respondents; n=number of respondents per grade

The learners’ BMI was calculated using the WHO growth chart for children and adolescents (5–19 years) (WHO, 2011). It is unmistakably true that obesity (BMI) increases with age or grade level. The rise in obesity can be due to an increased intake of processed carbs, sugar, and fat. It can be hypothesised that high BMIs are caused by the ingestion of energy-rich foods such as powdered milk (or coffee cream) or foods high in fat and sugar (e.g. sweetened beverages and

confectionaries). Sweets and sugars were consumed at an average of 85% across all grades, as shown in table 4.3 Several anthropometric measurements can be used to quantify adiposity-related risk, including the body mass index (BMI; weight in kilogrammes divided by the square of an individual's height in metres), waist hip circumference (HC), circumference (WC), waist-to-height ratio (WHtR), and waist-to-hip ratio (WHR; ratio of WC to HC) (Sebo et al., 2017).

The findings show that there were no wasted or severely wasted lean people, but there were more overweight people, and obesity increased with age. This trend was also found in American adolescents, where the number of overweight and obese individuals rose as they grew older (Ludwig, 2018). Kimani-Murage et al., (2010) and Rossouw et al., (2012) also discovered that an increase in age, ethnicity, and population group is associated with an increase in overweight and obesity. This tendency was also observed among teenagers in Canada (Hanley et al., 2000). Standard (healthy) weight was less than 20% in all grades, while overweight leaners were more than 40% in all grades.

The high consumption of snacks and sweets (Table 4.4) is consistent with the THUSA BANA research in the Northwest province, which assessed obesity and overweight among teenagers. According to the author, excessive snack food consumption and high-sugar soft drinks may increase energy intake and replace healthy foods in the diet, contributing to a higher BMI. (Almoraie et al., 2021; Kruger et al., 2006). Children who are exposed to acute experimental food promotion eat more. Advertising for high-sugar food and drinks, in particular, encourages consumption of these foods. It is important to discuss oral health, obesity, and overall nutritional health in the discussion of the harmful health impacts of food advertising on children (Kearney et al., 2021). This basically implies the need for intervention, such as incorporating nutrition-related information into the school curriculum for both children and educators, to ensure that learners understand that harmful lifestyle diseases are correlated with non-communicable diseases (NCDs), are often incurable, and may often result in death (Branca et al., 2019; Letlape et al., 2010). In the current survey, 52% of young females are overweight. Similar findings were found in Kruger et al. (2005), who reported a dominant proportion of obese black respondents at 7% and overweight black respondents at 8% across all nine provinces in South Africa.



#### 4.5. PHYSICAL ACTIVITY OF LEARNERS

Physical activity categories were developed based on their answers to questions about how often and for how long learners engage in exercise. Athletics, according to the report, refers to an organised activity code at school, while jogging refers to what they do on their own.

In Table 4.6 the frequency of all grades per week is indicated.

**Table 4.6: Frequency of physical activities for all grades per week**

Activity	Frequency	Grade 10		Grade 11		Grade12		Total	
		(n=57)	%	(n=52)	%	(n=93)	%	(N=202)	%
<b>Soccer</b>	Every day	3	5	1	2	-	-	4	2
	Less than 1 time/week	1	2	-	-	1	1	2	1
	1-2 times/week	3	5	4	8	2	2	9	4
	3-4 times/week	2	4	2	4	-	-	4	2
	5-6 time/week	1	2	1	2	2	2	4	2
<b>Netball</b>	Every day	5	9	3	6	-	-	8	4
	Less than 1 time/week	4	7	1	2	1	1	6	3
	1-2 times/week	15	26	11	21	5	5	31	15
	3-4 times/week	2	4	2	4	3	3	7	3
	5-6 time/week	-	-	-	-	1	1	1	0.49
<b>Athletics</b>	Every day	2	4	1	2	2	2	6	3
	Less than 1 time/week	3	5	-	-	1	1	4	2
	1-2 times/week	1	2	1	2	1	1	3	1
	3-4 times/week	-	-	1	2	1	1	2	1
	5-6 time/week	1	2	-	-	-	-	1	0.49
<b>Volleyball</b>	Every day	-	-	-	-	1	1	1	0.49
	Less than 1 time/week	2	4	-	-	1	1	3	1
	1-2 times/week	-	-	-	-	1	1	1	0.49
	3-4 times/week	1	2	2	4	1	1	6	3
	5-6 time/week	-	-	3	6	1	1	4	2
<b>Dance</b>	Every day	2	4	2	4	-	-	4	2
	Less than 1 time/week	2	4	2	4	-	-	4	2
	1-2 times/week	3	5	3	6	-	-	6	3
	3-4 times/week	1	2	1	2	2	2	4	2
	5-6 time/week	-	-	-	-	-	-	-	-
<b>Jogging</b>	Every day	5	9	8	15	-	-	13	6
	1 time/week	3	5	-	-	3	3	6	3
	1-2 times/week	7	12	2	4	2	2	11	5
	3-4 times/week	1	2	2	4	-	-	3	1
	5-6 time/week	2	4	1	2	-	-	3	1

\*\*N=Total number of repondents; n=number of respondents per grade

Due to the small number of participants per grade, physical activities such as table tennis, tennis, cricket, gymnastics, skipping, football, volleyball, javelin, swimming high jump, and hockey had the lowest number of participants. Participants were less than two in each of the three sampled classes. Eleven respondents reported practising karate between four and five days a week. As seen in Table 4.7, the physical activity with the highest attendance rate was netball at 26% for grade 10, 21% for grade 11, and 5% for grade 12 at one-or two-times a week. Volleyball was the least athletic sport and had the lowest percentage of attendance in all grades. Learners in grades 10, 11, and 12 played soccer, netball, baseball, javelin, shotput, athletics, diving, volleyball, high jump, karate, zumba/dance, jogging, table tennis, tennis, cricket, gymnastics, skipping, football, and basketball.

