THESIS ABSTRACT

Master of Public Health

Adventist University of Africa

School of Postgraduate Studies

TITLE: FACTORS ASSOCIATED WITH OVERWEIGHT/OBESITY AMONG CHILDREN OF MOGODITSHANE ADVENTIST SCHOOL CHILDREN IN BOTSWANA

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Date Completed: July 2019

The epidemic of childhood overweight/obesity, which in the developed world is mainly found in rural areas, has increased the incidence of plaguing cities and towns of the developing world. This is particularly the case in developing nations that are also experiencing nutritional transition, such as Botswana. The hypothesis of this study stated that there is no statistically significant association between demographic profiles/eating behavior/activity habits/parental factors with overweight/obesity status amongst children of the Mogoditshane Adventist School in Botswana.

Both the questionnaires for the teachers and the parents were mainly interviewer-administered, although there were instances where some participants took the questionnaire and filled it independently. A certified Tanita scale was used to measure BMI for validity and reliability. Scales were calibrated and checked by the Botswana Bureau of Standards and certified to be appropriate for use in this study. Height measurements for the children were taken by trained measurers with the

children standing in a standardized position of up straight with their legs and feet together and head vertical for precision.

Both quantitative and qualitative data were analyzed. Chi-square was used for testing the socio-demographic variables, as well as the factors, eating behavior, and activity habits for association with overweight/obesity status (BMI z scores). Furthermore, multivariate logistic regressions were used to assess the independent factors associated with overweight/obesity.

Data were collected from 152 parents of children 6-13 years of age to describe the aforementioned factors. Mothers were the majority at 63.6% of the sample. Batswana comprised 81.6 % of the sample. Child male participants were 42.8% while females comprised 57.2%. The children's weight status was categorized using BMI z scores. 14.5% had BMI z scores > +2SD (Obesity), 19.1% had BMI z scores > +1SD (Overweight), 63.2% had BMI z scores between +1 and -2 (Normal), 2.6% had BMI z scores of <-2 (Underweight), and 0.7% had BMI z scores <-3 (Severe underweight).

There was only one statistically significant variable (factor) found to be associated with overweight/obesity: Parental concern for child's body weight [PV = 0.000; AOR = 4.659 (2.207-9.955)]. Additionally, whether the child eats fast food weekly [PV = 0.007; AOR = 0.207 (0.066-0.649)], whether child eats breakfast in the morning before school [PV = 0.048; AOR = 2.790 (1.008-7.727)], education of participant parent [PV = 0.036; AOR = 0.155 (0.027-0.886)] were the three statistically significant variables (factors) found to be associated with children's obesity status. Therefore, we failed to reject the null hypothesis. The recommendations of the study show that consideration of the socio-demographics, healthy diet and activity factors is needed in developing child overweight and obesity prevention programs.

Adventist University of Africa

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A thesis

presented in partial fulfillment

of the requirements for the degree

Master of Public Health

by

Mpho Mponwane

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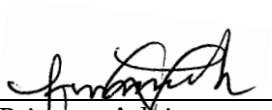

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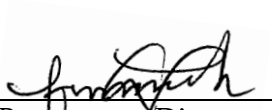

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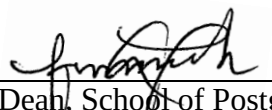

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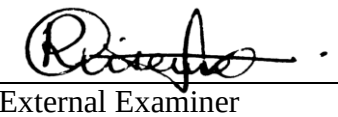

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This work is dedicated to the children of Mogoditshane Adventist Primary School and the children of Botswana at large for their contribution to this study.

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LIST OF ABBREVIATIONS

AIDS	Acquired Immunodeficiency Syndrome
BMI	Body Mass Index
CDC	Centers for Disease Control
CI	Confidence interval
CVD	Cardiovascular diseases
HDL	High-density lipoprotein cholesterol
HIV	Human Immunodeficiency Virus
IOTF	International Obesity Task Force
LDL	Low density lipoprotein cholesterol
MAPS	Mogoditshane Adventist Primary School
METs	Metabolic equivalent units
NCDs	Non Communicable Diseases
NT	Nutritional Transition
NW	Normal weight
OB	Obesity
OW	Overweight
PA	Physical Activity
PE	Physical Education
SD	Standard Deviation
SDS	Standard Deviation Score
SSBs	Sugar Sweetened Beverages
SES	Socioeconomic status
T2D	Diabetes Type 2

TBF	Total Body Fat
TV	Television
US	United States
UW	Underweight
WC	Waist Circumference
WHO	World Health Organization

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My indebtedness in this work goes to a number of people for their invaluable contribution and support, encouragement, and contribution. Firstly, I would like to extend my heartfelt appreciation to my primary and secondary Advisers, Dr. Daniel Ganu and Dr. Susan Baker from the Adventist University of Africa. I am grateful for the time they took to read through my manuscript. It is your highly esteemed guidance and leadership and advice that has resulted in this work and made this study what it is. My second thank you goes to the Ministry of Health and Wellness of Botswana and Mogoditshane Adventist Primary School for granting me permission to do this study.

Last but not least, I appreciate all my research assistants for their assistance during the data collection. My final and foremost appreciation goes to God and family for their social, moral, and spiritual support during this very busy time.

CHAPTER 1

INTRODUCTION

Background of the Study

This research study was influenced by several disturbing reports: statistics which show that from 2000 to 2007 obesity has been on the rise for both females and males aged under 5 years from 10.4% to 11.2% (WHO, 2007); reports that indicate that children born in the second and third generations have the most significant changes in the prevalence of obesity with an increase from 20% to 32% compared with first-generation children (WHO, 2014); and reports from the region (Southern Africa) that the prevalence of overweight has surpassed that of underweight (WHO, 2018).

Also, there is data that in older adolescent children in Botswana, the prevalence of obesity and underweight combined has surpassed that of underweight (Wrotniak et al., 2009). Additionally, there is a dearth of literature regarding research among children aged between 6 to 13 years that will be interesting to study and know (limited literature also evident in the Botswana Multi-Sectoral Strategy for the Prevention and Control of Non-Communicable Diseases 2018 – 2023 referencing the year 2007 WHO statistics on childhood obesity/overweight).

As expected in nations undergoing Nutritional Transition (NT), including Botswana, urbanization and higher SES are positively associated with increasing prevalence rates of overweight and obesity (Wrotniak et al., 2012). This data is consistent for school children in urban and peri-urban centers like Gaborone and

Mogoditshane respectively, as well as among private school students (Freedman et al., 2007).

Mogoditshane Adventist Primary School, a private school, is in Mogoditshane, a peri-urban district located immediately adjacent to the capital city of Botswana, Gaborone, on the western side. The district's bordering of Gaborone seems to have resulted in the urban lifestyle being incorporated into the way of life of residents. Most of these residents work or do business in Gaborone since Mogoditshane seems like an extension of Gaborone. There is a significant industrial activity in Mogoditshane as well. Fast food outlets are also increasing in number and changing both the appearance of the village, as well as the health of the residents. The population of Mogoditshane is 57,637, the largest of the villages surrounding Gaborone (Global Health Data Exchange, 2011).

MAPS (student population of 446) was conveniently selected as the study setting. The first reason for this is that it is in the peri-urban area (Mogoditshane), which like other peri-urban and fully urban areas is known for the high prevalence of childhood obesity. Secondly, after it was noted by the researcher that about half of the student population is Seventh-day Adventist, a religious Christian group known for their culture of healthy living (hereafter called, simply Adventist). The area was studied to find out if there are some positive outcomes that may be derived from studying this group.

As stated above, statistics in Botswana show a steady increase in childhood obesity. The latest scores from the Southern Africa region, that Botswana is a part of, confirm pediatric obesity as a public health emergency. Below is a representation of the rise of childhood obesity against the decline of both stunting and wasting in Southern Africa (WHO, 2018):

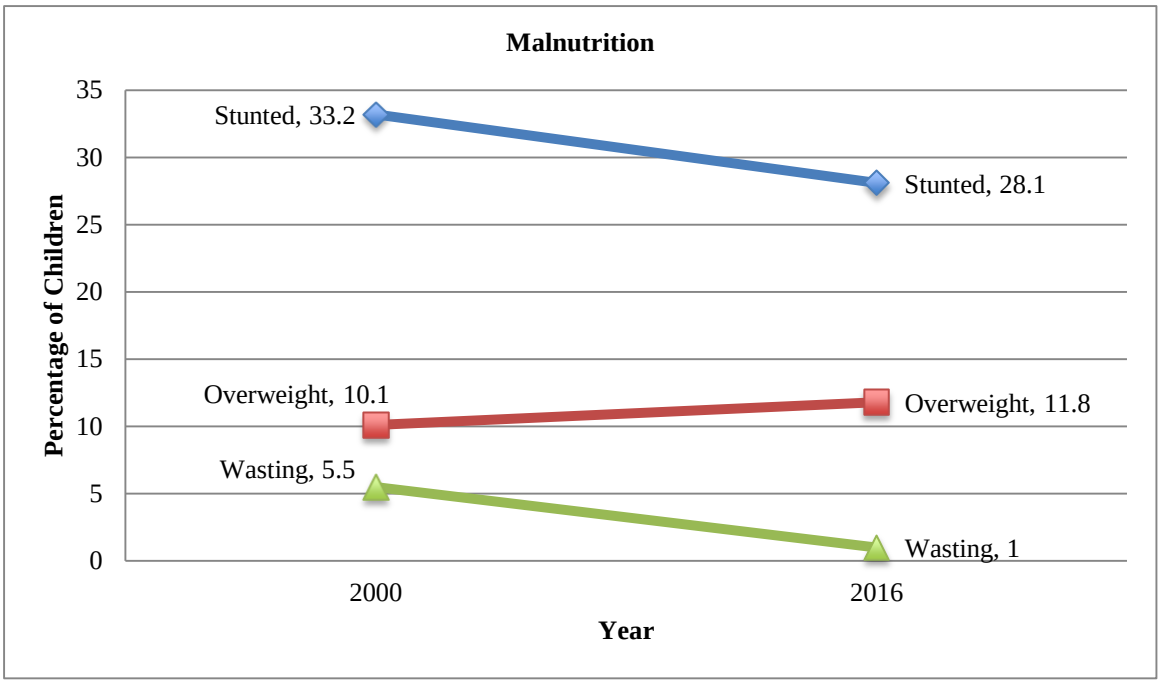


Figure 1. The Rise of Childhood Obesity/Overweight in Southern Africa

Statement of the Problem

Before the year 2000 (WHO, 2007, 2018), there was a small number of overweight/obese children but today in schools like MAPS, there is an increasing prevalence of overweight/obesity in school children; making their health outcomes negative because of the overweight/obesity risk factors. The crucial question to ask is: What can the MAPS teachers and parents do to ensure that school children have health and wellness programs that will help them maintain healthy body weight? This study, therefore, seeks to identify factors predisposing school children in MAPS to overweight/obesity and to develop a consolidated strategy for mitigating the problem of obesity based on the findings of the study.

Research Objectives

1. To determine the demographic profiles of the school children for overweight/obesity.

2. To establish the magnitude of the problem of overweight/obesity in MAPS children.
3. To infer factors influencing overweight/obesity in school going children at MAPS.
4. To examine the perceived impact of health promotion programs on MAPS.

Research Hypothesis

The research hypotheses are that there is no statistically significant association between demographic profiles/eating behavior/activity habits/parental factors with overweight/obesity status amongst Mogoditshane Adventist school children in Botswana.

Conceptual Framework

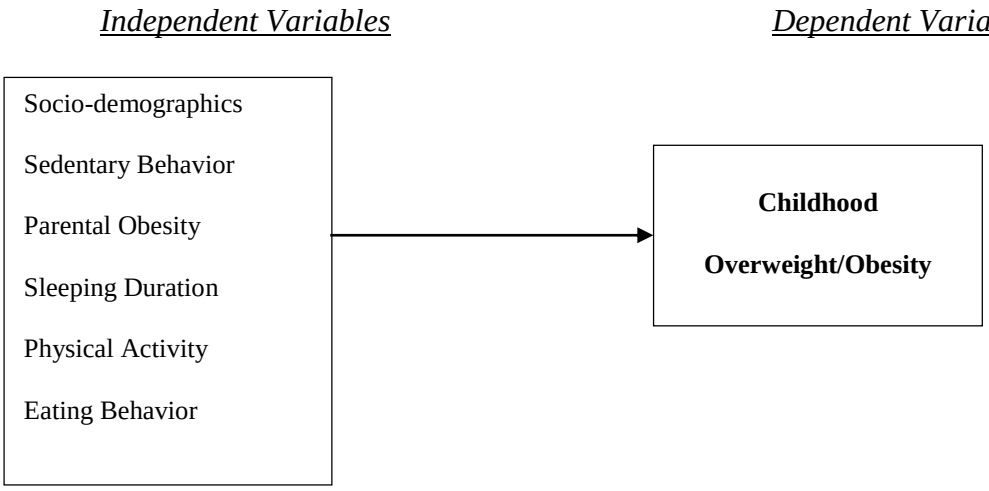


Figure 2. The Framework of Factors Associated with Overweight/Obesity

In the graph shown above, the dependent variables are the state of overweight and obesity; while eating behavior, physical activity, parental obesity, sedentary behavior, and sleeping duration are independent variables. The socio-economic demographic variables, as discussed in the literature review and included in the questionnaire, were given special consideration.

There is a myriad of causes of overweight/obesity and obesity, both genetic

and environmental, but the increase in obesity prevalent in children seems to be more closely related to changes in lifestyle and living environment (Lin et al., 2014). Consistent with the aforementioned, several studies reported that behavioral factors such as dietary intake (Lin et al., 2014; Shan et al., 2010; Song et al., 2012), sedentary behaviors (Lin et al., 2014; Shan et al., 2010; Song et al., 2012; Yi et al., 2012), Physical Activity (PA) or inactivity (Shan et al., 2010), and short sleep time (Song et al., 2012; Yi et al., 2012), as well as parental obesity (Tzou and Chu, 2012), were closely associated with obesity risk in children (Zhang et al., 2016). Therefore, the five aforementioned factors, together with the socio-demographic characteristics, were incorporated in this theoretical framework, as they are established risk factors of overweight/obesity.

This agrees with the NT that theorizes that as nations progress economically, food production moves away from dependence on subsistence farming to industrialized agricultural production. It further emphasizes that there is an associated shift in lifestyle patterns leading to a dramatic shift in diet and physical activity**.** Brown (2014) concludes this idea by stating that the NT related changes in lifestyle patterns alter the energy-balance equilibrium leading to an increased risk of obesity.

Of all the lifestyle patterns or factors discussed in this section that are influenced by the nutrition transition, the first was the diet behavior itself, then what some authors identify as the 'hallmark of the nutritional transition' which is physical activity (Brown, 2014). It, therefore, follows that another study attributed the burden of overweight/obesity to fast foods and physical inactivity risk factors (Kar and Khandelwal, 2015).

This study further considered parental obesity as another vital factor because as one researcher states eating and physical activity patterns (the two main lifestyle

patterns of the NT) are related to elements of nature and nurture, school-based programs may be most effective when they support and reinforce healthy practices at home (Mendelson, 2007). Sleeping duration and sedentary behaviors are also added because they are crucially important lifestyle/behavioral patterns influenced by the NT.

The research limited itself to the aforementioned factors and used the above-mentioned framework to help explain how national and economic development, the decline of rural living and the rise in urbanization, processed and energy-dense foods and PA reorganization (the hallmark of NT) have influenced the development of overweight/obesity. Together with parental obesity, it was further showcased that postmodern lifestyles, sedentary behavior, and sleep duration, have also influenced childhood obesity outcomes. Additionally, the objectives of this study were focused on several research concepts that can be analyzed within the scope of the mixed-methods approach of quantitative and qualitative descriptive analytic methods.

Purpose and Significance of the Study

The purpose of this study was to describe the various socio-demographics, eating behaviors, activity habits and parental factors associated with overweight/obesity and to explore the relationship of these factors with children's overweight/obesity status (in BMI z-scores) among the MAPS children. The significance of the research was to add to previous studies' elucidation on factors associated with overweight/obesity in school children, and that intelligence must be used to guide the recommendation of a workable strategy and best target public health efforts to prevent the onset and progression of overweight/obesity in Botswana and countries facing a similar challenge.

Therefore, the present study analyzed the demographic and socioeconomic

profiles of the school children. Furthermore, the study aimed to assess the current extent of the overweight/obesity epidemic, investigate the early life (students at an early age) and infer behavioral and environmental factors influencing such phenomenon. Additionally, the study examined the perceived impact of the health promotion programs on MAPS children.

A previous study like this one, but of older adolescents, by Corbett Brown focused on the qualitative approach but this study, of children aged 6 to 13 years, used the mixed method of qualitative and quantitative approaches. In the present study, the quantitative method was used precisely to measure the food environment and eating behavior, and activity habits (physical activity, sedentary behavior, and sleep duration) in the home, school, and community as well as the caregiver feeding styles of parents of MAPS children. The qualitative method was implemented to capture specifically the teachers' perceptions of eating behavior and physical activity, and both the teachers' and parents' perceptions regarding the obesity prevention intervention. The study also incorporated true parent-child dyads and teachers of the same children. Results for this study on these pupils, ages 6 to 13 years, were interesting to know since the study is unique with regards to addressing the category of children in the early life that has not been researched before.

Scope and Limitations of the Study

It was not the intention of this research to discuss overweight/obesity and obesity entirely. Its task was to ascertain factors influencing or contributing to overweight/obesity in MAPS children and suggest a strategy for addressing the problem. Its study was confined to MAPS in Botswana. It sought to contribute understanding regarding the culture of a healthy lifestyle to wellbeing and the health

promotion of children and adolescents, in case there is any, that can be derived from the MAPS.

Operational Definitions of Terms

Body Mass Index: (BMI) (BMI = [mass (kg)/height (meters) squared]) Adolescent underweight, normal weight, overweight, and obesity are classified by age and gender-specific BMI z-scores of less than -2 standard deviations, -2 to +1 standard deviations, between +1 and +2 standard deviations, and +2 standard deviations and greater, respectively.

Eating Behavior: a broad term that encompasses food choice and motives, feeding practices, dieting, and eating-related problems such as obesity, eating disorders, and feeding disorders.

Nutritional Transition: theorizes that as nations progress economically, food production moves away from dependence on subsistence farming to industrialized agricultural production.

Obesity: for children between 5 and 19 is BMI-for-age greater than 2 standard deviations above the WHO Growth Reference median.

Overweight: for children between 5 and 19 is BMI-for-age greater than 1 standard deviation above the WHO Growth Reference median.

Parental Obesity refers to obesity of either parent (paternal or maternal) during pregnancy.

Physical Activity: bodily movement produced by skeletal muscles that require energy expenditure.

Sedentary Behavior: a type of lifestyle with little or no physical activity (a person with a sedentary behavior) is often sitting or lying down.

Seventh-day Adventist or Adventist: Christian denomination with a doctrinal emphasis on Jesus and His second coming, and who also uphold a healthy lifestyle including vegetarianism and physical exercise. The denomination is also known for their Sabbath weekly rest on the seventh day, Saturday.

Sleep duration: the total amount of sleep obtained, either during the nocturnal sleep episode or across the 24-hour period.

CHAPTER 2

REVIEW OF LITERATURE

As noted, the study sought to establish factors associated with overweight/obesity at MAPS, with a view to then determine a workable intervention strategy for the school children. This chapter comprehensively reviewed related studies, and literature relevant to the objectives of this research on issues pertaining to overweight/obesity in school children. The review also identified the gaps and challenges in the area of study.