The most athletic exercise that all the learners engaged in was "netball," which is why the school has only female learners. Volleyball, Zumba/dance, and karate had the fewest members in all grades. The respondents were questioned about their physical sedentariness. Their replies included the following: "They lack the time to indulge in athletics, are uninterested in sports, are sluggish, anxious, or suffer from medical problems such as syncope, asthma, or injuries." One of the learners claimed that exercise is critical and that it is an excellent way to alleviate stress and anxiety associated with grade 12 exam stress, "implying that physical activity can also be an effective way to relieve stress and anxiety." The average number of physical activities that learners did was 1 per week. This means that most learners don't do more than one physical activity a week. There are findings in South Africa that suggest inadequate physical activity levels and inactive habits, especially among young people. A research was performed in Southern Africa on 767 teenagers to determine the time interval or amount of time spent on physical activity on a regular basis (McVeigh & Meiring, 2014). The findings indicated that there is a sudden decline in physical activity levels, which is followed by an increase in age and physical sedentariness (McVeigh & Meiring, 2014). In comparison to this study, the overall number of physical activities undertaken by learners was 1-2, implying that the majority of learners participate in no more than one physical activity per week.

The average amount of physical activity was 0.9 (90 minutes), implying that they usually spent 1 hour and 30 minutes a week exercising. The study's findings contradict the American Centers for Disease Control and Prevention's (CDC) 2014 recommendation that young people (6–17 years) engage in at least one hour of moderate-to-vigorous physical activity every day. According to the Australian Government Department of Health (2014), teenagers should spend

no more than two hours per day on sedentary tasks, which includes time spent on a device, such as watching television or using a smartphone, mobile phone, or computer. The success rate was 1-2, indicating that they engage in physical activity on a relatively daily basis and that they usually spend (180 minutes) 3 hours. They are seated or sedentary, which means they do not meet the physical sedentariness criteria outlined above.

**Table 4.7: Duration of physical activities for all grades per week**

Activity	Duration	Grade 10		Grade 11		Grade 12		Total	
		(n=57)	%	(n=52)	%	(n=93)	%	(N=202)	%
<b>Soccer</b>	less than 30 minutes	1	2	1	2	1	1	3	1
	30 minutes -59 minutes	5	9	1	2	1	1	8	4
	60 minutes	3	5	3	6	-	-	6	3
	90 minutes	1	2	2	4	-	-	3	1
	120 minutes	-	-	1	2	1	1	2	1
<b>Netball</b>	less than 30 minutes	1	2	-	-	1	1	2	1
	30 minutes -59 minutes	10	17	4	8	4	4	18	9
	60 minutes	7	12	5	10	2	2	14	7
	90 minutes	3	5	1	2	2	2	6	3
	120 minutes	4	7	-	-	1	1	5	2
<b>Athletics</b>	less than 30 minutes	-	-	-	-	1	1	1	0.49
	30 minutes -59 minutes	4	7	3	6	1	1	8	4
	60 minutes	1	2	1	2	4	4	6	3
	90 minutes	-	-	-	-	-	-	-	-
	120 minutes	-	-	1	2	-	-	1	0.49
<b>Volleyball</b>	less than 30 minutes	8	14	1	2	-	-	9	4
	30 minutes -59 minutes	6	11	2	4	4	4	12	6
	60 minutes	2	4	3	6	3	3	9	4
	90 minutes	1	2	-	-	-	-	1	0.49
	120 minutes	2	4	3	6	4	4	9	4
<b>Dance</b>	less than 30 minutes	4	7	1	2	-	-	5	2
	30 minutes -59 minutes	2	4	1	1	-	-	3	1
	60 minutes	1	2	-	-	-	-	1	0.49
	90 minutes	1	2	2	4	1	1	4	2
	120 minutes	-	-	-	-	-	-	-	-
<b>Jogging</b>	less than 30 minutes	7	12	4	8	1	1	12	6
	30 minutes -59 minutes	9	16	10	19	-	-	19	9
	60 minutes	3	5	-	-	-	-	3	1
	90 minutes	2	4	1	2	-	-	3	1
	120 minutes	-	-	-	-	-	-	-	-

\*\*N=Total number of repondents; n=number of respondents per grade

In Table 4.7 the duration of all physical activities of all respondents per week is outlined. It is not exciting for all learners to participate in all physical exercises. The physical exercise in which most learners were involved was netball (17% in grade 10 for 30-59 minutes per week, 10% in grade 11 for 90 minutes per week, and less than 5% in grade 12 for less than 5 minutes per week). It might be that at grade 12, learners are more focused on their final exams and do not allocate any time for exercise due to too much schoolwork load. Volleyball was the second athletic activity with tangible participation: 14% in grade 10 for less than 30 minutes a week, 11% in grade 10 for 30-59 minutes per week, and less than 10% in grade 11 and less than 5% in grade 12. For jogging, grade 10 had a 16% participation rate, grade 11 had a 19% participation rate, and grade 12 had no participation rate in the average range of 30–59 minutes per week.