It is agreed that the term overweight defines excess body weight for height whereas the term obesity is used to refer to excess body fat. Excess calorie intake or insufficient physical activity or both is the main cause of overweight and obesity. Additionally, various factors, genetic, behavioral, and environmental, are important in its pathogenesis. Studies also note that increased body fat mass also becomes a major risk factor for the development of cardiovascular and metabolic diseases such as type 2 diabetes (Schwingshackl et al., 2015). Developing countries like Botswana have a demanding problem of a double burden of disease among children, that of overweight/obesity in children and adolescents on one end and malnutrition and underweight on the other end.

It is important to keep the children safe from the problem of overweight/obesity and the other complications associated with it and to also ensure a healthy future for them. There is substantial evidence indicating that several other physical health problems, including sleep disorders, as well as psychosocial problems,

such as low self-esteem and social withdrawal, are associated with childhood obesity (Barlow and Dietz, 1998; Young et al., 2000). Studies further note that there is difficulty in controlling obesity in adults and the multiple long-term adverse effects of childhood obesity, and for that reason the prevention of childhood obesity has been recognized as a public health priority (Young et al., 2000).

This issue is of interest in Botswana where the public health burden of HIV is shifting to the chronic management of HIV-positive patients with medications that have metabolic side effects similar and possibly additive to the complications of obesity, such as dyslipidemia and insulin resistance (Wrotniak et al., 2012). Therefore, assessing obesity and risk factors associated with NCDs in Botswana is identified as particularly relevant (Wrotniak et al., 2012).

Demographic Profiles of School-going Children to Overweight/Obesity

The demographics, as patterns to overweight/obesity and obesity, include BMI, BMI z scores, sex, age, SES, residence, and nationality. There are also parental factors like parental concern for child's body weight, education, occupation, and marital status (most of which are discussed in the next section under parental factors).

BMI is the most generally used index, or indicator, of weight status. This anthropometric indicator is easy to use and convenient as it can be compared across available studies. The BMIs of children, unlike BMI assessment for adults, is not the same at different ages (Ages 1 to 19). Therefore, overweight and obesity in children and adolescents are expressed as BMI-for-age (De Onis and Lobstein, 2010). There are three most popular internationally comparable reference sets for children and adolescents, namely the International Obesity Taskforce (IOTF), the Centers for Disease Control and Prevention (CDC) and the World Health Organization (WHO)

(Cole et al., 2000; Mercedes De Onis, Garza, et al., 2007). The chart that African studies use needs to be compiled with adequate normative values for the African continent (Methodology chapter considered that).

Overweight and obesity are no longer considered diseases or health problems of the affluent, since there is an increase in prevalence rates in low-income and middle-income countries (as indicated in the background of the study), especially in urban areas. As a result, lower or higher socioeconomic statuses are examinable variables when researching about overweight/obesity in Africa.

In studies, age is categorized, as they appear to be a strong age-dependent trend from early childhood to late adolescence in the prevalence of obesity and overweight. Researchers observe that consideration for sex in demographics is crucial since from cross-survey comparisons, the prevalence of overweight and obesity seems to decrease from early to late childhood, after which it once again increases to reach values of over 20% in girls in late adolescence (Armstrong et al., 2011).

Armstrong et al. (2006) observed a phenomenon that seemed culture-related – overweight increased with age in African girls but decreased with age in White girls. A number of studies speculated that the aforementioned finding is linked to the fact that overweight, in certain African cultures, is seen as an indication of wealth and happiness and, in more recent times, as an indication that the individual does not have HIV or AIDS (R. A. Clark et al., 1999; Mvo, 1999). Thus the socio-demographics of overweight/obesity studies should explore the aspect of ethnicity or nationality to examine the difference that maybe be found in different cultures.

Authors Wang et al. (1998) assert that populations in a transition towards urbanization may experience an increase in overweight and obesity. It is further observed that higher rates of overweight and obesity in relatively well-fed urban

children are probably related to lower activity levels, smaller families, the availability of energy-rich fast-foods and, often, higher parental income (R. Kruger et al., 2006).

A study by Manios et al. (2010) has shown a mother's weight and perception of her child's weight to be important determinants of her child's BMI status. Furthermore, conversely, this relationship is not always the case and the opposite would appear to be found frequently outside Western countries. Steyn et al. (2005), for instance, has reported an association between underweight children and overweight mothers in Russia, China, and Brazil. Smuts et al. (2008) show a similar disparity between mother's weight and child nutritional status in a South African study comprising 4000 children from the Eastern Cape and KwaZulu-Natal where a co-existence was found between mothers' or caregivers' overweight or obesity and child malnutrition.

Steyn et al. (1994) and Tladinyane (2003) in their studies on rural communities in Limpopo and the North West Province revealed that between 30% and 50% of underweight children had overweight or obese mothers or caregivers. In the same vein, Finucane and colleagues remark that the fact that the mean age-standardized BMI for women in southern Africa increased from about 25.8 kg/m2 in 1980 to ≥ 28 kg/m2 in 2008, does not augur well for the future BMI status of South African children. The mothers are becoming overweight and therefore predispose their children to overweight and obesity. Parental weight is also an important demographic to consider in childhood/ overweight and obesity studies.

Statistics and Magnitude of the Problem

WHO (2018) recognizes an emerging face of malnutrition as childhood overweight and obesity. In the same edition it presented the following statistics:

1. 5.6% or 38.3 million children under age 5 around the world were overweight in 2017 (an increase of 8.2 million since 2000).
2. In 2017, almost half of all overweight children under 5 lived in Asia and one quarter lived in Africa (46% and 25% respectively).
3. In three sub-regions, at least one in every ten children under five is overweight (Southern Africa, Northern Africa, and Central Asia; 13.7%, 10.3%, and 10.7% respectively).
4. In Africa, the number of overweight children under 5 has increased by nearly 50% (From 6.6 to 9.8 million) since 2000 (There has been no progress to stem the rate of overweight in more than 15 years).
5. Share of overweight children under 5 in 2017 by country income classification (Low income is 10%; Lower middle income is 38%; Upper middle income 39%; High income is 12%).

These joint malnutrition estimates indicate that Africa and Asia bear the greatest share of all forms of malnutrition. They show that malnutrition rates remain alarming with stunting declining too slowly while overweight continues to rise. What is interesting to observe is that the overweight percentage declined by 2% in Asia, while it rose by 1% in Africa in one year (between 2016 and 2017). While Asia needs attention because of its high numbers, the increasing rates in Africa is a cause for concern and call for intervention. It is estimated that more than 30 million overweight children live in developing countries, compared to 10 million in developed countries (Pienaar, 2015).

According to the World Health Organization (WHO), overweight and obesity remain the leading cause of premature death worldwide (WHO, 2014). Because overweight children are about 30-50 % more likely to suffer from comorbidities such as metabolic syndrome in adulthood than those with normal weight, it is of utmost importance to treat overweight and obesity as soon as possible (Weiss et al., 2004).

As a result, alarming and constantly growing numbers World Health Organization designated obesity as a global epidemic in 1998 (WHO, 1998). Following this designation, since the early 2000s child obesity prevention has been a

public health priority in many countries and there has been significant government investment in the early childhood and the primary school sectors (Garnett et al., 2016, pp. 1985–2012).

There is data that indicates the prevalence of overweight and obesity among Botswana children. Available statistics show that from 2000 to 2007 overweight/obesity has been on the rise for both females and males under 5-year-old from 10.4% to 11.2% (WHO, 2007). It was further noted that Children born in the second and third generations have the most significant changes in the prevalence of overweight/obesity with an increase from 20% to 32% compared with first-generation children (WHO, 2014). In a nationwide sample of adolescent secondary-school students in Botswana, 16% of adolescents were overweight/obese, with three Overweight/obese adolescents for every underweight one (Wrotniak et al., 2009).

In comparison with other African countries, the prevalence of overweight/obesity at 12% and obesity at 5% observed in our study is less than reported in adolescents from the Democratic Republic of Congo (Longo-Mbenza et al., 2007) but similar to data from South Africa (Monyeki et al., 2002; Somers et al., 2006), the Seychelles (Stettler et al., 2002) and far greater than that reported in Lagos, Nigeria (Ben-Bassey et al., 2007). Data showing almost double the prevalence of overweight/obesity in girls than boys agree with data from South Africa (R. Kruger et al., 2006; Monyeki et al., 2002; Somers et al., 2006) and Seychelles (Stettler et al., 2002). (Wrotniak et al., 2012) observed that these combined data from the African continent suggest that the nutrition transition is moving apace in African countries and more predominantly than the malnutrition pattern that is more commonly represented in the Western press.

The UNICEF, WHO, World Bank global and regional child malnutrition estimates from 1990 to 2017 reveal that the global community is still far from a world without malnutrition. The joint estimates, published in May 2017, cover indicators of stunting, wasting, severe wasting and overweight among children under 5, and reveal insufficient progress to reach the World Health Assembly targets set for 2025 and the Sustainable Development Goals set for 2030 (WHO, 2018).

Factors Associated with Obesity in School Children

As shown in the conceptual framework in the previous chapter, eating behavior, physical activity, parental obesity, sedentary behavior, and sleep duration are the factors associated with obesity in school children that this study will consider. These factors will be explained in the next paragraphs.

Eating Behavior

As a result of the nutritional transition that is experienced in the developing world, healthy traditional foods are being replaced by processed and energy-dense foods from the more industrialized developed world. Writers assert that the traditional diet of developing nations consists of unprocessed, low energy-dense foods that are high in plant-based nutrients and low in animal-based proteins and oils (Misra et al., 2010). As such the traditional diet of Botswana, a lot similar to other African nations is comprised of sorghum, samp (chopped dehulled dried maize/corn kernels), maize, beans, groundnuts, green leaves, and lean meat (Shaibu et al., 2012). These whole fruits, vegetables, and healthful starches-legumes, and maize, and animal proteins with little fat are certainly low energy-dense foods.

As the nutritional transition occurs in the continent of Africa, refined foods take the place of the traditional foods as part of the daily diet (Maruapula et al., 2011).

The westernized diet (for example, rice, bread, savory snacks, sweet beverages, and candies) is high in added sugars, animal fats, and animal proteins; contains less dietary fiber; and generally, provides fewer servings of fresh fruits and vegetables in developing nations (Delisle, 2010; Satia, 2010). Nontraditional diets have been positively associated with an increased risk of overweight and obesity (Satia, 2010) and relatedly, a study shows that decreasing consumption of the traditional Botswana diet among adolescent school students is positively associated with increased prevalence of overweight and obesity (Maruapula et al., 2011). Given the prevalence rates of overweight/obesity in adolescents in the urban areas of Botswana, food scarcity is no longer the driving force behind energy intake, a typical pattern of urbanized developing countries (Kimani-Murage et al., 2010).

A research analysis of the reported food intake behaviors of adolescents in Botswana secondary schools suggests that overweight and obese children, especially those of higher SES and from more urban environments, follow a snack-food pattern that has a greater risk of obesity/obesity (Maruapula et al., 2011). This study also shows that these children combine 'eating out' with more servings of high-energy snack foods and fewer servings of traditional foods.

Initial evidence has emerged revealing the diet-related perceptions of adolescent students and adolescent's parents of what constitutes a healthful diet for adolescent students in Botswana. This data comprises information about adolescent and parent perceptions of the healthfulness of traditional and none traditional diets for adolescents. The research done in the context of the student's ecological setting by (Brown, 2014) considered their intrapersonal and interpersonal influences, as well as local, national, and global influences.

There is a growing body of evidence where there seems to be a contradiction

between adolescents' dietary knowledge and eating behaviors. For instance, western adolescents see obesity as a problem and yet continue to eat foods known to increase obesity risk (Sylvetsky et al., 2013). Studies also make reference to an apparent transition from plant-based, low energy density foods to foods high in added oils and sugars, that is related to the innate preference for foods that offer a more palatable experience, higher satiety, and generally have greater sensory appeal (Drewnowski and Almiron-Roig, 2010).

Researchers observe that taste preferences have shifted in rich urban-living adolescents in Africa, in the presence of increased availability of westernized foods and enough income to purchase those foods, sweet foods such as doughnuts and candy, which are consumed for the purpose of individual pleasure (Brown, 2014, p. 22). Since the healthfulness and social meaning of foods are important in understanding some of the psychosocial drivers of poor eating habits and the subsequent risk of obesity, below is the discussion of levels of influence that captures perceptions of food.

Intrapersonal and interpersonal influences. Obesity studies conducted in Botswana by (Brown, 2014) seem to indicate that the transition of taste preferences for foods with added oils and sugars has already occurred among adolescent students attending the public and private schools sampled. As the intrapersonal and interpersonal (micro and macro) influences of dietary perceptions were assessed, these adolescents and parents of adolescents identified healthy versus unhealthy foods yet choose to eat unhealthily. The following were the findings of adolescents and parents of adolescents in Gaborone City (urban Botswana) regarding food choices in the first research of its kind by Brown (2014):

1. Adolescents individually choose unhealthy foods based on taste preferences

2. Socially choose poor diets due to peer pressure from other adolescents
3. Social status related to westernized foods, and the perceived lower cost of unhealthy foods
4. Parents acknowledge purchasing unhealthy foods for their children based on the child's taste preferences
5. Parents also acknowledge the influence of social pressures related to demonstrating a desirable SES to such purchases of unhealthy foods.

School personnel (PE teachers, administrators, tuck shop clerks) in Botswana note that students seem to prefer non-traditional foods generally and increase purchases of those foods on days when traditional foods (e.g., beans) are provided as part of the school lunch. Change of attitude and change seems possible. For instance, the perception that teachers were disinterested, and schools sold junk foods to students in search of profits was not the case among adolescent participants from one of the private schools.

In these private schools' unhealthy foods in the tuck shop (hamburgers, doughnuts, etc.) were replaced with sandwiches, fruits, vegetables, and other healthy snacks. Additionally, participants from this school perceived teacher support for healthy eating and described the only in-class snacks that are allowed as being fruits, vegetables, and water (instead of fizzy drinks). While the participants noted that initially there was pushback against the changes, the student population eventually embraced them (Brown, 2014).

It has been discussed that increased exposure to westernized foods does not necessarily lead to taste preference transition. This is evidenced by a lack of significant taste preference transitions in the Philippines, Malaysia, and Indonesia, where westernized foods are perceived to be foods that should be eaten occasionally or rarely, while traditional foods continue to be the main staples of their respective national diets (Lipoeto et al., 2013).

Local, national, and global influences. The phenomenon of weight gain among the higher socioeconomic status in the developing world is disturbing and contrary to the perception of the westerners or behaviors abroad. Abroad, in the developed world, the reality is the opposite, with child and adolescent obesity being predominant among the lower socioeconomic status (Wronka, 2014). In Europe obesity was found to be predominant among immigrants (mainly those from the developing world), and in America, it was the minority comprising of Latinos and African Americans. In the USA, however, obesity among adolescents is more common in lower SES environments (Grow et al., 2010; Voorhees et al., 2009).

The key reason for the above mentioned seems to be the fact that the final phase of the nutritional transition, titled behavioral change (Popkin and Gordon-Larsen, 2004), in which intentional eating and physical activity behaviors enables successful aging even in the setting of high rates of chronic diseases, is yet to come in Botswana. The current description of food patterns in adolescents, however, may help to inform improved health behaviors.

Adventists are generally known to be health-conscious in their choice of diet and lifestyle in general. Evidence from the Adventist health studies 1 and 2 continue to provide positive feedback about the healthy lifestyles of Adventists (Juneby, 2012). On a local level, little is known about the diet behavior of Adventists children and their households in Botswana. In addition to perceptions and quantitative results from all Mogoditshane Adventist Primary students, this study intends to elucidate also on the childhood obesity status of Adventist students, as well as make a comparison between Adventist and non-Adventist. This will be helpful to find out the preposition Adventist lifestyle. The eating behavior, as well as other risk factors will be considered since this is the initial study on Adventist lifestyle. Currently, little is

known about childhood obesity of Primary school children in Botswana.

The World Health Organization advises that a healthy diet includes the following:

1. Fruit, vegetables, legumes (e.g. lentils and beans), nuts and whole grains (e.g. unprocessed maize, millet, oats, wheat, and brown rice).

2. At least 400 g (i.e. five portions) of fruit and vegetables per day, excluding potatoes, sweet potatoes, cassava, and other starchy roots.

3. Less than 10% of total energy intake from free sugars, which is equivalent to 50 g (or about 12 level teaspoons) for a person of healthy body weight consuming about 2000 calories per day, but ideally is less than 5% of total energy intake for additional health benefits. Free sugars are all sugars added to foods or drinks by the manufacturer, cook or consumer, as well as sugars naturally present in honey, syrups, fruit juices, and fruit juice concentrates.

4. Less than 30% of total energy intake from fats. Unsaturated fats (found in fish, avocado and nuts, and in sunflower, soybean, canola and olive oils) are preferable to saturated fats (found in fatty meat, butter, palm, and coconut oil, cream, cheese, ghee and lard) and *trans*-fats of all kinds, including both industrially-produced *trans*-fats (found in baked and fried foods, and pre-packaged snacks and foods, such as frozen pizza, pies, cookies, biscuits, wafers, and cooking oils and spreads) and ruminant *trans*-fats (found in meat and dairy foods from ruminant animals, such as cows, sheep, goats and camels). It is suggested that the intake of saturated fats be reduced to less than 10% of total energy intake and *trans*-fats to less than 1% of total energy intake *(5)*. In particular, industrially-produced *trans*-fats are not part of a healthy diet and should be avoided.

5. Less than 5 g of salt (equivalent to about one teaspoon) per day. Salt should be iodized (WHO, 2018).

Physical Activity

Studies have shown that decreasing physical activity (PA) is a hallmark of the NT and a determinant in increasing obesity (Satia, 2010). (Maruapula et al., 2011) stress the high energy cost most families dispensed in preparation of meals, for instance, at the time of Botswana's independence in 1966. It is further emphasized that it was physically demanding to fetch water from some distance, gather fire-wood and fruits from the bush and crack maize or pound sorghum to prepare food the family. This researcher agrees that such intense physical exertion would render the

energy intake lower than the energy cost. Therefore, the shift from farming and other strenuous traditional occupations to service sector jobs (less strenuous) have also resulted in the energy balance equation such that the dominant nutritional challenge at present is not to maintain sufficient body weight but to prevent excess weight gain (Maruapula et al., 2011). There are also fewer PA requirements within the same occupations, increased use of mechanized transportation, and decreased PA as part of leisure activities (Popkin and Gordon-Larsen, 2004).

Research also shows that urbanization and private school attendance are positively associated with decreased PA among adolescents in urban Botswana as compared to adolescents living in towns and rural villages. This is the case in spite of mandatory versus optional physical education programs in private and public schools, respectively (Malete et al., 2013).

Neighborhood safety and support. In addition to increasing urbanization and mechanization of transportation and work, perceptions of the meaning of PA and of barriers to being physically active may also play a role in the PA shift as part of the NT. For instance, in a study in Botswana, adolescents and parents suggested that safety concerns prevented after-school PA near the school as well as in the home neighborhood. The writer also adds that due to the combination of school ending late, early dusk in the winter, and not feeling secure while outdoors around the school or home students did find it safe to walk home.

The above-mentioned reasons have influenced parents to advocate for children to be driven to and from school, or “passive transport” (Brown, 2014). Brown further reports that adolescents complained of a lack of park space or athletic facilities in their neighborhoods, and pronounces the perception of limited facilities as positively associated with lower levels of PA.

Lack of physical activity knowledge and stigma. School personnel in Botswana suggest adolescents and their parents have a potential lack of knowledge regarding the positive effects of PA (Shaibu et al., 2012). H. S. Kruger et al. (2005) emphatically states that while weight loss may be a positive result of increased PA, the fear of losing too much weight and the fear of being perceived as possibly having HIV/AIDS infection may negatively affect PA levels (H. S. Kruger et al., 2005). Perhaps because of the aforementioned and other reasons, levels of PA are decreasing in sub-Saharan Africa, including Botswana, especially in the urban areas among adolescent school students and adults (Brown, 2014).

It is unknown if the cultural and health habits (physical activity) of Adventists have either a positive or negative impact on child/adolescent obesity. The perceptions of parents and teachers in primary school student's childhood obesity are unknown. Quantitative studies in general, have not been conducted in Botswana to understand child/adolescent obesity.

The World Health Organization guidelines on physical activity are as follows:

1. Children and youth aged 5–17 should accumulate at least 60 minutes of moderate- to vigorous-intensity physical activity daily.
2. Amounts of physical activity greater than 60 minutes provide additional health benefits.
3. Most of the daily physical activity should be aerobic. Vigorous-intensity activities should be incorporated, including those that strengthen muscle and bone, at least 3 times per week (WHO, 2011).

Parental Obesity

The strongest predictor of childhood overweight as well as later adult obesity is parental obesity (Catalano et al., 2009). Therefore, the sad reality is the tendency for obesity to be related to certain families who have had a history, multiple members, as obese. It has been reported in studies across the world that children with one or

both parents being overweight or obese were more likely to be obese compared to those with normal weight parents (Jiang et al., 2007; Li et al., 2006; Nagel et al., 2009; Thibault et al., 2010).

Other study findings revealed that parental overweight or obesity might increase the risk of obesity in children through genetic influence and environmental factors such as dietary habits and family lifestyle (Maffeis, 2000). Various researchers observe that the links of parental weight reflect the genetic and cultural transmission of overweight and obesity from parents to children (Anderson et al., 2002; Craig and Mindell, 2006; Shrewsbury and Wardle, 2008) are complex to some extent because they involve multiple dimensions (genes themselves, and the cultural aspects such as dietary behavioral lifestyle and education). Anderson et al. (2002) further point that children of overweight mothers were approximately 3 points of percentage more likely to be obese, and children of obese mothers were 8 points of percentage more likely to be obese (Craig and Mindell, 2006; Shrewsbury and Wardle, 2008).

Genetics. There is a general understanding that genetics has a major role in obesity. Studies indicate that in some cases genes are directly responsible for obesity in disorders such as Prader Willi syndrome, Lauren moon Biedl Bardet syndrome (Micheal, 2001). The explanation of the occurrence of such conditions among certain families is the fact that family members share common attitude towards food, eating habits and exercise (Merritt, 1982).

It is estimated that heredity contributes approximately 5 to 25% of the risk of obesity. It is becoming common knowledge that the obesity of mother passes mainly to boys and obesity of father to girls. For instance, a study of 7 to 9-year-old children in Punjab showed positive relationship between BMI of boys with BMI of both father and mother whereas BMI of girls is associated with BMI of father only (Sangha et al.,

2006).

Environment. Unhealthy environments that promote unhealthy eating have also been identified as blameworthy for child obesity (Ebbeling et al., 2002; Savage et al., 2007). Wardle et al. (2002) attributed the environmental cues to both family and social factors that influence the food intake of a child. For instance, the home environment set by the availability of foods, preference for particular food items, portion size, cultural values, food preparation, mealtime, structure, and feeding styles are all first pre-determined for the child by parental influences at a young age where autonomy is not yet possible (Patrick and Nicklas, 2005).

Therefore, childhood obesity/overweight has been linked to household food habits and physical exercise (Davison and Birch, 2001; Steinbeck, 2001). Household eating habits are furthermore considered environmental factors that contribute to health inequalities (Darmon and Drewnowski, 2008; Dowler, 2001), particularly those relating to the weight of children (Davison and Birch, 2001; Klohe-Lehman et al., 2007). This researcher asserts that parental influence through the home environment cannot be underestimated in changing the food and physical exercise choices of a child.

Socioeconomic status and education. Lioret et al. (2007) showed that children aged 6 to 14 years have a lower risk of overweight when the socioeconomic status of the head of the household is higher (managers and professionals) or medium (employees, technicians) rather than lower. Several other studies have shown inverse relationships between the education level of parents (especially the mother) and BMI in children (Lazzeri et al., 2011; Shrewsbury and Wardle, 2008). Researchers observe that low socioeconomic status may lead to risky behaviors such as, poor diet, lack of physical activity, and a sedentary lifestyle, that predisposes children to obesity and

overweight (Klohe-Lehman et al., 2007; Singh et al., 2008). Conversely, children living in relatively wealthy households are predisposed to receive attention or special care from parents who offer a variety of physical and cultural activities and educate their children on the virtues of a healthy diet (Ranjani et al., 2016).

Nationality. Nationality affects parents' socioeconomic position, which influences overweight and obesity in children. In Craig and Mindell (2006). England, the highest prevalence of overweight was among foreigners as compared to the general population (Craig and Mindell, 2006). The modern environment may have unmasked previously silent obesogenic genes thrifty genotypes (Bangaiorno, 2002). The effect of the modern environment is global, but varying in extent from country to country apparently as a result of the stage of the NT.

There is an interesting contrast in the relationship between cultural and socio-economic characteristics of the parents and the children's obesity and overweight in different studies around the world. Some researchers showed that children with parents with higher education level (university degrees and high school diplomas) and with more highly qualified occupations had a lower likelihood of being overweight/obese than of children with lower education and less qualified occupation (Albertini et al., 2008; Posso et al., 2014). Still, others reviewing the evidence of overweight/obesity transition among school-aged children and youth in Sub Saharan Africa (Laxmaiah et al., 2007; Muthuri, Francis, et al., 2014) found the higher prevalence of overweight and obesity in children of higher social economic status compared to those of lower socioeconomic status.

Brown (2014) acknowledged Botswana culture as possibly influencing some of the unhealthy lifestyles of adolescents, especially attitudes toward body size. This was discussed in the previous section where larger bodies are associated with

affluence and thin bodies with having HIV/AIDS. These findings were also highlighted in other research with participants in Moroccan and South African communities (Dapi et al., 2007; Puoane and Hughes, 2005).

Several studies suggest that parents tend to underestimate the problems of overweight and obesity in children (Doolen et al., 2009; Eckstein et al., 2006; He and Evans, 2007; Jeffery et al., 2005) and that this situation is more pronounced when parents themselves are overweight. The writers also remark that despite the existence of such a risk, self-reported weight and height can reliably predict the prevalence of obesity and associated behaviors.

Sleep Duration

The past century shows a consistent decrease in the sleep duration of children and adolescents (Matricciani et al., 2012). Although the evidence for the optimal sleep duration for children has recently been discussed (Matricciani et al., 2012), the emerging weighty of evidence seems to suggest that lack of sufficient sleep is a contributing factor to the increased prevalence of overweight and obesity among children and adolescents (Cappuccio et al., 2008; Carter et al., 2011; Chaput et al., 2011).

The rise in availability and use of electronic entertainment and communication devices, especially during the late evening, has been reported to delay bedtimes and to be associated with shortened sleep duration in children (Chahal et al., 2013). This aspect is discussed in detail in the previous section.

Motivation to eat. Observational and experimental studies have presupposed that short sleep duration and sleep restriction adversely affect selected endocrine system functions, and lead to alterations in the levels of the appetite-stimulating hormone ghrelin and the anorexo-genic hormone leptin (Chaput and Tremblay, 2012;

Spiegel, Leproult, et al., 2004; Spiegel, Tasali, et al., 2004). Researchers sound an alarm that the physiological effect of shortened sleep may be the hormonal regulation of appetite that contributes to the development of obesity (Chaput et al., 2007; Patel, 2009; Taheri et al., 2004).

Energy-dense foods. Recently some studies suggested that self-reported late bedtime is associated with a poor diet high in energy-dense, nutrient-poor foods in children and adolescents (Golley et al., 2013), and added further that late sleep preference is associated with consumption of fast foods in adolescents (Fleig and Randler, 2009).

On the prevalent consumption of SSBs containing caffeine among Danish school children, the researchers emphatically pointed that they could not exclude the possibility that these beverages may have contributed to the reported quantity of SSBs consumed by children in their study (Kjeldsen et al., 2014). A key reason for being that the stimulating effect of caffeine may also cause difficulties falling asleep, wakefulness and disrupted sleep (Popkin and Gordon-Larsen, 2004). Future studies on caffeine beverages and childhood obesity will help elucidate the association between the two.

There are a number of study findings that agree with the recommendations by the American Academy of Pediatrics that children have 2 hours or less of sedentary screen time daily. Emerging evidence though shows that watching TV for more than 1.5 hours daily is a risk factor for obesity, but only for children 4 through 9 years of age (De Jong et al., 2013).

Sedentary Behavior

Sedentary behavior is defined as any activity with an energy expenditure of 1.0–1.5 metabolic equivalent units (METs) (Lee, 2015). Another definition of

sedentary behavior is activities requiring low levels of energy expenditure that include sitting or lying down (Morton et al., 2016). Sedentary behavior is not the lack of productivity, but it is the product of time spent in specific sedentary behaviors (Jago et al., 2010). It has been observed that physical activity or the lack of it may affect mental and physical development (Durnin, 1989). Therefore, sedentary behavior has emerged as a potential risk factor for obesity and cardiometabolic risk factors in children (Tremblay et al., 2011).

With the poverty datum line now at less than 17%, more children in Botswana now tend toward sedentary behavior. They are not required to do strenuous work to prepare their food like in the past. Rather their parents buy for them ready-to-prepare or ready- to-consume packs from stores. For urban children of the high socioeconomic status is more than availability of running water, but the provision of geysers to warm their water, and cooking stoves not requiring firewood and also a house manned by assistants that causes a predisposition towards obesity. These children are furthermore transported to school, rather than walking from home to school sometimes even if the school is nearby. Therefore, the phenomenon of changing patterns of infrastructural development and affluence is considered to be causing excess weight gain in both adults and children (Maruapula et al., 2011).

Screen-time. Whilst homework and reading have been identified as prominent sedentary behaviors amongst children (Atkin et al., 2008), screen-time remains the most prevalent and has been consistently associated with obesity (Tremblay et al., 2016). In addition, screen-time is associated with short sleep duration (Falbe et al., 2015; Hale and Guan, 2015), less time spent in PA (Lazzeri et al., 2011; Olds et al., 2011), a poorer diet, such as lower fruit and vegetable consumption (Shang et al.,

2015), greater intake of soft drinks (Wang et al., 2018) and unhealthful sugary snacks (Hare-Bruun et al., 2011).

Public health guidelines recommend children spend no more than two hours per day engaged in screen time (Tremblay et al., 2016). The availability of smartphones and other handheld devices makes the situation difficult to control with the resultant health complications. Children are found to spend a considerable amount of time viewing TV (Marshall et al., 2006), although TV viewing time lately does not appear to be a good marker for global sedentary behavior (Biddle et al., 2009).

Studies though have recognized TV viewing as one aspect of sedentary behavior that has been studied in relation to obesity in children (Marshall et al., 2004), and it seems to be more strongly related to obesity than markers of overall sedentary behavior (Rey-López et al., 2008; Tremblay et al., 2011). In the previous section on sleep duration, it has already been discussed that the potential mechanisms linking TV viewing to obesity in children include the low associated metabolic rate, increased snack food consumption, exposure to food advertisements that promote increased energy intake, and displacement of PA. This happens when instead of sleeping or being involved in physical activities children watch TV for prolonged periods of time.

Consistently several studies showed that children who spent more time watching television, playing video games, and using computers had a 1.56 higher obesity risk (Lioret et al., 2007; Thibault et al., 2010). These studies added that watching television, playing video games, and using computers plainly represent sedentary activity in children and they were related to a higher energy intake during inactivity time. Lim and colleagues further argued though that not all sedentary behavior showed the same relevance to and relationship with obesity, and that playing video games, and using computers did not have such a high risk compared to

watching TV when they did not adversely replace physical activity (Lim and Wang, 2006).

Family and home environment. Authors, as the literature will show, observe that the media-rich physical home environment is common, and it is keeping such devices in children's rooms that increases the possibility of TV viewing and game playing. Taylor and colleagues (1994) assessed that children who have older siblings who spend considerable amounts of time playing electronic or computer games were more likely to involved in the use of the same devices in a similar way.

Writers affirm that the broader family environment has also been shown to be influential with factors such as family TV viewing habits (Sallis et al., 2012), TV viewing rules, eating meals while watching TV and family structure and family dynamics (Granich et al., 2010) related to TV and another electronic media use. In a study among Form 3 male students, a correlation was found between computer and videogame occurrence in the bedroom and hours of individual media use, as opposed to no correlation for TV (Mercieca, 2010). This may be attributed to the decrease in the use of TV and the increase in the use of the computer, tablets, smartphones and electronic media. These gadgets can be easily taken into the bedroom and parents are having less control over their use by their children.

Furthermore, there are reports in Botswana where adolescents and parents of adolescents suggest that sedentary behavior (TV, Facebook, homework) is a barrier to adolescent PA (Brown, 2014). Sedentary behavior is positively associated with increased BMI in children and adolescents (Prentice-Dunn & Prentice-Dunn, 2012). The information technology era has increased screen time. This is lately further complicated by the increase in social network platforms that some children and adolescents are engaged in.

Perceived Impact of the School Health Promotion Programs for Overweight and Obesity Reduction

Harris et al. (2009) assert the limited success of individual behavioral-based interventions to address the increasing prevalence of overweight and obesity and therefore imply the imperative to consider other factors outside of the individual. Since the school is considered an important setting for the development of health-related behaviors for pupils, the schools are identified as one of the potential settings to deliver nutrition and physical activity interventions aimed at reducing childhood obesity (Harris et al., 2009; Khambalia et al., 2012) as school children a spend considerable amount of their day in the school settings.

There is a body of research that has investigated the associations of school demographics, school physical activity, and food policies and resources, school neighborhood, support for active transport, after-school recreational facilities and programs in relation with the obesity epidemic (Leatherdale et al., 2010; Mâsse et al., 2014; Morton et al., 2016). The aforementioned builds on prior research (Fox et al., 2009; Harrison et al., 2011; Richmond and Subramanian, 2008). This is complemented by other studies that have also examined school environments and health-related behaviors such as nutrition and physical activity (Hanks et al., 2012; Sallis et al., 2012). This growing body of evidence is consistent in highlighting the vital role of the school food and physical activity environments in encouraging eating and activity habits of school children, and the outcome weight status.

There is limited evidence on school-level factors to the health-related factors and childhood overweight/obesity in Africa especially. Recently, there is emerging evidence of this emergency, childhood overweight/obesity and obesity. Research findings among African populations suggested that attending affluent, private or high

SES schools increases the odds of overweight and obesity (Fruhstorfer et al., 2016; Muthuri, Wachira, et al., 2014).Richmond and Subramanian (2008), and Miyazaki and Stack (2015), on the other hand, studies conducted in the US (found that children attending higher SES schools had lower BMI). As the argument has been made in this research, HSES schools tend to promote healthy behaviors (perhaps through their resources and or the prior exposure and education of parents) and subsequently lower the odds of overweight/obesity and obesity in the high-income countries.

As previously discussed, the school food environment has a significant impact on children's eating behaviors and hence body weight, as more than one-third of the daily caloric intake occurs while at school (Briefel et al., 2009). Furthermore, studies found that less healthful foods at school were positively associated with higher BMI and obesity/overweight (Fox et al., 2009; Mâsse et al., 2014). Findings before the above-mentioned indicated that the absence of school shops and snack bars and also limiting the availability of less healthful foods in school shops were associated with reduced intake of sugar-sweetened beverages and energy dense snacks (Briefel et al., 2009; Hanks et al., 2012).Another study revealed that healthful foods did not protect children from poor dietary habits. Gibson et al. (1998) state that given the increased exposure to less healthful options, food preference, the main determinant of food intake in children, could have contributed to poor dietary behaviors, thus the overall intake of these foods would displace the healthy options in the diets.

A study by Leatherdale (2013) revealed that children attending schools that had more PA facilities both on and off grounds tend to have lower odds of abdominal obesity than their counterparts who were attending schools that were poorly resourced. Additionally, the study indicated that students who had access to these facilities were less likely to be overweight. This seems to be a complex area of study

because some research has linked the provision of recreational facilities both at the school level and school community to increased physical activity (Sallis et al., 2012) while results from other studies were mixed (Morton et al., 2016). It was evident from a meta-analysis by Morton et al. (2016) that indicated that the association with activity-specific facilities but not the overall physical activity resources.

Richmond et al. (2014) found little or no significant association between physical activity resources and programs and weight status in adolescents attending middle to high schools. Therefore, there has been contradictory evidence linking school physical activity facilities to child weight status. Prior research, though, has found that after-school programs may promote increased participation in extracurricular physical activity and related-health outcomes among children and adolescents (Beets et al., 2009). This is also difficult to achieve since PA activities occur when children are in a hurry to leave the school for their homes. If creatively explored, this initiative of extra-curricular PA seems posed to reserve the negativity outcome of overweight/obesity and obesity plaguing the world.

Gaps and Challenges

This section identifies the gaps and challenges in the study. Gaps and challenges are multiple in childhood obesity research in general. This is because as a study overweight/obesity is relatively young with the body of evidence still growing, and most of it still in the field. There is a need to bridge the evidence gap in a couple of areas, especially in priority areas such as childhood obesity. As scanty as the evidence is, in the developed world the situation is better with the evidence increasing and positive results emerging. Many upper-middle-income countries are also working well to reach the progress of (with challenges) the developed world (WHO, 2018).

The challenge is that the socioeconomic demographic of the childhood

overweight/obesity epidemic prevalence is different between the developed and the developing world. As a result, there is a challenge in using research findings from these groups that vary demographically, as their problems do not always correspond. The developed countries, which are at a more advanced stage of the overweight/obesity epidemic, are facing a widening socioeconomic gap in childhood obesity (Stamatakis et al., 2010). In these high-income nation's obesity prevalence is increasing among children in lower socioeconomic groups, whilst prevalence is stabilizing or decreasing among children from more advantaged backgrounds (Frederick et al., 2014). As stated above the developing countries tend to have a reverse pattern, with higher childhood obesity prevalence among higher socioeconomic groups (Wang, 2001) and the urban area as shown above. The disturbing challenge is that researchers forecast that as economic circumstances continue to improve, particularly in the less developed areas of Botswana, there is great likelihood that the prevalence of overweight/obesity and its comorbidities will increase (Freedman et al., 2007).

Additionally, there is an analysis showing that in developing countries overweight and obesity rates in children and adolescents are increasing not just among the high socioeconomic groups but also in the lower-income groups where underweight remains a major concern (Ranjani et al., 2016). There is a case of high prevalence of the childhood obesity epidemic in the high socioeconomic groups, and the double burden of disease for the lower-income groups (Wronka, 2014).

Whereas researchers in developed countries since the need for more that needs to be done considering the "adverse impact of rural residency on healthy behaviors among children, and that state legislators and school authorities should take actions, such as implementing healthy lifestyle programs, increase budget, and modify school

wellness policy, to promote healthy lifestyle and control obesity in rural children" (Ling, 2014), the local need, and that of other developing nations, is the urban areas. Therefore, this disparity, as well as inequities and inequalities that pose serious challenges for childhood obesity interventions need to be addressed through research that it be appropriated to the local setting, that of Botswana in this study.