Grade 12 has the lowest participation of all physical events, while Grade 10 has the highest participation. According to table 4.5, grade 12 has the highest rate of overweight learners at 60%, while grade 10 has a rate of 40%. They are aware that physical exercise is essential for maintaining health and strength, as shown in Table 4.2, but they do not practise what they know. Consumption of fats and oils is decreasing for grade 12 and 11 learners relative to the rate for grade 10 learners. This could mean that they are attempting to lower their BMI. The most common physical activities among learners were netball and jogging. Many 11<sup>th</sup> and 12<sup>th</sup> graders said they work out once or twice a week for 30–59 minutes.

According to the findings of this report, girls do not seem to engage in enough physical exercise and their activities are debatable. To successfully implement healthy lifestyle campaigns in schools, effective and operational policies must be implemented. If these techniques are to be implemented in a school environment, schools must hold contrivance open days to educate students about the value of physical activity. Relevant professionals, such as the department of sports and recreation, would deliver a talk on well-being topics to educate the learners about nutrition and physical activity.

Reduced levels of physical activity and resulting increased inactivity seem to have contributed to the development of a common standard of life for many South African children (Gomwe et al., 2022). The study found that a higher proportion of children are sedentary, with respondents citing (lack of interest/no sport they enjoy, loss of time, laziness, asthmatic, injury, anxiety, boredom; and medical conditions) as factors. A follow-up SA National Risk Behaviour Review

(Baard & Mckersie, 2015; Reddy et al., 2009) found that 42% of children did not meet the required level of regular physical activity.

#### 4.6. THE RELATIONSHIP BETWEEN NUTRITION KNOWLEDGE AND DIETARY INTAKE

The objective was to determine whether learners put what they know into practise. Should their dietary awareness correspond to the foods they eat on a regular basis?

**Table 4.8: Correlation of variables**

Correlations								
	Age 2019	Grade 2019	BMI 2019	Number of physical activities	Total number of frequencies	Duration	Level of Performance	Time spent sitting
Age	1							
Grade	.321**	1						
BMI	-0.023	0.048	1					
Number of physical activities	0.019	0.001	-0.037	1				
Total number of frequencies	0.038	0.008	-0.016	.897**	1			
Duration	0.042	-0.093	0.000	.822**	.794**	1		
Level of Performance	0.119	0.000	-0.023	-0.030	-0.027	-0.043	1	
Time spent sitting	0.014	-0.041	-0.014	-0.086	-0.101	-0.125	.785**	1

\*\* . Correlation is significant at the 0.01 level (2-tailed).

Correlation is used to determine the course and length of partnerships. Pate et al. (2002) showed that the physiological benefits of physical activity are closely related to the frequency, strength, and length of the physical activity. The present research discovered a strong and statistically important association between the number of physical activities and their frequency levels ( $r = 0.897$ ). In the study of Christoffersen et al. (2015), it was also discovered that there were statistically significant linear trends in both intensity and frequency ( $p < 0.001$ ). The higher the physical activity frequency, the higher the intensity. There is also a strong association between the frequency and length of physical activity, which is statistically significant ( $r = 0.822$ ). School-age adolescents are required to engage in a variety of physical activities for 60 minutes per day or more of moderate-to-vigorous physical activity for appropriate physical development (Strong et al., 2005). Additionally, there is ample evidence in Table 4.8 that age and grade have a substantial relationship. There is an important relationship between frequency level and length ( $r = 0.794$ ). Correlation coefficients of less than 0.9 showed that there was no

evidence of multicollinearity between independent variables. Variation between food categories was clarified by 32.6% when used as an independent variable.

**Table 4.9: Coefficients of variables**

Coefficients <sup>a</sup>										
Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	95.0% Confidence Interval for B		Collinearity Statistics	
		B	Std. Error	Beta			Lower Bound	Upper Bound	Tolerance	VIF
1	(Constant)	0.075	0.834		0.090	0.928	-1.572	1.723		
	age	0.135	0.039	0.236	3.475	0.001	0.058	0.211	0.900	1.111
	grade	-0.051	0.057	-0.061	-0.889	0.375	-0.164	0.062	0.888	1.126
	BMI	-0.008	0.010	-0.049	-0.750	0.454	-0.027	0.012	0.971	1.030
	Number of physical activities	-0.081	0.075	-0.173	-1.080	0.282	-0.229	0.067	0.162	6.190
	Total number of frequencies	0.036	0.086	0.062	0.423	0.673	-0.134	0.206	0.192	5.222
	Duration	0.055	0.083	0.076	0.665	0.507	-0.109	0.220	0.317	3.155
	Level of Performance	0.177	0.065	0.287	2.721	0.007	0.049	0.306	0.373	2.684
	Time spent sitting	0.092	0.042	0.232	2.208	0.029	0.010	0.174	0.374	2.671

a. Dependent Variable: Dietary groups

With a p-value less than 0.001, the regression model is statistically important. Girls' age was an important factor affecting food group intake ( $p = 0.001$ ), or age was strongly and substantially associated with food group intake. This means that as one's age increases, one's intake of more food groups increases as well. According to Rossouw et al. (2012), an increase in age, ethnicity, and demographic group correlates with an increase in overweight and obesity. The food groups were found to have a major impact on performance, age, and time spent sitting. Increased BMI results in decreased intake of some food classes, which means that learners with a higher BMI consume fewer calories.

This assertion corroborates Ritchie's (2012) conclusions. It was discovered that black girls consumed fewer meals and snacks, which resulted in larger increases in BMI and waist circumference. The more time they spend sedentary (sitting), the more food groups they consume, which was also discovered in a study conducted in the eThekweni region, where the

majority of children spend an average of four hours every day and six to eight hours on weekends (Puckree et al., 2011). The current research discovered that increasing physical activity results in a decline in sedentary behaviour. These results were also discovered in Wu et al.'s 2017 research.

According to Reddy et al. (2010), reduced physical activity levels and the resulting increase in physical inactivity seem to have become a common way of life for many South African adolescents. As a result, a follow-up SA National Risk Behaviour study found that 42% of children spent more time engaging in physical inactivity (Reddy et al., 2010). Norris & McVeigh's (2012) report showed that only 27% of a total of 30 children meet the regular structured standards on a smaller scale.

**Table 4.10: The nutrition knowledge and dietary intake of all learners**

Grade		Pearson Correlation	
10	Nutrition Knowledge	Pearson Correlation	1
		Sig. (2-tailed)	
		N	55
	Dietary Intake	Pearson Correlation	-.293*
		Sig. (2-tailed)	.032
		N	54
11	Nutrition Knowledge	Pearson Correlation	1
		Sig. (2-tailed)	
		N	50
	Dietary Intake	Pearson Correlation	-.139
		Sig. (2-tailed)	.341
		N	49
12	Nutrition Knowledge	Pearson Correlation	1
		Sig. (2-tailed)	
		N	91
	Dietary Intake	Pearson Correlation	-.036
		Sig. (2-tailed)	.738
		N	87

\*\* N=Total number of respondents

The study's findings indicate that grade 10 students are more positively associated with nutrition awareness and dietary consumption. Additionally, (Nawaz et al., 2016; Spronk et al., 2014), they found that the relationship between these two variables is favorable. (Choi et al., 2008) also found that children in lower grades often exhibited a favourable outlook toward diet



and food preferences. On the other hand, Asakura et al. (2017) discovered that food consumption was adversely linked to diet awareness in lower-grade girls. According to the study's findings, there was no substantial association between nutrition awareness and dietary consumption in grades 11 and 12. Similar findings were seen in Yahia et al. (2016) research, where diet awareness was found to be adversely associated with food intake.

This indicates that, despite any knowledge of the detrimental effects of an unhealthy diet on one's wellbeing, the learners in the study continued to consume unhealthy foods. This finding is consistent with other research that discovered inadequate dietary habits even in children with a high level of nutrition awareness (Abdollahi et al., 2008). Other research has shown that nutritional intelligence is a factor affecting consumer food choices (Choi et al., 2008; Phometsi et al., 2006; Welch et al., 2005). A lack of awareness about nutrition has been proposed as a contributing factor to unhealthy eating patterns (Kostanjevec et al., 2013). However, experience alone may not be sufficient to ensure good dietary practice.

Early in life, a change in optimistic thinking and attitudes toward healthier eating contributes enormously (Sherman & Muehlhoff, 2007). Numerous factors that influence dietary intake, such as cooking methods, palate, and cultural and religious beliefs about food preparation, should also be included in future research, as these factors can affect how effectively students apply nutritional knowledge to their daily eating habits. Convenience and the price of food are known to affect how well learners can use what they know about nutrition in their everyday eating habits.

Nutrition education programmes are designed to increase awareness and thereby have a beneficial effect on dietary intake (Heaney et al., 2011; Lee & Kim, 2005; Morgan et al., 2010; Powers et al., 2005). There is a significant shortage of well-designed, contemporary research that fails to investigate the role of nutrition awareness in these and other factors that may affect dietary intake. The lack of validated metrics for measuring nutrition knowledge is a significant constraint, but also a challenge to overcome, as instruments must expose contemporary nutrition knowledge and guiding principles that are constantly evolving. They must also be sensitive to different cultures, which can be hard to do when evaluating groups with different customs (Spronk et al., 2014).

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## **CHAPTER 5**

### **CONCLUSION AND RECOMMENDATIONS**

This chapter summarises the study's findings, conclusions, and guidelines, as well as the study's intent and further implications, all of which are focused on the interpretation of evidence that aligns with the study's objectives.

#### **5.1. CONCLUSION**

The aim of this research was to determine the impact of high school students' nutritional information on their physical activity and dietary consumption as well as to assess their anthropometric measurements. The main objectives of the study were to firstly, to evaluate the nutritional knowledge of high school learners.

According to the study's findings, diet awareness scores were very high or above average at all grade levels. Grade 11 had the highest percentage of outstanding diet awareness ratings and no very poor responses were detected. It can be assumed that grade 11 students know more about nutrition, are less likely to be overweight, and eat less fat and oil than students in other grades.

Secondly, to determine the dietary intake of high school learners

Carbohydrate-rich foods such as cereals were consumed at a rate of 98% across all grades, while corn, maize meal, and pasta were consumed at the highest rate across all grades. Fruit and vegetable intake was extremely poor in all classes. Sugars and desserts such as chocolates and biscuits were consumed at an 85% rate across all classes. Consumption of fish and shrimp was very poor in this report.

Thirdly, to assess the anthropometric measurements of high school learners.

The study discovered that overweight people are extremely common, and their popularity grows with age.

Fourthly, to determine how physically active are school learners

Physical activity involvement was extremely poor in terms of frequency and length for all tasks, and participation declined with increasing grade. Nonetheless, this demonstrates that teens will benefit significantly from dietary action.

Lastly, to assess the relationship between nutritional knowledge and dietary intake of high school learners.

The Grade 11 learners appeared to have more nutrition knowledge as compared to grade 10 and 12. Obesity is common in all grades .

Carbohydrate-rich foods such as cereals were consumed at a rate of 98% across all grades, while corn, maize meal, and pasta were consumed at the highest rate across all grades. Fruit and vegetable intake was extremely poor in all classes. Sugars and desserts such as chocolates and biscuits were consumed at an 85% rate across all classes. Consumption of fish and shrimp was very poor in this report..