Other fears prevail of overweight/obese adolescents in Botswana remaining overweight/obese into adulthood, when the country is having a serious burden of NCD treatment exacerbated already by one of the highest prevalence of HIV and antiretroviral drug treatment (Wrotniak et al., 2012). To bridge this gap, according to a local study's initial effort, and to prevent further increase in the prevalence of overweight/obesity, environmental and behavioral factors associated with increasing SES and urbanization must be considered as economic development continues (Letamo, 2011).

Additionally, the poverty datum line has been declining over the years from 30.6% registered in 2002/3 to 16.3% in 2002/2015/16 (Statistics Botswana, 2018). This seems to be the gains encouraged by the government's midterm goal in line with vision 2016 to eradicate poverty. (Wrotniak et al., 2012) observed that these gains came along with challenges of rapid urbanization, an increasingly sedentary population and a lack of clear strategy for providing wider access and participation in physical activity programs in schools and the community (Wrotniak et al., 2012). It is not surprising under the conditions that ischaemic heart disease and cerebrovascular disease are among the top five causes of death in Botswana (WHO, 2011). As a result, there is a concern that without intervention, NCDs (including obesity) in Botswana could possibly surpass HIV/AIDS as the major cause of mortality and morbidity.

Some of the gaps and challenges are similar globally and follow the need for

continuous improvement. For example, in Kentucky, existing mandates prohibit sugar-sweetened beverages in school vending machines, but no mandate exists to require physical education for all grades (Kaiser Family Foundation, 2012).Research findings presuppose that the physical education curriculum should be an indispensable component for a school-based healthy lifestyle program; thus, policymakers should introduce and advocate for legislation to require physical education for all grades (Ling, 2014).

The challenge that the Canadian study observed is that there is a need for a repository of school-based interventions wherein program interventions and their results are shared (Mendelson, 2007). This is viewed as important to enable policy developers to access a comprehensive database of school-based interventions to recommend best practices. Mendelson (2007) further counsels that although action in children's health should proceed on the best available evidence rather than wait for better evidence, there is need of ongoing input of experts and leaders from all sectors and fields to help in effectively promoting healthy lifestyles while respecting each child's need for safety, security, and respect. It is additionally pronounced by Mendelson (2007) that to be able to fill the above-mentioned gaps, in addition to prospective longitudinal intervention research, the researchers also require applied research, including behavioral and process (advocacy and implementation) evidence in real-life settings to determine the best practices, policies, and programs as a basis for broader implementation.

CHAPTER 3

METHODOLOGY

Design

The study adopted a descriptive cross-sectional study design, with an analytical component. As noted, the study sought to establish factors associated with overweight/obesity at MAPS, with a view to determine a workable health promotion program for the children.

Population, Sampling Formula and Technique

The study was conducted at MAPS. Seventh-day Adventists are popular for upholding the health message. The school has enrolled both Adventists and none Adventists pupils. The study sought to investigate the degree of childhood overweight/obesity prevalence in this population. The study is the first of its kind, especially with children of ages 6 to 12 years.

To measure the sample in this research, *Slovin Formula* will be used as shown below (Simamora, 2004):

$$n = \frac{N}{1 + N(e)^2}$$

Where:

n is the sample size

N is the population size

e is the level of precision (0.05)

Then:

N is 446

$1 + N(e)^2 = 1 + 446\ (0.05)^2 = 1 + 446\ (0.0025) = 1 + 1.115 = 2.115$

Therefore

n = 446/2.115 = 210.8747044917 = 211 school children

A random sampling technique was used to select the respondents of this study. Mogoditshane Adventist School is a primary school with pupils of ages 6 to 13 years (male and female). Baranowski (1988) observes that previous research has suggested that children 10 years of age and under cannot recall activities accurately and are unable to quantify the time frame of activity. Therefore, the intent of the study involved only the parents and teachers of children of all grades, including Grade 6 and 7 (11 to 13-year-olds are in this group), given the time and financial constraints of the study.

Additionally, results show that parents are highlighted as crucially important in managing obese pre-adolescent children (Knowlden and Sharma, 2012; NICE, 2013; Oude Luttikhuis et al., 2009; SIGN, 2010). It is also significant to note that most clinical practice guidelines or consensus statements on the management of pediatric obesity stress the importance of parental and family involvement, although a small number provide age-specific recommendations (V. A. Shrewsbury et al., 2011).

The population of Mogoditshane Adventist School is 446 pupils. The sample size of 211 children was drawn from the population whose parents and teachers were interviewed. The study included black African children. Nonblack African (i.e. Asians and Caucasians) children were excluded. In instances where one parent is black African, the parents were requested to complete the questionnaire with information pertaining to that child, as that child is also considered black African.

The names of Mogoditshane Adventist School children were written in small pieces of paper and then collected and selected at random and picked children who were surveyed. This sampling method had no bias and all children had equal chances to be selected. For each child, a parent was interviewed. All available teachers were interviewed.

Validity and Reliability

This study tested for validity and reliability as shall be shown in the sections following. For validity as employed in this study the question asked if whether the right phenomenon has been measured and the accuracy of the measurements as further defined and determined in the following summarized ways:

Construct validity is the extent to which the research measures what it claims to measure. The questionnaire attached shows that the test items have a set of interrelated items.

Internal validity is the extent to which a piece of evidence supports a claim about cause and effect. The study, as discussed below, deliberately showed how bias was reduced.

External validity is whether the findings are applicable to the general population. The use of the probability sampling strategies indicates that the results of this research can be generalized across Adventist schools and similar schools; other populations and settings may simply learn pertinent lessons.

Reliability is defined as the degree to which a test is free from measurement errors, since the more measurement errors occur the less reliable the test (Fraenkel, Wallen, & Hyun, 2003; McMillan & Schumacher, 2001, 2006; Neuman, 2003). Therefore, in this study, it was ensured that the data collection techniques and analytic procedures would reproduce the same consistent findings if they were repeated on

another occasion or if replicated by another researcher. The research sought to avoid and limit participant error by all means possible (dates of birth were collected from the school, and children's height and weight were collected by an expert, and wherever possible the questionnaire was administered by a trained research assistant). Participant bias was managed in various ways including private interviews for parents. Researcher error was reduced by among other things ensuring that the weight scale is calibrated, and measurements for children are taken using standard procedure as shall be shown in the following sections. Researcher bias was addressed by the researcher's endeavor to be objective. As highlighted by (Messick, 1989), the unified idea of validity also includes reliability and the two are intertwined with each other.

Therefore, the next sections entailed how the equipment (scales for measuring BMI) and the data collection tools (Questionnaires/Interviews) were ensured to be valid and reliable. When measuring BMI, gender, age, and ethnicity were considered as discussed below. The data collection instruments were also modified from questionnaires and assessment tools that have been proved for reliability and furthermore tested for internal consistency for the current study. The additional open-ended and close-ended questions that were added followed the rules of making a valid and reliable questionnaire to ensure consistency, credibility and trustworthiness of the qualitative and quantitative instruments (detailed under sections on equipment and instruments, and data collection). Lastly, the two questionnaires were piloted with 10 parents and 10 percent of the teachers to test their validity and reliability (Isaac & Michael, 1995).

Measurements and Instrument for Data Collection

This study considered the three components of accurate measurements. These are (1) a standardized measurement technique, (2) quality equipment which is regularly calibrated and accurate, and (3) trained measurers who are reliable and precise in their technique (WHO, 1995; Henry, 1992).

Instrument

Upon approval from the Committee on Human Subject Research, the Health Research and Development Division of the Ministry of Health and Wellness of Botswana (the national committee responsible for approving human subject research), primary school children, their teachers and parents were invited to participate in this study. Standardized instruments (questionnaires) were used to measure the teacher's level of proficiency; the perceived impact of the school programs at overweight/obesity prevention; parenting style; and children's dietary and activity habits (sedentary behavior, physical activity, and sleeping duration). The data collection tools section elaborates on this more.

Anthropometric Measurements

Because BMI being widely used around the world, which enables comparisons between countries, regions and population sub-groups, this study employed this measure of body mass. BMI is the most commonly used measure in national and international obesity prevalence statistics and so is most useful for historical trend analyses and international comparisons (NOO, 2009).

The body mass index (BMI) is a commonly used measure of excess body weight, but it is not a direct measure of adiposity (Freedman and Sherry, 2009; Shah and Braverman, 2012). Excessive body weight may reflect high bone density

(Miljkovic et al., 2016), which directly correlates with an increase in BMI (Morin et al., 2009). This study will employ BMI because it remains a proxy in research for body weight and it has been directly associated with blood lipids (Katzmarzyk et al., 2001).

For validity and reliability of weight measurements, standardized equipment (Tanita scale was tested with Botswana Bureau of Standards and passed as safe to be used) was used with known masses to be certain of precision after measuring every 20 children. Height was measured by qualified and trained enumerators (research assistants). Bodyweight was measured to the nearest 0.1 kg in light clothing, and height was measured without shoes. The equipment was calibrated and maintained according to manufacturers' guidelines. BMI was calculated as body mass (W, kg) divided by height (H, m) squared. The BMI values were transformed into BMI z scores using WHO reference values for pediatric BMI (Mercedes De Onis, Onyango, et al., 2007):

The WHO weight classification is based on the BMI for-age z-scores for children and adolescents (5 through 19 years old – age and sex-specific):

Obesity (OB) if BMI > + 2 SD,

Overweight (OW) if BMI > +1 standard deviation (SD),

Normal weight (NW) between +1 SD and -2 SD,

Thinness (UW) if < - 2 SD,

Severe thinness (UW) if BMI < -3 SD.

The z-scores were used in this study because the BMI (and its percentiles) alone is not enough to describe overweight and obesity in children, as it does not differentiate fat from the lean mass (Wang & Chen, 2012). Daniels (2009) observes that the BMI percentiles also, may not adequately describe the risk for co-morbidities

and it is opined to not optimally stratify children and adolescents with BMI in the high percentiles.

Furthermore, the choice of z-scores is influenced by its advantages as follows:

> they are calculated based on the distribution of the reference population (mean and standard deviation), and thus reflect that reference distribution; second, as standardized quantities, they can be compared across ages, sexes, and anthropometric measures; third, Z-scores can be analyzed as a continuous variable in studies. In addition, they can quantify extreme growth status at both ends of the distribution (Wang & Chen, 2012).

This study chose among the several international references based on the appropriateness and trustworthiness of the reference to the population.

For example, The International Obesity Task Force (IOTF) references were not chosen because there are less geographically and temporary dependent than some other cut-offs and provide limited centile ranges (Cole et al., 2000). WHO standards and references were chosen because of their advantages pertaining to the population of the study as an African country (Ghana) was included in the sample (WHO, 2009), as well as the contextualization of z-scores that were explained below**.** Additionally, reference data depict physiological growth and the created software converting to SDS various anthropometric measurements allows expressing measurements as continuous variables (Rolland-Cachera, 2011) as also expressed above.

Botswana does not have national BMI references like some large populations. For example, the Centers for Disease Control and Prevention (CDC) references are used in United States (US) for children and adolescents' overweight and obesity evaluation(Ogden et al., 2014). As a result, there was no local reference to compare with the international BMI references. However, there was a study in Botswana that chose an international BMI reference based on scientific method.

The research, first known study to provide empirical evidence of a nutrition transition in Botswana and the potential role of SES, used the WHO z-score

categories for overweight and obesity in adolescents because these data sets included African children (WHO, 2009). The study stated that although The International Obesity Task Force (IOTF) recommended the use of different cut-offs based on validated epidemiological data sets from Brazil, the USA, Great Britain, Hong Kong, the Netherlands and Singapore (Cole et al., 2000), these guidelines would have reduced the prevalence of OB in the population by 1% with no change in OW. The research further suggested that since body composition in African subjects may vary from East Asian, European and North and South American subjects, therefore the WHO reference is the more representative standard. Another observation was an additional shortfall in the selection criteria that The IOTF cut-offs do not evaluate underweight, a factor that is still present in Botswana. Therefore according to these authors, the reference fitting the Botswana context is the WHO Reference (Wrotniak et al., 2012).

The aforementioned (which is consistent with the intent of this study) is based on the counsel of the expert consultation for WHO which agreed that BMI cut off points should be:

1. based on easy-to-obtain valid and reliable measurement in surveys and clinical settings;
2. sensitive to important health-related change over time for monitoring purposes;
3. science-based, with a sound general foundation, and with validity in the population in question;
4. able to predict risks in populations and detect a difference in risks between population groups;
5. useful for comparisons across populations; and based on ideas that are easy for policy-makers, clinicians, and the public to understand (The Lancet, 2004).

The decision of the consultation to make no attempt to redefine BMI cut-off points for each population separately but rather identify potential public health action points along the continuum of BMI and propose the methods by which countries

could make decisions about the definitions of increased risk for their population were used as a guide. Such an approach has several advantages:

1. the BMI cut-off points will cover differential risk and BMI versus body fat relations;
2. lack of availability of data for a specific population does not invalidate the cut-off points;
3. identification of a specific set of divisions should promote a standardized approach among countries;
4. the cut-off points should persist long term because the availability of new data will not trigger a revision;
5. the values are relevant both for public health purposes and to development of clinical guidelines, and finally,
6. it does not require additional measurement of waist for public health purposes but still allows for additional use of waist for screening and clinical purposes (The Lancet, 2004).

Based on the recommendation as tested and shown above, this study used the WHO Reference. The WHO Reference is more contextualized and the use of z-scores makes it safe to employ as stated above.

Race and Ethnicity

This study considered data from a growing number of studies that have highlighted that there is a correlation between total cholesterol and obesity among children and that this relationship varies by race and ethnicity. Braet et al (2004) further suggest that genetic variability might be due to adaptation to longer-term stresses in the geographic region in which different groups evolved, perhaps related to climate and local disease load (Braet et al., 2004). They also highlight that body composition differs across race, citing examples of non-Hispanic black children that have lower levels of body fat at a given BMI level than Mexican American and non-Hispanic white children.

Researchers in an important finding from the WHO Growth Study stated that

despite differences in racial and ethnic background, there were minimal differences in the rates of linear growth observed among the six countries sampled. After adjusting for age and sex, the variability in the measured length of participants from birth to 24 months was overwhelmingly due to differences among individuals (70% of the total variance) and only minimally to differences among countries (3% of the total variance) (WHO, 2009).

The abovementioned strengthens the evidence that children of all ethnic backgrounds have similar potential for growth when raised in environmental conditions favorable to growth, particularly smoke-free households, and have access to health care and good nutrition (Dietitians of Canada, Canadian Paediatric Society, 2010). Although the above mentioned seems consistent with various studies, it is also observed that the international reference charts for monitoring the secular trends in childhood obesity need to be continually refined and evaluated (Lobstein et al., 2004).

Data Collection Questionnaires and Procedures

The strategy to be adopted for data collection was the use of interviews (questionnaires). Two questionnaires were developed. These were used to capture the views of parents and teachers. The parent's questionnaire was mostly quantitative, while the teachers 'were mainly qualitative in approach.

The study, with regards the parent's questionnaire, was conducted by interviewing the parents of the 211 children available to be interviewed in person, and their thoughts and perceptions were gathered by administering the Eating Behavior and Activity Habits Survey: Parent's Questionnaire (The word 'activity habits' includes the factors sleep duration, sedentary behavior, and physical activity). A list of appointments was obtained on each data collection day from the school staff before collecting the data, and some parents who preferred to do the questionnaire at home

were afforded the opportunity. Research assistants were dispatched; these assistants also helped with translation into Setswana where necessary.

Information about the age and gender of the children was obtained from the school staff on the day of data collection. To increase the participation rate, study participants were informed early of the benefit of the study to their children and the nation at large. Private school-going children and their parents are in a high socioeconomic status, and therefore motivation in monetary terms was not engaged as thought to possibly not encourage participation. Respondents were not offered money to participate in the study.

The study itself encouraged the involvement of teachers since it was a community-based study, which teachers are a part of. The researcher believed this encouraged the participation of a large number of teachers in this study.

The questionnaires have demographic and socioeconomic variables in common (enclosed in the questionnaire in detail). These were demographics of the child and parent such as age, sex, and ethnicity; and the socioeconomic status of the parents (income, employment status and occupation, and parental education) and other factors that have to do with the health concerns of children. Data were scored on these variables accordingly.

The Eating Behavior and Activity Habits: Parent's Questionnaire

This study developed questions about eating behavior and activity habits factors (independent variables) mainly by using the Family Eating and Activity Habit Questionnaire-Revised (FEAQ- R). This questionnaire is basically centered on the parent and therefore forms the basis of the parental questionnaire as explored next. Select questions were used and modified to meet the requirements of this study.

The Family Eating, and Activity Questionnaire Revised (FEAQR)

The Family Eating and Activity Habit Questionnaire-Revised (FEAQ-R) was used to collect parental and family eating and activity habits data (Golan and Weizman, 1998). Co-researchers Golan and Weizman identified the factors that affect obesity and weight loss in children and divided these independent variables into four scales and developed a questionnaire using these scales which is the FEAQ. The four scales are activity level, stimulus exposure (energy-dense food items and eating-related to hunger, and eating style), eating-related to hunger, eating style (while watching television or when bored). Previous studies have demonstrated utility and internal consistency of the questionnaire (Golan and Weizman, 1998). Therefore, the current study used the questionnaire, further tested it for its reliability for the local context.

Open-ended questions were added to the questionnaire (see appendix) to assess parental child feeding for effectiveness. Open-ended questions were included in the above-mentioned questions where in-depth knowledge is required. This research added three open-ended questions on the last section of the questionnaire to get parents' perceptions and suggestions on factors influencing obesity, as well as their ideas about its prevention. This study also mainly showcased the use of the Likert and rating scales, and dichotomous scales (shown with the other similar scales in the enclosed questionnaires) suggested by (L. A. Clark and Watson, 1995) as the two dominant response formats in modern scale construction.

The FEAQ-R does not have questions pertaining to sleep duration. For the purposes of this study, two questions on sleep duration were added to the parent's questionnaire. One question was in the eating behavior section, and the other was included in the activity habit section of the parent's section. Additionally, the parent's

questionnaire enclosed questions to help measure effectiveness, especially on its qualitative side. Lastly, some questions from the Town of Northborough Childhood Obesity Needs Assessment for 2008 to 2009 (Northborough Childhood Obesity Needs Assessment Report, 2008-2009), which was used mainly to form part of the Teacher's questionnaire, were added to the Parent's questionnaire to complement and further modify it to cater for all factors discussed in the study.

These questions were written through the guidance of proper questionnaire formulation rules. This is an important consideration for consistency with the other items in the questionnaire for reliability and validity. Additionally, this questionnaire was pretested with 10 children from the population of the research. This was to test the instrument for reliability and validity during the pilot test. After the additional questions were modified accordingly for the current study the internal consistency (Cronbach's α) ranged from 0.70 to 0.83 and was considered acceptable for this study.

The Eating Behavior and Physical Activity Assessment Toolkit: The Teacher's Questionnaire

This questionnaire was mainly qualitative with open-ended questions. The teacher's questionnaire focused on only 2 factors predominant with the school setting: Eating Behavior and Physical Activity. The principle survey that this questionnaire was derived and modified from is the Town of Northborough Childhood Obesity Needs Assessment for 2008 to 2009. Independent variables (as shown in the questionnaire) were derived from the relevant aspects of the objectives and factors influencing obesity with regards the school setting, and the teachers' (personal and public data). The data was gathered through open-ended questioning of their attitudes and experiences and inductively probing their responses.