## 5.2. RECOMMENDATIONS

For Objective 1 and 2 it is recommended that government agencies like basic education, sports, and recreation work together to create national strategies for students that help them learn early on how important physical activity, diet, and nutrition are.

For objective 2 and 3 the researcher recommends that teachers and caregivers must foster an atmosphere conducive to physical activity by teenagers in order to reduce the incidence of overweight and obesity. Healthy ingredients, such as indigenous foods, must be included on school menus to increase teenagers' nutritional versatility and to provide vegetarians with a choice of foods to choose from, rather than eat the same thing twice.

For objective 4 and 5 the researcher recommend that physical education and nutrition must be taken seriously in the classroom and at home. Owners of school tuck shops, food handlers at schools, guardians, and street sellers should be informed on the value of a balanced diet for children, marketing snacks from indigenous and healthy foods and how to avoid foods rich in sugar and fat whilst maximising foods with more nutritional alternatives. Both educators and children should receive monthly training on the benefits of fitness, diet, and exercise for students.

To lessen frequent issues with feeding, the NSNP policy, which is in place in the majority of South African schools, should be regularly watched. Known feeding initiatives are more concerned with profit than those focused on reducing poverty and improving child well-being. In addition to creating tenders, the government should develop an effective monitoring plan to guarantee that the food is prepared and served in accordance with established criteria.

## 5.3. IMPLICATIONS FOR FURTHER RESEARCH

The results of this study indicate that further research is needed as follows:



- The effect of nutrition education on nutrition knowledge and dietary intake to improve dietary diversity of rural and urban high schools in Empangeni.
- The impact of food brought to school from home by learners on dietary intake.
- The socio economic status of caregivers, dietary intake and its impact on learner's consumption patterns.
- Only females were interviewed, a similar study must be conducted in high schools with males.
- The impact of indigenous foods on the school menu in high schools at Empangeni.
- The nutritional status and nutritional knowledge of Life Orientation educators in Empangeni
- The physical activity and nutritional status of care givers and facilitators of learners attending high schools in Empangeni.

## APPENDICES

### APPENDIX 1: LEARNER CONSENT FORM

Date...../..... /20.....

Good morning/afternoon learner/s,

I am Miss Noluthando Gumede (218021543) from the University of KwaZulu-Natal, Pietermaritzburg campus. I am reading for a Master of Agriculture in Food Security. I am working on a project concerned with nutrition knowledge on dietary intake and anthropometric measurements in which you are invited to participate. . The main objective is to understand the effect of high-school learner's nutritional knowledge on dietary intake physical activity and to assess their anthropometric measurements. Nutrition education is the vital method of improving nutritional knowledge, nutritional attitudes and practises for school children and the whole community at large. The project is in its initial phase. I am conducting a survey among 160 participants to know more about their knowledge, dietary intake and anthropometry in terms of nutrition and physical activity. The duration of your participation if you choose to enrol and remain in the study is expected to take about 2 hours.

We hope that the study will create the following benefit such as **Nutrition education** is an essential component in improving dietary habits and **food** choices, in order to reverse the under **nutrition** and improve the **nutritional** diagnosis. Poor dietary habits and lack of physical activity can be the main reason for poor **nutritional** status among learners.

This study has been ethically reviewed and approved by the UKZN Biomedical research Ethics Committee (approval number\_\_\_\_\_).

In the event of any problems or concerns/questions you may contact the researcher at or the UKZN Biomedical Research Ethics Committee, contact details as follows:

#### AFRICAN CENTRE FOR FOOD SECURITY

University of KwaZulu-Natal  
School of Agriculture, Earth and Environmental Sciences  
Rabie Saunders Building  
Tel: 033 260 5144 -. Cell: 060 367 6480  
Email: [tandoorgumede@gmail.com](mailto:tandoorgumede@gmail.com)

## BIOMEDICAL RESEARCH ETHICS ADMINISTRATION

Govan Mbeki Building

Private Bag X 54001

Durban

4000

KwaZulu-Natal, SOUTH AFRICA

Tel: 27 31 2604769 - Fax: 27 31 2604609

Email: [BREC@ukzn.ac.za](mailto:BREC@ukzn.ac.za)

Your participation in this research is voluntary and you may withdraw participation at any point, in the event you refuse/withdraw from participating, you will not incur penalty.

**The Confidentiality** and protection of personal information. **Confidentiality** means keeping a client's information between the researcher and the client, and not telling others including co-workers, friends, and family. The researcher will **maintain confidentiality** of participant's information in a locked and secured environment. Members of the study team will be trained in these issues and understand not to discuss participants outside of the research context.

I Name: \_\_\_\_\_ have been informed about the study entitled *Understanding the effects of high-school learner's nutritional knowledge on dietary intake activity and assess their anthropometric measurements* by Ms Noluthando Gumede.

I understand the purpose and procedures of the study.

I have been given an opportunity to answer questions about the study and have had answers to my satisfaction.

I declare that my participation in this study is voluntary and that I may withdraw at any time.

If I have any further questions/concerns or queries related to the study I understand that I may contact the researcher at Mobile No.: 060 367 6480, Email: [tandoorgumede@gmail.com](mailto:tandoorgumede@gmail.com)

If I have any questions or concerns about my rights as a study participant, or if I am concerned about an aspect of the study or the researchers then I may contact:

## **BIOMEDICAL RESEARCH ETHICS ADMINISTRATION**

Research Office, Westville Campus

Govan Mbeki Building

Private Bag X 54001

Durban 4000

KwaZulu-Natal, SOUTH AFRICA

Tel: 27 31 2604769 - Fax: 27 31 2604609

Email: [BREC@ukzn.ac.za](mailto:BREC@ukzn.ac.za)

Signature of the learner: \_\_\_\_\_ Date: \_\_\_\_\_

## APPENDIX 2: NUTRITION KNOWLEDGE QUESTIONNAIRE.

### Nutrition knowledge, physical activity and nutritional status.

The following sections contains two types of questions. Multiple choice and true/ false.