The intention is to fill a gap in public health toolbox, and as Bernard asserts,

and help to explain the why and how of health issues and provide a more in-depth understanding of who, what, and when (2011). Therefore, this questionnaire addressed concerns of validity and reliability (find enclosed questionnaire with its sections). To further address the issues of consistency, adequacy, and credibility the study was sensitive to context, the natural setting in which behaviors and beliefs occur or arise (Hammersley, 2008). Therefore, translators were available to ensure respondents understood the questions and had the chance to explain his or her response.

There were a small number of close-ended questions that were followed consistently by open-ended questions for an in-depth understanding of the factors of this new area of childhood obesity. This includes qualitative questions on effectiveness. Like the parental questionnaire, this last section of the teachers' questionnaire also gathered teachers' perceptions and suggestions on factors influencing obesity, as well as their ideas about its prevention.

The demographic and socioeconomic details in this questionnaire only involved the teacher, not the child, since it is understood that they are filling in data about the school children and the school in general. The questionnaire was also pretested with 10 % of the teachers from the population of the research. This was to test the instrument for appropriateness and trustworthiness during the pilot test.

Therefore, after the pilot test was conducted, class teachers and parents were asked for feedback regarding the survey schedule and questionnaire. Participants were asked if they had any difficulty with understanding and answering the questionnaires. They were also asked to communicate their recommendations for the improvement of the questionnaires. Part of the reason for the pilot test was to verify the suitability of the instruments for the African (Botswana) context. The suggested changes were

noted and appropriated accordingly.

Method of Data Analysis

Quantitative (Mainly Dealing with Parent's Questionnaire)

After the numbering of the questionnaires, collection of data in the form of a questionnaire was manually entered into a computer file using Stata13 statistical software to create a database (Although the BMI z-scores were computed with the use of the WHO Anthro Plus, and the condition produced added onto Stata13). Statistical estimates in this study were computed using Statistical Package for Stata13. Values were assigned to the response categories for the questions that have more than one response choice.

To describe the socio-demographic characteristics, eating behavior, and activity habits, as well as the parental factors, a descriptive measure of percentage was calculated. The descriptive statistics described the characteristics of the parents and children who participated in the study. By calculating the descriptive measures like mean and standard deviation for height, weight, BMI, as well BMI z-scores for the child participants, physical measures of children were also described.

After generating frequencies for each of the variables, the researcher used cross-tabulations to explore overweight/obesity or obesity among children between the ages of 6 and 13 differs by socio-demographic factors, eating behavior, and activity habits. Next, a binary logistic regression was then used to test how well the predictor variables independent variables predicted or explained overweight/obesity or obesity among children and adolescents between the ages of 6 and 13 (Logistic regression refers to statistical models where the dependent, or outcome variable, is categorical: In the present study the logistic regression model was performed to

predict characteristics of overweight/obese and obese school-aged children compared with not being overweight or obese).

Finally, the researcher conducted a multivariate analysis using logistic regression to examine the likelihood of the overweight or obesity explained by each of the independent variables. Thus, adjusting for it using multivariate analysis controlled confounding. The adjusted odds ratios were calculated to quantify the strength of association between risk factors and variables with a p-value less than 0.05 were considered significant. Furthermore, odds ratios and Chi-square tests at 5% significant levels and 95% confidence intervals were generated using the software. Odds ratios were interpreted as follows: OR=1 (exposure does not affect odds of outcome); OR>1 (exposure associated with higher odds of outcome);OR<1 (exposure associated with lower odds of outcome).

The independent variable with less than 148 observations was not included in the analysis with regards to the univariate analysis and multivariate analysis, and a minimum of 10 cases with the least frequent outcome for each independent variable in the model was required. Multicollinearity of the independent variables was checked by standard error, and variables with standard error of greater than two were excluded from the multivariate analysis.

Qualitative (Mainly Dealing with the Teachers' Questionnaires)

After numbering questionnaires, the qualitative data was examined to derive an explanation for each specific phenomenon. This was to understand the research objectives by revealing patterns and themes in the data. This was based on the factors and variables of the study.

Ethical Considerations

The researcher upheld the principles of confidentiality in order to protect the respondents from possible harm. Therefore, the information from the respondents was between the researcher and the respondent. The research participants signed the consent form, and they were supplied with relevant and all the information they needed to know about the study protocols.

As detailed in the consent form, the respondents were initially told about the purpose of the study as outlined in this work. Then that was followed by communication about the benefit of the study, whether or not there were payments or if they had any right to refuse or withdraw from the study. The consent form had information supplied to the participants that the research may result in a decreased incidence of overweight/obesity in Mogoditshane and surrounding area.

The respondents were also informed that they were not to be paid for participation in the study. The parents and teachers who agreed to participate in the research were then required to complete a consent form and were informed of their autonomy and self-determination and that they retained their right to withdraw from the study at any time without affecting their relationship with the investigators. The parents of the school children consented on their behalf. The names of the participants or any type of identifier of the respondents were not included in the study.

CHAPTER 4

RESULTS

This chapter is a summary of the study findings, as well as the details of its statistical output. The results are reported succinctly through the use of tables. This chapter merged the quantitative and qualitative data reporting on the demographic characteristics of the participants and their children, participants' eating behavior, and activity habits (physical activity, sedentary behavior, and sleep duration) in the home, school, and community as well as the caregiver feeding styles of parents of MAPS School children, and furthermore capture the teachers' perceptions on eating behavior and physical activity, as well as both the teachers and parents perceptions regarding the obesity prevention intervention. The quantitative outcomes consist of descriptive statistics, whereas the qualitative results consist of narrative descriptions embodied in themes and quotes generated from the data.

Demographic Characteristics of the Participants

Two hundred and eleven (211) potential respondents were invited to participate in the study, and the consent forms were distributed to them. Thirty-three parents did not consent. Questionnaires were distributed to the 178 participants who consented. A total of 160 respondents completed the survey. Eight participants were excluded from the study because some children were transferred before they were measured for BMI, and others were dropped because their dates of birth were not included for analysis by the WHO Anthro Plus. Thus, a total of 152 participants remained for the logistic regression analysis (Only 1 variable had responses below

148 observations, which is less than 70% of the sample; namely ‘gender of parent’.

Characteristics of Parent Participants

Table 1 presents the characteristics of the parent participants. Mothers (Females) constituting 63.8% of the total study sample were the majority of the participants. In place of residence, Gaborone accounted for 44.7% of participants, followed by Mogoditshane (29.6%), and lastly Greater Gaborone (24.3), those who stay near Gaborone/Mogoditshane. About 74.0% of the sample distribution was married. The data on ethnicity shows that the study participants were mostly Batswana (plural for Motswana) comprising 81.6%, and the other category were other African nationals (13.8%). Adventists were 44.7%, while non-Adventists were 53.9% (see the rest of the results below).

Table 1. Distribution of Parent Participants according to their Characteristics

Characteristics	Parent Participants	N	%
Gender of Parent	Male	34	22.4
	Female	97	63.8
Place of Residence	1. Gaborone	68	44.7
	2. Mogoditshane	45	29.6
	3. Greater Gaborone	37	24.3
Name of Church	1. Adventist	68	44.7
	2. Non-Adventist	82	53.9
Marital Status	Married	112	73.7
	Unmarried	37	24.3
Nationality (Participant)	Motswana (African)	124	81.6
	Other Known African Nationality	21	13.8
	Unknown African Nationality	7	4.6
Nationality (Partner/Spouse)	Motswana (African)	91	59.9
	Other Known African Nationality	29	19.1
	Unknown African Nationality	32	21.0

Table 2 shows more distribution on the characteristics of the parent participants. The findings pertaining to the education status of the parent participants indicate that approximately 91% of the parents attended some college, have a bachelor's degree or masters/Ph.D., while only slightly less than 9% have high school or less than high school qualification. The sample for occupation had 32.9% of the participants who selected the response "Government/Private Sector", 11.2% were "other", 12.5% worked in the healthcare sector, while another 13.8% indicated they were in business (More response choices are in Table 2).

Approximately 78.3% of the participants were confident that they were middle class (lower middle class or upper-middle-class). Only 3.3% indicated that they were probably in the lower class since they sometimes struggled to pay school fees (When their education, and the education of their spouse/partner, as well as their occupation, and the occupation of their spouse/partner were considered this study found all parents to be in the high socioeconomic status; those who were students or single and unemployed themselves had the extended family that supported them to the extent of providing their children with private school attendance).

Table 2. Distribution of Parent Participants according to their Characteristics

Characteristics	Parent Participants	N	%
Education (Participant)	Less than High School/High School	13	8.6
	Certificate, Diploma, Higher Diploma	42	27.6
	Bachelor's Degree	61	40.1
	Masters or PhD	36	23.7
Education (Partner/Spouse)	Less than High School	1	0.7
	High School	8	5.2
	Certificate, Diploma, Higher Diploma	40	26.3
	Bachelor's Degree	40	26.3
	Masters or PhD	18	11.8
Occupation (Participant Parent)	School Teacher/Lecturer	17	11.2
	Government/Private sector	50	32.9
	Agriculture/Farming	3	2.0
	Health Care	19	12.5
	Business	21	13.8
	Military	5	3.3
	Student	5	3.3
	Unemployed	1	0.7
	Other	17	11.2
Occupation (Sponsor/Partner)	School Teacher/ Lecturer	13	8.6
	Government/Private Sector	40	26.3
	Agriculture/Farming	3	2.0
	Health Care	9	5.9
	Business	32	21.1
	Military	3	2.0
	Student	0	0.0
	Unemployed	1	0.7
	Other	11	7.2
Family Income	Upper Middle Class	5	3.3
	Lower Middle Class	119	78.3
	Lower Class	5	3.3

Table 3 is the last of the background variables. The data distribution shows vegetarians (10.5%), and non-Vegetarians (87.5%). About 30% of the parents thought they were overweight/obese. Exactly 61.2% of the parents' participants thought they had normal weight while 7.2% were of the opinion that they were underweight. Parents opined that 19.7% of their children were overweight/obese. The percentage of children parents thought had normal weight was 75.0, while they thought 5.3 percent to be underweight. The parents concerned about the bodyweight of their children were

40.8%. The remainder of the parents (57.2%) said they were not concerned about the bodyweight of their children.

Table 3. Distribution of Parents Participants according to their Characteristics

Characteristics	Parents Participants	N	%
Vegetarian or Non-Vegetarian	Vegetarian	16	10.5
	None Vegetarian	133	87.5
What do you think about your weight as a parent?	Obese/Overweight	46	30.3
	Normal	93	61.2
	Underweight	11	7.2
What do you think about your child's weight?	Obese/Overweight	30	19.7
	Normal	114	75.0
	Underweight	8	5.3
Are you concerned about your child's weight	Yes	62	40.8
	No	87	57.2

Characteristics of Child Participants

Table 4 below is presented the characteristics of the children participants. Approximately forty-three percent of the children who participated in the study were male, while 57.2% were females. The ages of children participants were from ages 6-13 (All the children registered their age, and the mean of their age was about 9).Group 1 (6 to 9years) was 38.2, while group 2 (10 to 13 years) was 61.8%. The prevalence of obesity/overweight was slightly high in the age group 6-9 years (29.1%). Group 2(10-13 years) was 27.8%. Of the children sampled 14.5% were singularly obese, while 33.6% were overweight/obese.

Table 4. Characteristics of Child Participants

Characteristics	Children	N	%
Age	6 – 9	58	38.2
	10 -13	94	61.8
Gender of Child	Male	65	42.8
	Female	87	57.2
BMI-z scores	Obese (BMI >+2SD)	22	14.5
	Overweight (BMI >+1SD)	29	19.1
	Normal (BMI between +1 and -2)	96	63.2
	Thinness (BMI < -2SD)	4	2.6
	Severe Thinness (BMI < -3SD)	1	0.7

Table 5 summarizes the descriptive statistics of the physical measures of the children participants. The school children of MAPS had a mean height of 138.4 centimeters with a minimum of 113.5 centimeters and a maximum of 165.0. The mean weight for children was 35.6 kilograms. Bodyweight for children ranged between 14.7 kilograms and 83.8 kilograms. Children had a mean BMI of 18.5. The BMI z scores had a mean of 0.5, standard deviation of 1.6, as well as a minimum of -3.2 standard deviation and a maximum of 5.3 standard deviations. The BMIs used to compute the BMI z scores are in the results below. (The BMIs of the children were adjusted for child age and sex to get measures of relative weight called BMI z-scores or BMI standard deviation, which generated the result for the conditions shown in figure 1).

Table 5. Descriptive Statistics of Children's Height, Weight, BMI, and BMI Z Scores

	Sample Size	Minimum	Maximum	Mean	SD
Height	152	113.5	165.0	138.4	12.6
Weight	152	14.7	83.8	35.6	13.3
BMI	152	48.0	12.6	18.5	5.0
BMI z scores	152	-3.2	5.3	0.5	1.6

Association of Overweight/Obesity with Socio -demographic Characteristic

Tables 6 and 7 discuss the association of obesity/overweight with socio-demographic characteristics of study subjects. In table 6, overweight/obesity was higher among ages 10 to 13 years (38.3%%) than 6 to 9-year-olds (25.9%). Overweight/obesity was almost equal in genders of children, female children (33.7%) and male children (33.3%). The percentage of male parents (32.6%) who had overweight/obese children in comparison with female parents (22.7%) was higher.

The places of residence in Gaborone (38.2) and Mogoditshane (26.7%) showed lower percentages of overweight/obesity than places of residence a distance from Gaborone/Mogoditshane (64.9%) called greater Gaborone (Perhaps, children of parents in HSES who can afford private school tuition). The unmarried (46.0%) showed a substantial-high percentage of overweight/obesity than married (29.5%). At that high rate it did not surprise that though not statistically significant when associated with overweight/obesity, it showed a trend towards statistical significance (0.068) and double the odds of being overweight/obese for the unmarried.

The vegetarian and Church frequencies shown below will be discussed further in one of the following sections to find out how they interact with each other and obesity or overweight/obesity. This is to suggest why vegetarians (72.4%) and Adventists (38.2%) had higher overweight/obesity percentages than non-vegetarians (62.5%) and non-Adventists (38.2%).

Table 6. Association of Obesity/Overweight with Socio-demographic Characteristics of Study Subjects

Characteristics	Overweight/Obesity				P-value	Crude OR (95% CI)
	No		Yes			
	Freq	%	Freq	%		
Age Categories						
6 – 9	43	74.1	15	25.9		1
10 –13	58	61.7	36	38.3	0.117	1.779 (0.866-3.655)
Gender of Child						
Female	57	66.3	29	33.7		1
Male	44	66.7	22	33.3	0.960	0.983 (0.498-1.939)
Gender of Parent						
Female	68	77.3	20	22.7		1
Male	29	67.4	14	32.6	0.230	1.641 (0.730-3.688)
Place of Residence						
Gaborone	42	61.8	26	38.2		1
Mogoditshane	33	73.3	12	26.7	0.205	0.587 (0.258-1.336)
Greater Gaborone	24	35.1	13	64.9	0.754	0.875 (0.380-2.014)
Name of Church						
Non-Adventist	59	72.0	23	28.0		1
Adventist	42	61.8	26	38.2	0.187	1.588 (0.799-3.155)
Marital Status						
Married	79	70.5	33	29.5	0.068	1
Unmarried	20	54.0	17	46.0		2.035 (0.948-4.367)
Vegetarian/Non-Vegetarian						
Non Vegetarian	92	69.2	41	62.5		1
Vegetarian	9	56.3	7	72.4	0.300	1.745 (0.608-5.008)

The statistics in table 7 show about equal percentages of Batswana children with other African nationalities with obese /overweight among participant parents (32.5% and 33.3% respectively). The partner/spouse of participant children (40.9%) had 12.3% of obesity /overweight prevalence more than Batswana (28.6%). Overweight/obesity levels were in the following order according to the level of education of participant parent from the highest to the lowest: masters/Ph.D. (50.0%), Less than high school/High school (38.5%), Degree (31.1%), and certificate diploma (23.1%). The perception of the parents about their own weight and the weight of their

children with regards overweight/obesity was such that those who thought they had normal weight actually had about 30% overweight/obesity.

Parental perceptions about underweight and overweight/obesity of both their own weight and that of their children revealed actual higher percentages of those who were overweight/obese than those who were underweight (50.0 and 36.4% respectively). Parents who were concerned about their weight registered 52.0% overweight/obese compared to 20.0% of those not concerned (The high percentages presuppose an intelligent understanding of the children's overweight/obesity status by their parents). Parental concern for a child's body weight (overweight/obesity) showed a strong association [OR = 4.156, 95% CI: 2.028–8.513], and was statistically significant (0.000).

Table 7. Association of Overweight/Obesity with Socio-demographic Characteristics of Study Subjects

Characteristics	Overweight/Obesity				P-value	Crude OR (95% CI)
	No		Yes			
	Freq	%	Freq	%		
Nationality of Participant						
Motswana	81	67.5	39	32.5		1
Other known African National	14	66.7	7	33.3	0.901	1.064 (0.398-2.846)
Unknown African National	4	57.1	5	42.9	-	-
Nationality of Spouse						
Motswana	65	71.4	26	28.6		1
Other Known African National	26	59.1	18	40.9	0.154	1.731 (0.815-3.677)
Unknown African National	10	58.8	7	41.2	0.304	1.75 (0.602-5.090)
Education of Participant						
Less than High School/						
High School	8	61.5	5	38.5		1
Certificate, Diploma	33	78.6	9	21.4	0.225	0.436 (0.114-1.664)
Bachelor's Degree						0.724 (0.209-2.506)
Masters/PhD	42	68.9	19	31.1	0.610	1.6 (0.439-5.838)
	18	50.0	18	50.0	0.477	
Parental Concern about Child's Body Weight						
No	68	79.1	18	20.9		1
Yes	30	47.6	33	52.4	0.000	4.156 (2.028-8.513)
Parents Thoughts about Her/ His Weight						
Underweight	4	50.0	4	50.0		1
Normal	80	70.2	34	29.8	0.672	0.754 (0.204-2.783)
Obese/Overweight	17	56.7	13	43.3	0.971	1.026 (0.262-4.023)
Parents Thought about Child's Weight						
Underweight	7	63.6	4	36.4		
Normal	65	70.0	28	30.0	0.245	0.425 (0.100-1.799)
Obesity/Overweight	29	63.0	17	37.0	0.737	0.765 (0.160-3.649)

Association of Obesity with Socio-demographic Characteristics

Tables 8 and 9 discuss the association of obesity with socio-demographic characteristics of study subjects. In table 8, obesity was higher among ages 10 to 13 years (16.0%) than 6 to 9-year-olds (12.1%). Obesity also showed higher percentages by about 7% in both children and parents in the male gender [Male children (18.2%)

and male parents (20.6)].

The places of residence in Gaborone (17.6%) and Mogoditshane (6.7%) showed lower percentages of obesity than places of residence a distance from Gaborone/Mogoditshane (18.9%) called greater Gaborone (Perhaps, children of parents in HSES who can afford private school tuition). The prevalence of obesity was almost equal for children from Gaborone and Greater Gaborone. The unmarried (21.6%) showed about double more obesity to the married (12.5%). The vegetarian and Church frequencies shown below will be discussed further in one of the following sections to find out how they interact with each other and obesity or overweight/obesity. This is to suggest why vegetarians (18.8%) and Adventists (19.1%) had higher obesity percentages than non-vegetarians (12.8%) and non-Adventists (11.0%).

Table 8. Association of Obesity with Socio-demographic Characteristics of Study Subjects

Characteristics	Obesity				P-value	Crude OR (95% CI)
	No		Yes			
	Freq	%	Freq	%		
Age Categories						
6 – 9	51	87.9	7	12.1		1
10 –13	79	84.0	15	16.0	0.509	1.383 (0.528-3.627)
Gender of Child						
Male	54	81.8	12	18.2	0.258	1.689 (0.681-4.191)
Female	76	88.4	10	11.6		1
Gender of Parent						
Male	27	79.4	7	20.6	0.320	1.675 (0.606-4.627)
Female	84	86.6	13	13.4		1
Place of Residence						
Gaborone Mogoditshane	56	82.4	12	17.6		1
Greater Gaborone	42	93.3	3	6.7	0.105	0.333(0.088-1.256)
	30	81.1	7	18.9	0.872	1.089(0.388-3.057)
Name of Church						
Non-Adventist	73	89.0	9	11.0		1
Adventist	55	80.9	13	19.1	0.165	1.917 (0.765-4.807)
Marital Status						
Married	98	87.5	14	12.5		1
Unmarried	29	78.4	8	21.6	0.180	1.931 (0.738-5.055)
Vegetarian/Non-Vegetarian						
Non Vegetarian	116	87.2	17	12.8	0.511	1
Vegetarian	13	81.3	3	18.8		1.575 (0.406-6.102)

The statistics in table 9 show about equal percentages of Batswana children with known African nationalities with obesity among participant parents (13.9% and 14.3% respectively). The children of partner/spouse of participant parents of known African (18.2%) had 7.2% of obesity prevalence more than Batswana (11.0%). Obesity levels were in the following order according to the level of education of participant parent from the highest to the lowest: degree (85.2%), masters/Ph.D. (83.3%), less than high school/high school (30.7%), and certificate diploma (7.7%). The perception of the parents about the weight of their children in the category of underweight with regards obesity was the most puzzling. About 38% of children

thought to be underweight were actually obese. This was the highest figure in the responses on parental perceptions on their children's weight (See the rest of the responses in the table below). Parents' perception of their weight, in relation to obesity status of their children, was not as exaggerated as that of their perception of their children's weight. Parents who were concerned about their weight registered 25.4% obese children compared to 7.0% of obesity among those were not concerned (The high percentages presuppose an intelligent understanding of the children's obesity status by their parents). Parental concern for child's body weight (obesity) also showed a strong association [OR = 4.539, 95% CI: 1.661–12.401] and was statistical significance (0.000).

Table 9. Association of Obesity with Socio-demographic Characteristics of Study Subjects

Characteristics	Obesity				P-value	Crude OR(95% CI)
	No		Yes			
	Freq	%	Freq	%		
Nationality of Participant						
Motswana	105	86.1	17	13.9		1
Known African National	18	85.7	3	14.3	0.966	1.029 (0.274-3.874)
Unknown African National	7	85.7	2	14.3	-	-
Nationality of spouse						
Motswana	81	89.0	10	11.0		1
Known African National	36	81.8	8	18.2	0.254	1.800 (0.656-4.938)
Unknown African National	13	76.5	4	23.5	0.168	2.492 (0.680-9.136)
Education of Participant						
Less than High School/ High School	9	69.2	4	30.7		1
Certificate, Diploma	39	92.9	3	7.1	0.039	0.173 (0.033-0.913)
Bachelor's Degree	52	14.8	9	85.2	0.179	0.389 (0.099-1.539)
Masters/PhD	30	16.7	6	83.3	0.286	0.450 (0.104-1.954)
Parental Concern about Child's Body Weight						
No	80	93.0	6	7.0		1
Yes	47	74.6	16	25.4	0.003	4.539 (1.661-12.401)
Parents Thoughts about Her/ His Weight						
Underweight	10	90.9	1	9.1		-
Normal	82	89.2	11	11.8	-	-
Obese/Overweight	37	80.4	9	19.6	-	-
Parents Thought about Child's Weight						
Underweight	5	62.5	3	37.5		-
Normal	103	90.4	11	9.6	-	-
Obesity/Overweight	22	73.3	8	26.7	-	-

There is a challenge where the statistics in table 6 above showed that the Adventist children, in general, have a higher prevalence of obesity/overweight than non-Adventist children (The health study among Adventists showed the advantages of a vegetarian diet against chronic diseases including the condition of obesity). The answer to that question may be that not all Adventists are vegetarians or fully subscribe to healthy living and eating or vegetarianism. The findings below (Table 10) seem to suggest additional reasons. The results show that, although Adventists are

slightly less than non-Adventist in the sample, the largest count in the variable 'Name of Church' is that of Adventists who live in Gaborone (36). The number 36 translates into 57.1% of Adventists in comparison with 42.9% of non-Adventists. Non-Adventists who stay in Mogoditshane and the rural villages nearby were 61.0% in comparison with the 39.0% of Adventists.

Therefore the cause of the high prevalence among Adventists might in part be due to the Adventists parents in Gaborone and the HSES class who can afford private school fees. In Africa, the prevalence of childhood obesity /overweight is high in urban areas. Equally, the demographics of high percentages of non-Adventist whose place of residence was Mogoditshane seemed to suggest that the majority of the HSES parents and children, with a high prevalence of obesity, are opting for other schools, perhaps based on religious affiliation or other persuasions as Adventists also opt for an Adventist school (As a result the non-Adventists at MAPS might not be as affluent as the Adventists at the said school as was shown in tables 11 to 14 below).

Table 10. Frequencies of Name of Church with Place of Residence

Place of Residence	Name of Church			
	Adventist		Non-Adventist	
	N	%	N	%
1. Gaborone	35	53.0	31	47.0
2. Mogoditshane	16	35.6	29	64.4
3. Greater Gaborone	16	43.2	21	56.8

Statistics seemed confusing for vegetarians (about 44% of children of vegetarians were overweight/obese) until it emerged from the data that only 2 out 7 children of vegetarians who were obese /overweight were Adventists. The observation is that Adventists more commonly practice vegetarianism as a family (meaning that there is a high probability that the children also practice vegetarianism), whereas in

the case of non-Adventist vegetarians vegetarianism might only be practiced by the participant parent as a choice, or for health reasons, and that may not mean that the children also practice vegetarianism (There is also the likelihood that, in case the non-Adventist who practices vegetarianism and whose children are also vegetarian, if that practice is not informed by healthy vegetarian supplementary foods, then the parent may supply the children with an unhealthy substitute diet that predisposes the children to obesity/overweight).

Tables 11 and 12 below further elucidates on the differences between Adventists and non-Adventist, vegetarianism and overweight/obesity. Adventist vegetarians (33.3%) have less overweight/obesity among their children than non-Adventist vegetarians (62.5%). It is worrisome that non-Adventist vegetarians have more than half of their children in the overweight/obesity category (further, probably, making authentic the argument that non-Adventist vegetarian children maybe from household experiencing dietary problems). Startling as well are the responses that show that non-Adventist non-vegetarians have the lowest prevalence of overweight/obesity (25.4%).

Another interesting contrast is that Adventists children from vegetarian families have a healthier weight than those from Adventist non-vegetarian households, while children from non-Adventists non-vegetarians have a healthier weight than non-Adventist vegetarians (See responses in Table 11 below). It is interesting to observe that the highest no of responses (21) from any category, which is non-Vegetarian (72.0%), is actually from Mogoditshane (semi-urban and semi-rural). Generally, as observed in table 10, Adventists have large numbers from the urban center (Gaborone), while non-Adventists have more children from the semi-urban (Mogotshane) and villages beyond (rural). As discussed above, it seems plain

that the place of residence influence overweight/obesity.

Table 11. Frequencies of Place of Residence with Adventist Vegetarians and Non-vegetarians (Overweight/Obesity)

Place of Residence	Adventist			
	Vegetarian		Non-Vegetarian	
	Overweight/ Obese (%)	Not Overweight/ Obese (%)	Overweight/ Obese (%)	Not Overweight/ Obese (%)
1.Gaborone	1 (25.0)	3 (75.0)	12 (38.7)	19 (61.3)
2.Mogoditshane	0 (0.0)	1 (100.0)	5 (31.2)	11 (68.8)
3. Greater Gaborone	1 (33.3)	2 (66.7)	6 (50.0)	6 (50.0)
Total	2 (33.3)	6 (66.7)	23 (39.0)	36 (61.0)

Table 12. Frequencies of Place of Residence with Non-Adventist Vegetarians and Non-Adventist Non-vegetarians (Overweight/Obesity)

Place of Residence	Non-Adventist			
	Vegetarian		Non-Vegetarian	
	Overweight/ Obesity (%)	Not Overweight/ Obesity (%)	Overweight/ Obesity (%)	Not Overweight/ Obese (%)
1. Gaborone	2 (66.7)	1 (33.3)	7 (28.0)	18 (72.0)
2. Mogoditshane	2 (50.0)	2 (50.0)	5 (23.8)	21 (76.2)
3. Greater Gaborone	1 (100.0)	0 (0.0)	6 (30.0)	14 (70.0)
Total	5 (62.5)	3 (37.5)	18 (25.4)	53 (74.6)

Tables 13 and 14 below additionally elucidates on the differences between Adventists and non-Adventist, vegetarianism and obesity. Adventist vegetarians (12.5%) have less obesity among their children than non-Adventist vegetarians (25.0%). Non-Adventist vegetarians children have double the percentage of their Adventist counterparts in the obesity category (also further, probably, making authentic the argument that non-Adventist vegetarian children maybe from household experiencing dietary problems).

These figures are a little less problematic than the overweight/obesity

prevalence. Even lower than overweight/obesity prevalence and more startling are the responses that show that non-Adventist non-vegetarians have the lowest prevalence of obesity (9.1%). It also obtains in another interesting contrast that Adventists children from vegetarian families have a healthier weight than those from Adventist non-vegetarian households while children from non-Adventists non-vegetarians have a healthier weight than non-Adventist vegetarians with regards obesity weight status as with overweight/obesity (See responses in Table 13 below).

Even more interesting is the observation that the highest no of responses (23) from any category (under obesity), which is non-Vegetarian (100.0%), is actually also from Mogoditshane (semi-urban and semi-rural). None of the children from Mogoditshane in that category is obese. Therefore, it also obtains here, as observed in table 10, Adventists have large numbers from the urban center (Gaborone), while non-Adventists have more children from the semi-urban (Mogoditshane) and villages beyond (rural).

As discussed above (in Table 10), it seems plain also here as we discuss obesity as when we studied overweight/obesity in the last paragraph, that the place of residence influences obesity (urban centers have a higher prevalence than the semi-rural and rural places). The affluence of those in the city, apparently, predisposes them to obesity (Education and occupation appear to worsen the situation: Adventists in this sample have better education and occupation than their non-Adventist counterparts – see APPENDIX E). Being more educated and having occupations paying high wages means the ability to buy processed foods that also adversely harm their health and the health of their children.

Table 13. Frequencies of Place of Residence with Adventist Vegetarians and Adventist Non-Vegetarians (Obesity)

Place of Residence	Adventist			
	Vegetarian		Non-Vegetarian	
	Obese (%)	Not Obese (%)	Obese (%)	Not Obese (%)
1. Gaborone	1 (33.3)	2 (66.7)	8 (34.8)	23 (65.2)
2. Mogoditshane	0 (0.0)	1 (100.0)	5 (33.3)	10 (66.7)
3. Greater Gaborone	0 (0.0)	4 (100.0)	5 (38.5)	8 (61.5)
Total	1 (12.5)	7 (87.5)	18 (30.5)	41 (69.5)

Table 14. Frequencies of Place of Residence with Non-Adventist Vegetarians and Non-Adventist Non-Vegetarians (Obesity)

Place of Residence	Non-Adventist			
	Vegetarian		Non-Vegetarian	
	Obese (%)	Not Obese (%)	Obese (%)	Not Obese (%)
1. Gaborone	0 (0.0)	3 (100.0)	3 (13.0)	20 (87.0)
2. Mogoditshane	1 (25.0)	3 (75.0)	0 (0.0)	23 (100.0)
3. Greater Gaborone	1 (100.0)	0 (0.0)	3 (15.0)	17 (85.0)
Total	2 (25.0)	6 (75.0)	6 (9.1)	60 (90.9)

Sample Characteristics of Teacher Participants

A total of 21 teachers agreed to participate in the mainly qualitative interview. The teachers were almost evenly distributed throughout all grades (Class teachers or subject teachers, and two school administrators) were involved. It is important to note that 50% of the teachers had only been in MAPS for only 3 years (30%), 6 (about 30%), had only been in MAPS for a year. The other half of the teachers had been in MAPS from 4 – 12 years (Distributed almost evenly through the years).

Three teachers had a certificate, 8 diplomae, 8 degrees and 2 had Masters qualification (Their teaching experience also ranged almost evenly from 1 – 34 years). This suggests fairly high levels of mobility at this school, as there were obviously less than half of those who had been at MAPS for over five years. In terms of educational attainment, all teachers were qualified for their posts, and the majority had high

educational levels as detailed above. Furthermore, the teachers had a myriad of other teaching experiences such as PE, special needs, coaching, and guidance and counseling.

All teachers interviewed said they were Adventist Christians. Vegetarians were 14.3% (3) whereas non-vegetarians were 85.7% (18). Half of the participants stated they were Botswana citizens; the other half were African internationals.

The Magnitude of Obesity/Overweight and Obesity among School Children

Figure 3 represents the distribution of the children participants based on their BMI z-scores (as also shown in table 4). BMI z-scores between +1 SD and -2 SD is 63.2% of the study population, which, according to the WHO growth charts, comes under the healthy or normal weight category. The study population with BMI z-scores equal to or greater than +2 SD (which shows obesity), and those greater than +1 SD (which is overweight) constituted 14.5% and 19.1% respectively. Thinness (BMI < -2SD) and severe thinness (BMI < -3SD) categories (or underweight or extreme underweight) consisted of 2.6% and 0.7% respectively.

At this rate, overweight/obesity (33.6%) and obesity (14.5%), the magnitude of the problem was alarming.

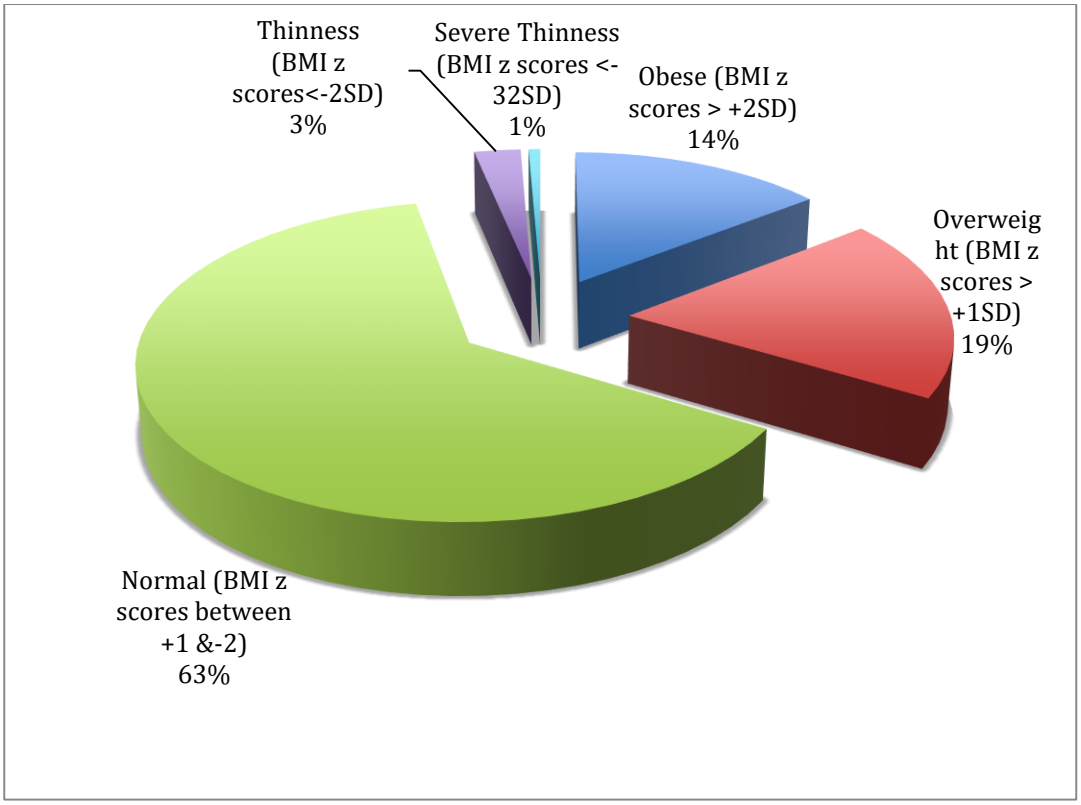


Figure 3. The Distribution of Child Participants by BMI z-scores

Already, it has emerged from the socio-demographic characteristics that overweight/obesity and obesity is a problem at MAPS. As shown above under 'perception of parents about their weight', and that of their children, the magnitude of the overweight/obesity problem is evident in the responses scored (those who thought they had normal weight actually had about 30% overweight/obesity). It is therefore not surprising that the variable showed a weak statistically significant association [OR = 0.178, 95% CI: 0.037–0.848]. Furthermore, the statistics revealed that parental perceptions about underweight and overweight/obesity of both their own weight and that of their children revealed actual higher percentages of those who were overweight/obese (50.0%) than those who were underweight (36.4%). Additionally, parents who were concerned about their weight registered 52.0% overweight/obese compared to 20.0% of those not concerned.

Apparently, parents have no doubt that their children have an overweight/obesity problem, owing to the high percentages of those who are concerned with their children's overweight/obesity status. Parental concern for a child's body weight (overweight/obesity) also showed a strong association with overweight/obesity [OR = 4.156, 95% CI: 2.028–8.513], statistically significant at 0.000.

The statistics of the perception of the parents about the weight of their children in the category of underweight with regards to obesity also evidenced a problem in terms of the magnitude of obesity (about 38% of children thought to be underweight were actually overweight/obese). Conversely, the scores show that parents' perception of their weight as it relates to their children's weight was not as exaggerated as that of their perception of their children's weight (those concerned about their weight registered 25.4% obese children compared to 7.0% of obesity among those were not concerned). It also seems to obtain here that the high percentages suggest an intelligent understanding of the children's obesity status by their parents. Parental concern for child's body weight (obesity) also showed a strong statistically significant association with obesity [OR = 4.539, 95% CI: 1.661–12.401].

Parents and Teachers Survey Interviews

The parents were also interviewed of the question pertaining to the children's weight. When asked if anything that can be done to make it easier for parents and caregivers to get help if their child's weight is a concern, participant 1 emphasized the need for assistance to parents through the health and wellness program by the school. The second respondent asserted the importance of the creation of the school health overweight/obesity program so as to team with health facilities to conduct health programs that will among other things, prevent junk foods from the school premises.

Television programs on health education that suggest diet and exercise plans have also been cited by a number of participants. Other respondents presupposed that the church might be of assistance also in health promotion. Participant 20 re-echoed the words of a couple other parents who stated professionals and health specialists such as dieticians and pediatricians need to be consulted. Respondent 20 further stressed the need for diet change.

Generally, parents are confident something can be done to help parents deal with overweight/obesity and obesity. When asked about the need for professional assistance to help her child to achieve a healthy weight and if she has made an attempt to receive assistance, respondent 30 observed the assistance offered to her child to achieve a healthy weight to have "only been a temporary solution". Therefore, parents and caregivers are in anticipation of a permanent solution to the issues of their children's weight problem. The parent echoed the concern of the majority of the parents in the research of the persistent problem of obesity/overweight. There were a good number of parents who were knowledgeable about the importance of portion size, frequency of meals, types of meals, times of eating, activity level, growth monitoring, and the need for education from the period of pregnancy (participants 35, 51, 113, 152). It would seem their special need is to translate that knowledge into experience.