For the multiple choice, choose **ONE** that you think is the best, and make a cross on the number next to the answer.

For the true/false questions, make a cross on the **TRUE** or the **FALSE**.

Please answer all the questions before moving on to the next one.

A reminder that your answers will not be known by anyone other than the researchers

Name of interviewee	
---------------------	--

Date	
------	--

### BIOGRAPHICAL INFORMATION

Name of the learner	
---------------------	--

Age	
-----	--

Grade:	
--------	--

### NUTRITION KNOWLEDGE

1. This food group is our body's best source of energy?

1	Meat group
2	Fats, oils and sweets
3	Breads and cereals
4	Milk and cheese

2. The base of the Food Pyramid includes foods we need to eat the most.

1	True	
2	False	

3. The milk, cheese & yogurt group are important for?

1	Strong bones
2	Teeth
3	Muscles
4	All of the above

4. Calcium is important only for adult women?

1	True	
2	False	

5. Which of the following vitamins play a key role in eyesight including night vision and color recognition?

1	Vitamin A
2	Vitamin B
3	Vitamin K
4	All of the above

6. Carrots, butternuts, oranges are good sources of vitamin C?

1	True	
2	False	

7. Which mineral is needed in red blood cells and help your body move oxygen around?

1	Zinc
2	Iron
3	Calcium
4	Potassium

8. How much water do you need to drink each day?

1	2 glasses
2	5 glasses
3	8 glasses or more
4	None of the above

9. All boiled water is safe no matter where you get it from.

1	True	
2	False	

10. Which foods contain a lot of fibre?

1	Oats, apples, beans
2	Milk, yoghurt, cheese
3	Beef, chicken, mutton
4	Butter, margarine

11. Whole-grain foods are high in fiber and nutrients.

1	True	
2	False	

12. Which of the following breakfast menus contain little fat?

1	Whole-wheat toast with thinly spread margarine
2	Weet-Bix with 2% fat milk
3	Bacon and egg
4	1 and 2

13. Breakfast is the most important meal of the day.

1	True	
2	False	

14. A well-balanced diet consists of

1	Consists mostly of meat, with smaller amounts of starch, fruits, vegetables, and dairy products
2	Consists mostly of vegetables, and smaller amounts of meat and dairy products
3	Consists mostly of starches, vegetables and fruits, with smaller amounts of meat and dairy products
4	None of the above

15. It is impossible to get all the vitamins and minerals you need from food, you need to take a vitamin and mineral pill.

1	True	
2	False	

16. From which of this food contains protein

1	bread, samp, rice, porridge
2	Apples, bananas, spinach, carrots
3	Milk, yogurt, cheese
4	Chicken, fish, beans, eggs

17. Dry beans, peas, and lentils should be eaten often?

1	True	
2	False	

18. Which of the following statements is true?

1	We don't need to include any salt in our diet, our body naturally creates it.
2	We do need to include salt in our diet and most of us don't get enough.
3	We do need to include salt in our diet, but most of us get too much.
4	All of the above



19. Salt should be added to all foods except fruits?

1	True	
2	False	

20. Which of the following foods are the lowest in fat?

1	Corn flakes
2	Grilled lean steak and boiled carrots
3	Pizza and milkshake
4	Fried lamb

21. You can eat as much fat you want every day?

1	True	
2	False	

22. Which foods contain a lot of starch?

1	Bread, rice, maize meal, samp
2	Maize meal only
3	Fruits and vegetables
4	Fresh fish and chicken

23. Foods such as bread, rice or samp, should be the main part of most meals?

1	True	
2	False	

24. Spinach and lettuce are examples of?

1	Fruit Vegetables
2	Root vegetables.
3	Leafy vegetables.
4	Salad Vegetables.

25. Vegetables are healthy and should be added to all foods.

1	True	
2	False	

26. How many portions of fruits should be consumed in a day?

1	$\geq 2$ portions per day
2	1 portion per day
3	1-3 portions a week
4	<1 portion a week or none

27. Fruits are healthy can be consumed every day?

1	True		
2	False		

28. Physical activity is essential because

1	Keeps you healthy and strong
2	To keep you busy
3	Do not take a lot of time
4	All of the above

29. If you are eating a healthy diet there is no need for you to be physically active.

1	True	
2	False	

30. The key to a healthy way of eating is to

1	Eat many different kinds of foods
2	Eat some foods more than other foods
3	Eat certain kinds of foods in moderate or small amounts
4	All of the above

31. Eating food that contains high amounts sugar can

1	Suppress the immune system
2	Increase weight gain
3	Give you energy
4	All of the above

32. Sugar and foods that contain sugar should be eaten in small amounts?

1	True	
2	False	

Thank you for participating in this study!

### APPENDIX 3: PHYSICAL ACTIVITY QUESTIONNAIRE

<b>Questionnaire nr</b>		<b>Date:</b>	
-------------------------	--	--------------	--

**Name of interviewee:** \_\_\_\_\_

**Name of learner:** \_\_\_\_\_

2.1 Are you doing any exercise/physical activity (eg walk, cleaning the yard, etc.) or organized sport (eg, netball, athletics, soccer, etc)? If yes go to Q 2.3

01	Yes		02	No	
----	-----	--	----	----	--

2.2 If no, why not?

.....