The teachers added more emphasis on the magnitude of the overweight/obesity problem. From the study sample of 21 (Table 15), 71.4% of the teachers said they considered overweight/obesity a problem in Mogoditshane Adventist School**.** A higher percentage of 81 also said they think overweight/obesity is a problem in Mogoditshane/Gaborone.

Table 15. The Views of Teacher Participants on whether Overweight/Obesity is a Problem at School and in the Community

Variable	Response					
	Yes		No		Don't Know	
	N	%	N	%	N	%
Whether overweight/obesity is a problem at school	15	71.4	5	23.8	1	4.8
Whether overweight/obesity is a problem in the community	17	81.0	3	14.3	1	4.8

Available Programs (Eating Behavior and Activity Habits)

This section shows the results of items included under-eating behavior and activity habits. Since eating behavior and activity habits are thought to be encouraging or discouraging unhealthy weight gain, the items concerning these factors also include items on weight as shown in the distributions below. The results from the parents' and teachers' interviews were added to complement the findings.

Eating Behavior Distribution

Tables 16 and 17 show The Eating Behavior Distribution. Firstly, the results of table 12 are given followed by table 13.

In table 16, an average of about 90% (92.1%, 88.3%, and 87.5% respectively) said the importance of what a child eats, how much they eat, and how much they weight was either often or always important to them (See Table 16 for more responses). The distribution also revealed that 6.6% (10) of parents say their children are always or often teased about their weight. Twenty-four parents (16.4%) indicated that their children are sometimes teased, while 112 (63.0%) said rarely or never. Exactly 50% of the parents communicated that their children eat fruits daily (often/always). About 7% more parents also said their children eat vegetables (57% of parents) daily (often/always). Out of the remaining, on average about 31% of the

parents said their children sometimes eat fruits and vegetables. As of fast foods 43.7% parents rarely offered children fast foods, while 45.7% did give their children fast foods sometimes. Eleven percent of the parents indicated that their children took fast foods often/always on a weekly basis. The drinking of sodas was reported as mainly rarely (37.5%), then sometimes (30.3%), never (15.8%), often (13.2%) and lastly always (3.2%) in diminishing percentage. Approximately 78% (never/rarely) rewarded their children with food.

Table 16. The Distribution of Eating Behavior

Variable	Response									
	Never		Rarely		Sometimes		Often		Always	
	N	%	N	%	N	%	N	%	N	%
What my child eats is important to me	3	2.0	3	2.0	6	3.9	17	11.2	123	80.9
How much my child is important to me	2	1.3	6	3.9	10	6.6	32	21.1	102	67.2
What my child weighs is important to me	2	1.3	8	5.3	9	5.9	32	21.1	101	66.4
Whether my child is teased about weight?	94	61.8	21	13.8	25	16.4	9	5.9	2	1.4
How much a child eats fruits daily	7	4.6	13	8.6	56	36.8	46	30.3	30	19.7
How much a child eats vegetables daily	7	4.6	19	12.5	39	25.7	59	38.8	28	18.4
How often, in a week, does your child eat fast foods	8	5.3	58	38.4	59	45.7	9	6.0	7	4.6
How much sodas does child drink on daily basis?	24	15.8	57	37.5	44	30.3	20	13.2	5	3.4
I use food to reward my child	83	54.6	35	23.0	22	14.5	5	3.3	3	2.0

When parents were asked whether the meals are served at a regular time, 34.7% of the parents said that often the meals are served at a regular time, followed by 28.3% who sometimes ensured the regular mealtime, then 22.4% said they always served the meal at a regular time. Two percent of the parents said that the meals at their house are never served at a regular time and 12.5% rarely serve meals at a regular time. Approximately 63% of children were said to never or rarely drink caffeinated drinks. Although 19.1% parents revealed that their children sometimes

drink caffeinated drinks. As shown in the table below, it was observed that the majority of the parents never or rarely allow their children to snack between meals, decide on the portion size or the right kind of meals for their children. The majority of the parents (68.4%) further indicated that they always provide breakfast for their children before they go to school. In ascending order parents decided the portion size of their children's food never/rarely (19.2%), sometimes (24.3%), and often/always (55.2%). Although more skewed to "often" and "always", the same ascending order of responses was observed in parents' decision of the right kind of food for their children: never/rarely (7.9%), sometimes (15.8%), often/always 74.4%).

Table 17. The Distribution of Eating Behavior

Variable	Response									
	Never		Rarely		Sometime		Often		Always	
	N	%	N	%	N	%	N	%	N	%
My child takes caffeinated drinks	57	37.5	39	25.7	29	19.1	15	9.9	10	6.6
Meals in my house are served at regular time	3	2.0	19	12.5	43	28.3	53	34.7	34	22.4
I allow my child to snack between meals?	14	9.2	19	12.5	68	44.7	35	23.0	14	9.2
My child eats breakfast before attending school in the morning	17	11.2	7	4.6	9	5.9	13	8.6	104	68.4
I am responsible for deciding what my child's portion size should be	13	8.7	16	10.5	37	24.3	37	24.3	47	30.9
I am responsible for deciding the right kind of food my child should eat	4	2.6	8	5.3	24	15.8	41	27.0	72	47.4

Association of Eating Behavior Variables with Overweight/Obesity and Obesity

For the purpose of logistic regression eating behavior variables were collapsed and recoded accordingly. As a consequence of a small sample only two values were generated per each independent variable (never/rarely/sometimes or often/always). The total frequency (no.) was registered as outlined in tables 18 to 24, as well as the frequency (no.) of overweight/obesity per value/variable (or case).

Association of Eating Behavior Variables with Overweight/Obesity

There were only two statistically significant variables of under-eating behavior (overweight/obesity). The statistically significant factors were: the importance of how much child eats [OR = 3.275, 95% CI:1.166-9.204], and child fast food weekly intake [OR = 0.318, CI: 0.124-0.815], as indicated in table 18 and 19 below.

Table 18. Association of Eating Behavior Variables with Overweight/Obesity (O&O)

Habit	No.	O&O No.(%)	p-value	Crude OR (95% CI)
What a child eats is important				
Never/Rarely/Sometimes	11	6(54.5)	0.137	2.560 (0.740-8.833)
Often/Always	141	45(31.9)		1
How much a child eats is important				
Never/Rarely/Sometimes	17	10(58.8)	0.024	3.275 (1.166-9.204)
Often/Always	135	41(30.4)		1
What child weighs is important				
Never/Rarely/Sometimes	19	8(42.1)	0.401	1.522 (0.571-4.058)
Often/Always	133	43(32.3)		1
Child teased for his/her body weight				
Never/Rarely/Sometimes	141	45(31.9)		1
Often/Always	10	6(60.0)	0.083	3.200 (0.860-11.905)
Child daily fruit intake				
Never/Rarely/Sometimes	76	27(34.2)	0.606	1.194 (0.608-2.343)
Often/Always	76	24(31.6)		1
Child daily vegetable intake				
Never/Rarely/Sometimes	65	26(40.0)	0.147	1.653 (0.838-3.262)
Often/Always	87	25(28.7)		1

Table 19. Association of Eating Behavior with Overweight/Obesity

Child fast food weekly intake				
Never/Rarely/Sometimes	21	12(57.1)		1
Often/Always	131	39(32.3)	0.017	0.318 (0.124-0.815)
Fizzy drinks intake daily				
Never/Rarely/Sometimes	124	40(38.5)		1
Often/Always	26	10(38.5)	0.543	1.313 (0.547-3.149)
My child takes caffeinated drinks				
Never/Rarely/Sometimes	126	40(31.7)		1
Often/Always	24	11(45.8)	0.186	1.819 (0.750-4.413)
Child meals served regularly				
Never/Rarely/Sometimes	64	23(35.9)	0.427	1.322 (0.664-2.636)
Often/Always	87	27(31.0)		1
The child is allowed to snack				
Never/Rarely/Sometimes	104	38(36.5)		1
Often/Always	46	12(26.1)	0.213	0.613 (0.264-1.324)
The child eats breakfast before school				
Never/Rarely/Sometimes	33	14(%)	0.250	1.593 (0.721-3.520)
Often/Always	117	37(31.6)		1
Responsible for deciding the child's portion size				
Never/Rarely/Sometimes	66	22(33.3)	0.879	0.948 (0.480-1.874)
Often/Always	84	29(34.5)		1
Responsible for deciding the right kind of food				
Never/Rarely/Sometimes	35	13(37.1)		1
Often/Always	114	37(32.5)	0.608	1.230 (0.558-2.709)

Association of Eating Behavior Variables with Obesity

There were four statistically significant variables under-eating behavior (obesity). The statistically significant factors were: the importance of how much child eats [OR = 2.892, 95% CI: 0.906-9.231] and child fast food weekly intake [OR = 0.318, 95% CI: 0.124-0.815], child fizzy drinks daily intake [OR = 4.520, 95% CI:1.677-12.182], child takes caffeinated drinks [OR = 5.215, 95% CI:1.907-14.265], and child eats breakfast before going to school[OR = 1.468, 95% CI:1.150-7.826], as indicated in table 20 and 21 below.

Table 20. Association of Eating Behavior Variables with Obesity (a)

Habit	No.	Obesity No.	PV	Crude OR (95% CI)
What a child eats is important				
Never/Rarely/Sometimes	11	3(27.3)	0.223	2.408 (0.587-9.884)
Often/Always	141	11(7.8)		1
How much a child eats is important				
Never/Rarely/Sometimes	17	5(29.4)	0.073	2.892 (0.906-9.231)
Often/Always	135	17(5)		1
What child weighs is important				
Never/Rarely/Sometimes	19	3(15.8)	0.862	1.125 (0.299-4.234)
Often/Always	133	19(14.3)		1
Child teased for his/her body weight				
Never/Rarely/Sometimes	141	20(14.2)	0.617	1
Often/Always	10	2(20.0)		1.513 (0.299-7.644)
Child daily fruit intake				
Never/Rarely/Sometimes	76	12(15.8)	0.645	1.238 (0.500-3.065)
Often/Always	76	10(13.2)		1
Child daily vegetable intake				
Never/Rarely/Sometimes	65	12(18.5)	0.231	1.743 (0702)
Often/Always	87	10(11.5)		1

Table 21. Association of Eating Behavior with Obesity

Child fast food weekly intake				
Never/Rarely/Sometimes	21	7(33.3)		1
Often/Always	131	15(11.5)	0.012	0.259 (0.090-0.743)
Child fizzy drinks daily intake				
Never/Rarely/Sometimes	124	13(10.5)		1
Often/Always	26	9(34.6)	0.003	4.520 (1.677-12.182)
The child takes caffeinated drinks				
Never/Rarely/Sometimes	126	13(10.3)		1
Often/Always	24	9(37.5)	0.001	5.215 (1.907-14.265)
Child meals served regularly				
Never/Rarely/Sometimes	64	9(14.1)	0.891	1.067 (0.419-2.716)
Often/Always	87	12(13.8)		1
The child is allowed to snack				
Never/Rarely/Sometimes	104	16(15.4)		1
Often/Always	46	5(10.9)	0.465	0.671 (0.230-1.956)
The child eats breakfast before school				
Never/Rarely/Sometimes	33	9(27.3)	0.025	1.468 (1.150-7.826)
Often/Always	117	13(11.1)		1
Responsible for deciding the child's portion size				
Never/Rarely/Sometimes	66	10(15.2)	0.882	1.071 (0.432-2.660)
Often/Always	84	12(14.2)		1
Responsible for deciding the right kind of food				
Never/Rarely/Sometimes	35	6(17.1)	0.651	1,267 (0.454-3.534)
Often/Always	114	16(14.0)		1

Parents and Teachers Survey Interviews (Eating Behavior)

During the interviews, the question was posed to the parents if they encourage the child to eat breakfast before attending school in the morning or provide lunch for the child to eat at school. Most parents described the breakfast they provide mainly tea or juice, bread, eggs, cereal (especially cornflakes) and soft porridge. Sandwich and soft porridge were in the majority, especially the soft porridge. Parents described lunch provided as noodles, yogurt, fresh chips, and polonies. The parents stated the top three favorite meals you provide at home consisted mainly of flesh, fish, chicken,

and meat. Vegetarians, especially Adventist vegetarians, listed beans, and vegetarian analogs like burgers and sausages. The common carbohydrates were bread, macaroni, spaghetti, and rice. The parents were inconsistent in the provision of fruits and vegetables to their children (a minority in the sample shows consistency).

The majority of the teachers interviewed asserted that the typical meal served to children was a healthy balanced vegetarian diet. Although a number of teachers said that there was "starch with veges", 'rice' and 'potatoes', 'pap and vegetables' and 'starch with soya and some salads also beans'. The implication was that healthy as it seems, the meal had a challenge of excessive starch on some days. Furthermore, teachers said although the meals served are healthy, 'a few children eat at school' as 'many bring packed lunch from home' (Teacher Participant 13) which comprises of 'chips (samba, lays), juice, bread, yogurt' which are highly processed foods (Teacher Participant 20).

Teachers at MAPS stated that the decision on what items to serve to children was based on a healthy balanced diet (66.7%). About a quarter (23.8%), the remainder of the teachers said the decision on what food to offer children was influenced by the Adventist healthy lifestyle and vegetarianism. The teachers (76.2%) remarked that the school is managing to provide options and at the same time encouraging students to make healthy choices by providing access to only healthy foods. The other 23.8% disagreed. The ratio was almost equal when teachers were asked if there were changes attempted by the school to encourage healthy eating habits among the students (57.1% agreed, the rest disagreed). Out of 21 teachers, 76.2% (17, the majority) said they believe the school food environment influences childhood overweight/obesity. They generally agreed that in an ideal world, they should be 'lots of fruits and vegetables'. Teacher Participant 19 further asserted, 'I believe what the school is serving is ideal'

and was backed by Teacher Participant 11 in that assertion, ‘food service is healthy in my school’.

Other teachers thought the food is to be more appetizing and a good number emphasized it should remain vegetarian. Almost all teachers saw their role as teaching the school children to eat healthy balanced meals, although only 28.6% of the teachers said they have healthy eating training or expertise (Five of the teachers got the training from a workshop, while one said she got the knowledge from a course on health science, and the remainder, the majority got their knowledge from the Adventist church, whose well recognized health teachings are both faith-based and evidence-based).

This high percentage of close to 80.0% in understanding their role as advocates for a healthful living has the potential for positive healthy weight outcomes. A good number of the teachers were more deliberate ‘to call parents and discuss’ (Respondent 7), and another stated ‘Already I am encouraging vegetarianism and avoidance of highly processed foods’ (Respondent 19) It would be interesting to observe how this positive attitude of the teachers aid overweight and obese children lose weight in a longitudinal study (unfortunately, the current study is cross-sectional)

Activity Habits

Table 22 summarizes the responses related to the influence of fatness and thinness, as well as life skills, to overweight/obesity. Fifty point seven percent of the parents “strongly disagreed” and “disagreed” that fatness and thinness are unchangeable, while 16.1% were “not sure” and 32% “strongly agreed” and “agreed”. It was interesting to find out that most families (48.1%) “disagreed” and “strongly disagreed” that lifelong recreation skills a child develops are important. The “Not sure” parents were 11.8%, the remainder, 42.7% were “strongly disagree” and

"agree."

The last 3 variables on the importance for a child to exercise, encouraging a child to be active, and the activity of a child in sports, recreation, and play show consistently similar results in the highest scores being those of the respondents who disagreed and strongly disagreed, slightly more than those who agreed or disagreed on the similar variables. Those who are not sure of the importance of the amount of exercise a child gets, and if they encourage their child to be active, or if their child is actually active in sports, recreation, and play activities are the lowest at 3.3%, 3.9%, and 11.8% respectively.

Table 22. Distribution of Fatness and Thinness and PA Skills

Habit	Response									
	Strongly Agree		Agree		Not Sure		Disagree		Strongly Disagree	
	N	%	N	%	N	%	N	%	N	%
Fatness, thinness unchangeable	12	7.9	36	23.7	24	16.1	39	25.7	38	25.0
Lifelong recreation skills a child develops are important	33	21.7	21	14.5	18	11.8	34	22.4	39	25.7
How much exercise my child gets is important	49	32.2	16	10.5	5	3.3	34	22.3	44	28.9
I encourage my child to be active	39	25.7	30	19.7	6	3.9	32	21.1	41	27.0
My child is active in sports, recreation, or play activities during the week	37	24.3	28	18.4	18	11.8	36	23.7	33	21.7

Association of Activity Habits Variables with Overweight/Obesity and Obesity

Association of activity habits variables with overweight/obesity. As shown in tables 23 and 24 respectively, there were no statistically significant univariate variables under activity habits. The absence of statistical significance was in both

overweight/obesity and obesity variables. Two independent variables about child exercise and activity were excluded because they had less than 10 cases.

Table 23. Association of Fatness and Thinness and PA Habits with Overweight/Obesity

Item	No.	No.(%) O&O	PV	Crude OR (95% CI)
Born to be fat or thin				
Strongly disagree/disagree	77	22(28.6)		1
Not sure	24	11(45.8)	0.119	2.115 (0.824-5.431)
Strongly agree/agree	48	18 (37.5)	0.299	1.5 (0.698-3.225)
Importance of development of lifelong recreation skills				
Strongly agree/agree	56	16 (28.6)		1
Not sure	18	7 (38.9)	0.378	1.655 (0.540-5.067)
Strongly disagree/disagree	75	27 (36.0)	0.277	1.526 (0.712-3.269)
Child active (Sports, recreation, play)				
Strongly agree/agree	63	19 (30.2)		1
Not sure	18	9 (50.0)	0.124	2.316 (0.794-6.746)
Strongly disagree/agree	67	23 (34)	0.612	1.211 (0.579-2.530)

Table 24. Association of Fatness and Thinness and PA Habits with Obesity

Item	No.	Obesity No. (%)	PV	Crude OR (95% CI)
Born to be fat or thin				
Strongly disagree/disagree	77	10 (13.0)		1
Not sure	24	5 (20.8)	0.350	1.763 (0.537-5.786)
Strongly agree/agree	48	7 (14.6)	0.800	1.144 (0.404-3.240)
It is important to develop lifelong recreation skills				
Strongly agree/agree	56	7 (12.5)		1
Not sure	18	4 (22.2)	0.350	1.918 (0.490-7.517)
Strongly disagree/disagree	75	11 (14.7)	0.737	1.191 (0.429-3.306)
Child active (Sports, recreation, play)				
Strongly agree/agree	63	9 (14.3)		1
Not sure	18	4 (22.2)	0.422	1.714 (0.460-6.393)
Strongly disagree/disagree	67	9 (13.4)	0.888	0.931 (0.344-2.519)

Association of activity habits variables with obesity. Table 25 shows that screen time 55.9% of children (watching TV, playing video games, using computers or handheld devices) for less than 2 hours. Other parents reported that 30.9% of their children were on screen time for 2 hours or more, while 11.2% were not sure how many hours their children spent on the screen. The hours shown to be those slept by most children are 8 hours and more at 79.6% (These high numbers did translate into statistical significance but were not included here because of a standard error more than 2).

The rest of the figures are shown in the table. Most of the children (53.3%) were indicated as exercising for less than 7 hours a week. Those who exercised for 7 hours or more were 35.5%. It is interesting therefore that, under child activity, the low numbers of PA did not translate into statistically significant associations.