.....

2.3 If yes, what kind of sport or exercise activities do you do?

List all activities and sport (cover all activities, exercise, sport!)

.....

.....

.....

2.4 For each of the activities you listed above, please tell us how often you do the activity?

	Activity	Less than 1 time/week	1-2 times/week	3-4 times/week	5-6 times/week	Every day	More than 1 time/day
01							
02							
03							
04							
05							
06							
07							
08							

2.5 For how long at a time (duration) do you do each of these activities?

	Activity	Duration (eg 15 minutes, 30 minutes, etc)
01		
02		
03		
04		
05		
06		
07		
08		

2.6 Are you doing any of the following types of physical exercise?

01	Walking		03	Bone strengthening		05	Muscle strengthening	
02	Jogging		04	Stretching		06	Aerobics	

Other, specify.....

2.7 How would you describe your level of performance in these?

01	Low		02	Moderate		03	Vigorous	
----	-----	--	----	----------	--	----	----------	--

2.8 How much time on average do you spend sitting down studying per day?

01	30 minutes or less		02	More than 30 but less than 60 minutes		03	1 to 2 hours		04	More than 2 hours	
----	--------------------	--	----	---------------------------------------	--	----	--------------	--	----	-------------------	--

## APPENDIX 4: 24 HR RECALL

### Dietary intake of learners at (24-hour recall for the learners)

Questionnaire nr.		Date:	
-------------------	--	-------	--

Name of interviewee: \_\_\_\_\_

Name of learner: \_\_\_\_\_

**Please tell us what you had to eat and drink in the last 24 hours?** Provide as much detail as possible on everything you had to eat or drink (quantities, etc) in the last 24 hours, starting from yesterday afternoon after school. Include school meal!

<b>After school yesterday</b>
<b>In the evening yesterday</b>
<b>Before coming to school today</b>
<b>At school today</b>
<b>Snacks and beverages consumed between meals</b> (details are important as this is where the main differences will be between the learners)

## APPENDIX 5: FOCUS GROUP QUESTIONS

**The purpose of the focus group is to get a clear picture of your dietary intake and the food you eat.**

### **Theme 1: School tuck-shop**

1. How many of you buy at the school tuck shop?
2. How often do you buy at the tuck-shop? When is it open?
3. What kind do you buy at the tuck shop?
4. What kind of foods and beverages would you like to see there?

### **Theme 2: School menu**

5. What kinds of foods are you currently eating at the school (school menu)?
6. What is it that you like about the school menu?
7. What is it that you dislike about the school menu? Why?
8. What changes would you like to see in the school menu? Probe on how the food is prepared!

### **Theme 3: Food eaten at home and brought to school from home**

9. What do you eat at home during holidays?
10. What is the difference between the foods you eat school and the foods you eat at home?
11. What kinds of foods you don't like eating at home and why?
12. What food you like eating at home?
13. Who of you bring food from home after a weekend or a holiday?
14. What kinds of food do you bring from home?

### **Theme 4: Consumption of traditional or indigenous foods**

15. What is (your understanding of) indigenous food sand traditional foods? Difference?
16. Which indigenous foods /traditionally/locally/available foods you know?
17. Which of these you eat?
18. What do you dislike/like (preferences) about indigenous foods
19. What will make you eat more indigenous/traditional foods?
20. What do you think about including some of these in the school menu?

## APPENDIX 6: ANTHROPOMETRIC MEASUREMENTS SHEET

Questionnaire nr.

Anthropometric measurements of learners

Researcher: Ms N Gumede

Research topic: Nutrition knowledge, physical activity and nutritional status of learners

<b>Name of person taking the measurements:</b>	
<b>Date when measurements are taken:</b>	
<b>Name of Learner:</b>	
<b>Date of birth of learner:</b>	

### ANTHROPOMETRIC MEASUREMENTS

Name of measurement	Measurement 1	Measurement 2	Average
Height (cm)			
Weight (kg)			



## **APPENDIX 7: PARENT CONSENT FORM**

Title of Study: **Understanding the effect of high-school learner's nutritional knowledge on dietary intake physical activity and to assess their anthropometric measurements.**

### **Description of the research and your child's participation.**

Your child is invited to participate in a research study conducted by Noluthando Gumede. The purpose of this research is understand the effect of high-school learner's nutritional knowledge on dietary intake physical activity and to assess their anthropometric measurements.

Your child's participation will involve answering questionnaires, taking BMI measurements as part of the research.

The amount of time required for your child's participation will be about 2hrs.

### **Risks and discomforts**

There are no known risks or discomforts associated with this research.

### **Potential benefits**

We hope that the study will create the following benefit such as Nutrition education is an essential component in improving dietary habits and food choices, in order to reverse the under nutrition and improve the nutritional diagnosis. Poor dietary habits and lack of physical activity can be the main reason for poor nutritional status among learners.

### **Protection of confidentiality**

The Confidentiality and protection of your child's personal information. Confidentiality means keeping a client's information between the researcher and the client, and not telling others including co-workers, friends, and family. The researcher will maintain confidentiality of participant's information in a locked and secured environment. Members of the study team will be trained in these issues and understand not to discuss participants outside of the research context.

### **Voluntary participation**

Participation in this research study is voluntary. You may refuse to allow your child to participate or withdraw your child from the study at any time. Your child will not be penalized in any way should you decide not to allow your child to participate or to withdraw your child from this study.

Contact information

In the event of any problems or concerns/questions you may contact the researcher at or the UKZN Biomedical Research Ethics Committee, contact details as follows:

**AFRICAN CENTRE FOR FOOD SECURITY**

University of KwaZulu-Natal

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Raubie Saunders Building

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Email: [BREC@ukzn.ac.za](mailto:BREC@ukzn.ac.za)

Consent

I have read this parental permission form and have been given the opportunity to ask questions. I give my permission for my child to participate in this study.

Participant's signature \_\_\_\_\_ Date: \_\_\_\_\_

Child's Name: \_\_\_\_\_

A copy of this parental permission form should be given to you.

## **APPENDIX 8: SOUTH AFRICAN FOOD BASED DIETARY GUIDELINES**

1. Enjoy a variety of foods
2. Be active
3. Make starchy foods the basis of most meals
4. Eat plenty of fruits and vegetables
5. Eat dry beans, peas, lentils and soya regularly
6. Meat, fish, chicken, eggs can be eaten every day
7. Eat fat sparingly
8. Use salt sparingly
9. Drink plenty of clean, safe water
10. If you drink alcohol, drink sensibly
11. Use sugar sparingly (Vorster et al., 2013)

## APPENDIX 9: BREC APPROVAL LETTER



RESEARCH OFFICE  
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Seven Abneri Building  
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Tel: 27 31 2604789 - Fax: 27 31 260-4684  
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Website: <http://research.ukzn.ac.za/Research-Ethics/Biomedical-Research-Ethics.aspx>

31 October 2018

Ms N Gumede (218021543)  
School of Agriculture, Earth and Environmental Sciences  
College of Agriculture, Engineering and Science  
[tandoorgumede@gmail.com](mailto:tandoorgumede@gmail.com)

Dear Ms Gumede

Protocol: Understanding the effect of high-school learner's nutritional knowledge on dietary intake physical activity and assess their anthropometric measurements.  
Degree: MSc  
BREC REF: BE650/18

### PROVISIONAL APPROVAL

A sub-committee of the Biomedical Research Ethics Committee has considered your application received on 22 October 2018.

The study is given **PROVISIONAL APPROVAL** subject to the response to the following queries:

1. The PI states that girls who are pregnant will be excluded. How will the PI screen for this?
2. The interviews are 2 hours in duration. Will the PI provide refreshments for the participants?
3. The Learner Assent form requires a Declaration section.
4. Please refer to the UKZN template for the Participant Information and Consent Document. Please re-submit these documents (revised copies)
5. Parental consent documents are required. The Participant Information and Consent Document should be translated into a local language.
6. Who will be conducting the anthropometric measurements? How will calibrations be been?
7. How will inter or intra examiner reliability be maintained?
8. How will feedback be given to the research participants?
9. How will the study impact on the learner's school programme (learning activities)?
10. How will the PI deal with possible over-reporting?
11. Has data collection occurred? If not, please amend the timelines for the project.
12. Certificates for ethics training are required for the PI and supervisor.
13. CV for the supervisor is outstanding.



UNIVERSITY OF  
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Website: <http://research.ukzn.ac.za/Research-Ethics/Biomedical-Research-Ethics.aspx>

31 October 2018

Ms N Gumede (218021543)  
School of Agriculture, Earth and Environmental Sciences  
College of Agriculture, Engineering and Science  
[tandoongumede@gmail.com](mailto:tandoongumede@gmail.com)

Dear Ms Gumede

Protocol: Understanding the effect of high-school learner's nutritional knowledge on dietary intake physical activity and assess their anthropometric measurements.

Degree: MSc

BREC REF: BE650/18

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5. Parental consent documents are required. The Participant Information and Consent Document should be translated into a local language.
6. Who will be conducting the anthropometric measurements? How will calibrations be been?
7. How will inter or intra examiner reliability be maintained?
8. How will feedback be given to the research participants?
9. How will the study impact on the learner's school programme (learning activities)?
10. How will the PI deal with possible over-reporting?
11. Has data collection occurred? If not, please amend the timelines for the project.
12. Certificates for ethics training are required for the PI and supervisor.
13. CV for the supervisor is outstanding.

Please could each query be responded to separately e.g. BREC Query 1: (List the query) and below the query state the Answer to Query 1. A tabulated response is not acceptable.  
Please email your response to [brec@ukzn.ac.za](mailto:brec@ukzn.ac.za).

All changes to the text must be highlighted and the relevant pages of the research application form resubmitted. Only one copy of the responses and amended pages needs to be submitted. Only when full ethical approval is given, may the study begin. Full ethics approval has not been given at this stage.

**PLEASE NOTE:** Provisional approval is valid for 6 months only - should we not hear from you during this time - the study will be closed and reapplication will need to be made.

Your acceptance of this approval denotes your compliance with South African National Research Ethics Guidelines (2015), South African National Good Clinical Practice Guidelines (2006) (if applicable) and with UKZN BREC ethics requirements as contained in the UKZN BREC Terms of Reference and Standard Operating Procedures, all available at <http://research.ukzn.ac.za/Research-Ethics/Biomedical-Research-Ethics.aspx>.

BREC is registered with the South African National Health Research Ethics Council (REC-290408-009). BREC has US Office for Human Research Protections (OHRP) Federal-wide Assurance (FWA 678).

Yours sincerely

  
Prof V Rambiritch  
Chair: Biomedical Research Ethics Committee

Supervisor: [Naldook12@ukzn.ac.za](mailto:Naldook12@ukzn.ac.za)  
Co Supervisor: [dlupress@ukzn.ac.za](mailto:dlupress@ukzn.ac.za)