Table 25. Frequencies of Child's Screen-time, Sleep-time and Weekly Exercise Time

Variable	Value	N	%
Estimate your child's screen time (sits and watches TV, play video games, or use the computer or handheld devices)	Less than 2 hours	85	55.9
	2 hours and more	47	30.9
	Not sure	17	11.2
Estimate the hours does your child sleeps at night	Less than 8 hours	138	19.7
	8 hours or more	121	79.6
How many hours per week does your child play or exercise enough to make him/her sweat and breathe hard	Less than 7 hours	81	53.3
	7 hours and more	54	35.5

When asked how much PA children should get each day teachers (38.1%) said the children should get enough PA for their health (The results revealed that this question was not asked properly, teachers should have been given a choice from about 1 hour to about 4 hours of PA for children to choose from). Nineteen percent of the teachers of the sample believed that 2 hours was how much PA children should get, while another 38.1% said 20 to 60 minutes was sufficient for the physical needs of the

students. The school administration confirmed that recess at MAPS was 1 hour 30 minutes. Breaks between lessons (4) were 5 minutes each. Teachers who responded "yes" there are opportunities for children to be active were 84.2%. Although 61.1% of teachers said they did not have PE training or expertise.

Table 26 shows that parents believed that a healthy diet (14.5%), physical activity (9.9%), and eating capacity monitoring (14.5%) could help reduce overweight/obesity. About half, 39.5% of the sample size, of the parents believed that all the aforementioned can help reduce overweight/obesity.

Table 26. Parents' Ideas to Reduce Overweight/Obesity

Variable	Condition	N	%
Ideas to help reduce overweight/obese in children	Given healthy food	22	14.5
	Allowed physical activity	15	9.9
	Eating capacity monitoring	22	14.5
	All of the above	60	39.5

When asked if they know overweight/obese students 93.8% of teachers in the sample said "yes". Reasons for obesity were at about the ratio of 3 (57.1% chose a poor diet) to 2 (42.9% said lack of exercise). Approximately seventy-two percent (3 to 5 on the scale) believe the school has much influence to help reduce the rates. Only 4.8% felt the school has no influence.

The teacher participants were asked to suggest school-based obesity programs that they think should be introduced, and how they think the programs will be helpful in reducing obesity in pupils. In terms of suggestions for programs, teacher participant suggested the introduction of the health club at school. It was highlighted that a health committee should be formed that should facilitate events such as the nutrition day. The general thrust of the responses was essentially that of encouraging change of diet

to a healthy vegetarian diet, more hours of PA, exercising, and sports to keep children active. Some teachers further emphasized that the affected children should be identified and be encouraged to eat healthily, and to exercise, as well as provision of Lunch at school for all children (The researcher actually attests that the teachers seemed to achieve the idea of creatively identifying those children who needed assistance with body weight status, and appreciative parents gave reports of how their children were assisted to eat healthily and lose weight). Others stated that workshop on the healthy diet should be conducted for parents and teachers, as well as upper classes.

Parents and Teachers Interviews
(Activity Habits)

Parents suggested that they and other caregivers may be supplied with enough information to encourage their children's physical activity. Parents presupposed that presentations on the health benefits of physical activity at public places such as schools, clinics, and the kgotla (public meeting, community council or traditional law court of a Botswana village were, headed by village chief or headman, community decisions are always arrived at by consensus).

Furthermore, TV, radio, pamphlets, social media, and paper were seen as useful avenues for information transference. A growing number of parents suggested that the school and the health facilities are the best places to supply the obesity/overweight health information (participant 149). They said one of the ways the community may improve in providing for sports and other physical activity in the community to their children is for the community leadership to stress the importance of sports and activity, and to play a major role in motivating the community to

participate. A number of respondents alluded to the need to supply communities with gym equipment.

As some of the "few physical activities, recreation, and sports the child gets involved in regularly", the parents mentioned that the school children engage in netball, football, swimming, dancing, running, walking, volleyball, skipping rope and playing on the playground. The parents generally agreed that children are involved in these activities almost every day.

Teacher participant 20 said the school's programs about PA were not effective because of lack of implementation. Although a couple of teachers believed the PA programs are effective, some thought 'the programs are effective' (Respondent 17) but the problem is limited time as participant 19 noted. About 3 teachers thought the children are fit, and that that shows that the PA programs are effective. It is noteworthy that some teachers said all the children of MAPS are doing PE (weekly activity) but the PE is not regular enough since there is only one PE teacher. Others blamed inadequacy of resources to adequately sponsor PE programs. Some teachers articulated that teachers at MAPS take keen interest in keeping their learners fit to develop a healthy mind in a healthy body. Others though rebutted this statement saying that the PA or PE programs are not effective because there is need for more trained PE teachers.

When asked what suggestions they have for changes at home, in schools, and in the community that would help children engage in PA, teacher participants highlighted that children should be allowed at least 1 to 2 hours to play each day, and also be engaged in different sports. Participants said teachers and parents should role model a healthy lifestyle for the children, and the school should have aerobics in summer, sports in winter, and the community should have ball games and avail

sporting to the children. A number of teachers said parents should encourage children to engage in extra-curricular activities, and that for that to happen the sports committee should deliberately establish a program that students should follow at school and at home. Parents should be taught about the importance of PA and create time for PA (walking, playing, sports etc.).

One teacher said there are no barriers to offering PA program. Other teachers say some parents cite ill health as the reason children may not engage in PA. Mention was also made of adequate sporting activities as a barrier to PA. A number of teachers said that there is not enough time for PA programs, because there are too many classes (timetable, clash of activities, and weather conditions), as a result, time and space is limited. Others lamented the unavailability of resources to use during PA program.

Parent and teacher perceptions of factors influencing overweight/obesity. To measure their perception of factors influencing obesity, initially, parents were asked if they know if their child is overweight/obese. Forty-five (29.6%) said they know their child is not overweight/obese. Fifty-two (34.2%) of the sample said they know their child is overweight/obese. The number that did not know their child is overweight/obese is 37 (24.3%). The number who said they were certain that their child was not obese/overweight is 45 (29.6%).

Forty-one respondents (27.0%) singularly said the reason children become overweight/obese is mainly because of poor diet, followed by 7 (4.6%) who said eating a lot was the cause, and finally 4 (2.6%) who said children become overweight/obese due to less physical activity. Eighty (52.6%) revealed that the reason is all three—poor diet, eating a lot, and less physical activity.

The majority of parents (60.5%) in Table 22 think they have a big influence to help reduce childhood overweight/obesity. The frequency diminishes from an average of about 14% between values 3 and 4 to 0.7% at value 1. This indicates that parents believe they have a “big influence” to help reduce overweight/obesity (The case for independent variable “influence was too low for chi-square).

Table 27. Parents' Influence to Reduce Overweight/Obesity

Variable	Value	N	%
Influence parents have to help reduce childhood overweight/obesity	No influence	1	0.7
	Influence	141	92.7

Parents and teachers’ interviews on effectiveness. Parents were asked to suggest ways parents and caregivers may be supplied with enough information to cook healthy food for their children. To enhance effectiveness in providing healthy food, parents suggested that dieticians and pediatricians through private companies and government initiatives should broadcast health programs on obesity through TV, radio, and local papers. Respondent 148 states that the school through seminars, and other innovative approaches like pamphlets, needs to provide ‘adequate information on how to encourage kids to eat vegetables’. She further suggested that such health talks should ‘provide recipes and more information on effects of bad eating habits and how to work on changing them’. Others suggested the following:

1. Healthy recipe books
2. Provision of literature on healthy foods and healthful living
3. Parents to attend health expo
4. Community cooking classes
5. School to employ health specialist
6. School campaigns by health professionals

7. Pamphlets and social media
8. Other online resources

Interviewed about ways the community may improve in providing for healthy meals to their children, respondent 152 highlighted that to 'encourage the traditional way of eating and discourage frying of food' may improve the provision of healthy meals by parents to their children. A large number of parents agreed with this assertion.

Respondent 1 viewed the school nutrition programs as effective because 'it does not encourage foods that lead to the obesity'. Generally, teachers said the nutrition program was effective because it promotes vegetarianism and healthy eating and provides a variety of foods. Another teacher clarified the type of food offered by the school: 'no junk food served at the school tuck-shop' (Teacher Participant 2). A home economics teacher (Participant 3) of 10 years teaching experience, who is also vegetarian said the 'school nutrition program is helpful because it helps learners to stay healthy and alert, and reduction of absenteeism as well'. Others were happy that knowledge of healthy eating was being 'passed onto students' but still others queried that it would be more effective if embraced by all parents, and if it was not just an option that some pupils are involved in.

Participant 14 further highlighted that the school nutrition program 'changes the lifestyle of children that adhere to it who end up having sound health' (Participant 14). Teacher respondent 7 said it is not effective because 'children throw away the food'. Only 3 teachers believed that the school nutrition program was not effective. Eighteen teachers (85.7%) believed the school nutrition program was effective.

Factors Associated with Overweight/Obesity among MAPS Children

The multivariable logistic regression analysis revealed that only parental concern for their children's weight was statistically significantly associated with overweight/obesity (Table 23). Accordingly, the odds of being overweight/obese were 4.7 times higher in children whose parents were concerned about their weight [AOR = 4.659, 95% CI: 32.197, 9.881]. The importance of how much a child eats and if a child eats fast food was not statistically significantly associated with overweight or obesity.

Table 28. Factors Association with Overweight/Obesity

Variables	P-Value	Adjusted OR (95% CI)
How much a child eats is important		
Often/Always	0.902	1.155 (0.115-11.559)
Whether the child eats fast food weekly		
Often/Always	0.251	0.290 (0.035-2.404)
Parental concern for the child's body weight		
Yes	0.000	4.659 (2.207-9.955)

Factors Associated with Obesity among MAPS Children

The multivariable logistic regression analysis revealed weekly fast food intake, eating breakfast each morning before school, and education (certificate, diploma and higher diploma) were statistically significantly associated with obesity (Table 24). Accordingly, the odds of being obese were almost 3 times higher in children who skipped breakfast [AOR = 2.790, 95% CI: 1.008,7.727)].

Similarly, the higher likelihood of being obese was found among children whose parents were concerned with their children's weight compared to children whose parents were not concerned with their children's weight [AOR = 5.733, 95%

CI: 1.353, 24.282]. If child eats fast food [AOR = 0.207, 95% CI: 0.066, 0.649] was associated with decreased likelihood of obesity. Additionally, education (certificate, diploma and higher diploma) was also associated with decreased odds of obesity [AOR = 0.155, 95% CI: 0.027-0.886]. All the other independent variables either were not statistically significantly associated with overweight or obesity or had a statistically significant association with overweight or obesity but had a standard error higher than 2 and therefore were excluded from the multivariate analysis.

Table 29. Factors Associated with Obesity

Variables	P-Value	Adjusted OR (95% CI)
Whether the child eats fast food weekly		
Often/Always	0.007	0.207 (0.066-0.649)
Whether the child eats breakfast every morning before school		
Never/rarely	0.048	2.790 (1.008-7.727)
Education of Participant Parent		
Certificate, Diploma and Higher Diploma	0.036	0.155 (0.027-0.886)

Discussion

Quantitative

The findings of this study revealed that 33.6% of school-aged children at MAPS were overweight/obese, while 14.5%were obese. The prevalence of overweight/obesity in the current study was higher than that of studies conducted in Addis Ababa, Ethiopia (12.7%) (Gebremichael and Chere, 2015), Kenya (14.4%) (Muthuri, Wachira, et al., 2014), Dar es Salaam, Tanzania (15%) (Muhihi et al., 2013), and Sub-Saharan Africa countries (10.6%) (Muthuri, Francis, et al., 2014).

Similar studies also conducted in various parts of India, according to which about 4.9–12% of children were overweight and obesity (Namdev et al., 2014; Nayak,

2011; Vohra et al., 2011), also revealed lower rates than this study. The above-mentioned settings appear to be similar contextually with both the HSES and LSES in the sample. This present study addressed only the HSES sample of school children. Therefore, the change in dietary behavior and activity habits related to nutrition transition and increased urbanization seems to have affected the children more in the present study. Additionally, Botswana is considered an upper-middle-income country, while the countries discussed above are low and middle income.

The prevalence of overweight/obesity in the present study was approximately similar to Egypt, 31.4% (Kyallo et al., 2013). Obesity and overweight/obesity rates in this study were also comparable to rates in some developed countries. These include Australia that showed 31.0% among children aged 4 - 13 years (Waters et al., 2008), and Canada that was 32.9% among girls (Veugelers and Fitzgerald, 2005). When compared to available rates in other urban areas in Africa, which range from 3.4% in Nigeria to 17% in South Africa (Ben-Bassey et al., 2007; Li et al., 2006; Monyeki et al., 1999; Prista et al., 2003), obesity rate in the current study was among the highest at 14.5% [Latest overweight/obesity statistics indicated 14.2% national prevalence in 2016 (Heart and Stroke Foundation South Africa)].

Clearly, overweight/obesity rates in the current study, among children in private schools, are indicative of a public health problem. From 1976 to 2016, the prevalence of childhood obesity in the U.S. more than doubled in children ages 2 to 5 (from 5% to 13.9%), nearly tripled in children aged 6 to 11 (from 6.5% to 18.4%) and quadrupled in adolescents' ages 12 to 19 (from 5% to 20.6%) (Hales et al., 2017; Ogden et al., 2014). From the current study, it seems likely that Botswana is experiencing a similar problem (extensive studies needed to elucidate more on the national prevalence). The urban/peri-urban girls and boys attending MAPS private

schools in the current study have about same rates of overweight/obesity and obesity as those in developed countries.

The similarity with some rates in Egypt in terms of the prevalence of overweight/obesity is not surprising since Egypt is also an upper-middle-income country. Children from high-income families are more likely to be overweight/obese as compared to low-income families' children. Researchers postulate that this might be due to the fact that an increase in wealth status might shift high-income families into nutrition transition by replacing traditional diet with energy-dense diet and sedentary lifestyle which are known risk factors of overweight/obesity (Tzioumis and Adair, 2014).

MAPS is a private school, and private school children are more likely to be overweight/obese and obese as compared public schools. This is the finding of studies that assessed children and adolescent's overweight/obesity in Tanzania, Kenya, Puerto Rico and India (Bhardwaj et al., 2008; Elías-Boneta et al., 2015; Gupta et al., 2012; Kimario, 2015; Kyallo et al., 2013).

Similar to the current research, other studies have reported higher rates of overweight among girls compared to boys. In a recent study conducted in Kenya among school children aged 9 - 13 years, girls in urban areas had less aerobic fitness than boys (Adamo et al., 2011). Therefore, according to that study lower PA among girls than boys maybe one of the reasons predisposing the females to overweight/obesity.

The current study indicated that parental concern for their child's weight was associated with a higher risk of being overweight/obese. Research presupposed that parental concern about their child's current weight status (Moore et al., 2012) may be meaningful predictors of willingness to engage in behavior change. It is further

indicated by a number of studies that among parents of children whose BMI is in the overweight or obese range, there is evidence of increased parental concern about their child's present weight status (Lampard et al., 2008; Pesch et al., 2016; Peyer et al., 2015; Trigwell et al., 2014) relative to those whose children have a healthy weight BMI. Trigwell reported limited evidence regarding ethnic variation in parental concern, with lower levels of concern for current childhood overweight reported in one study of parents from Black Somali backgrounds living in Liverpool, with others reporting no ethnic difference (Carnell et al., 2005).

This cross-sectional analysis confirmed a strong positive association between the child's current weight status and parental concern, suggesting parents of children who are overweight/obese are more likely than other parents to be concerned about their child's body weight. This research may be useful to guide further studies to determine whether parental concern is associated with healthier weight trajectories.

The interesting finding of this study was of children who take fast food during the week. Contrary to a myriad of studies around the world, children who take fast food weekly had lower odds of obesity in the present study. Research findings reported in Addis Ababa, London, and America indicate that the odds of being obese were higher among children who had taken fast food compared to those children who did not take fast food during the week (Dietz and Gortmaker, 2001; Ebbeling et al., 2002; Gebremichael and Chere, 2015; Patterson et al., 2012). It is becoming common knowledge that this might be related to the higher energy content of most of the fast foods. In this current study, however, the odds of being obese were lower among children who had taken fast food compared to those children who did not take fast food during the week. It is also surprising that a large number of children said they often/always take fast foods on a weekly basis and yet this figure did not translate into

higher obesity rates while those who never or rarely take had high prevalence rates. Although this is difficult to ascertain in the absence of a longitudinal study to prove the claim, it appears possible that in their high drive to reduce the rate of obesity, the teachers at MAPS encouraged the obese students not to take fast food. The high numbers of obese children among those who never or rarely take fast food seem to be those children who ceased taking fast food when they enrolled at MAPS but are still obese. It would appear to obtain that the children may be among those who recently embraced a healthy diet because, clearly, the benefits of that healthy diet had not resulted in a healthy outcome at the time of the study.

The current study found that the frequency of breakfast consumption is associated with a lower likelihood of overweight and obesity among MAPS school-going children in Botswana. The school children that regularly consumed breakfast in the morning before school had less overweight or obese compared to breakfast skippers. This finding confirmed the evidence from different studies summarized in 2010, (Szajewska and Ruszczynski, 2010) indicating that children and adolescents who skip breakfast are at higher risk of becoming overweight/obese. This growing body of evidence included Croezen et al., 2009; Sandercock et al., 2010; Timlin et al., 2008. More recent data strengthen this evidence (Archero et al., 2018), with a low number of studies not reporting an association or reporting it in some categories of the children (Coulthard et al., 2017; Mushtaq et al., 2011). Therefore, it would seem that this practice intended to help in weight loss by avoiding food in the morning actually result in weight gain. Berkey et al (2003) and Timlin et al. (2008) longitudinal studies reported excess weight and breakfast consumption as inversely related. Similar studies are still not there to reference in Botswana. Therefore this study gave

additional data about eating breakfast as helping to prevent or reduce obesity prevalence rates.

The education of the participant parent was associated with lower risk of being obese in the present study. While studies conducted in other lower economic status countries like Colombia and Kenya have reported a similar positive association between parental education level and child BMI, Odd ratios ranging from 1.9 and 4.8 respectively, (Bilić-Kirin et al., 2014; Butte et al., 2014; Muthuri, Wachira, et al., 2014), results from wealthier countries such as Brazil and the USA have reported a negative relationship between these factors, Odd ratios of 0.54 and 0.55 respectively, (Matthiessen et al., 2014; Ogden et al., 2014). Researchers have speculated that these findings may be potentially explained by a higher level of awareness (earlier exposure to obesogenic environment) and knowledge among the more educated parents in higher economic status countries in regard to the positive effects of maintaining a healthy body weight (WHO, 2009).

In contrast, in lower economies, higher parental education is associated with a higher likelihood of their children being overweight (Muthuri, Wachira, et al., 2014). Guedes et al. (2011) remark that in such families, children may also have access to more motorized transport, and engage in less active travel (Guedes et al., 2011), and in their affluence they feed their children the processed foods that in turn cause obesity. Furthermore, there is inadequate information about the adverse effects and health risks of adiposity. Perhaps, this is why there is a strong association between parental education level and child overweight/obesity in lower economic status countries. Researchers observe that these contrasting findings among some lower and higher-income countries provide further evidence of the varying status of physical activity and nutritional transition occurring in these countries (Katzmarzyk et al.,

2001; Popkin and Gordon-Larsen, 2004). Botswana seems caught in between these two worlds with it being a developing country yet upper middle income.

Independent variables, parental concern for a child's body weight, and whether child eats breakfast in the morning before school had strong statistically significant association with overweight/obesity and obesity respectively. While whether child takes fast food weekly and education of participant parent had a weak statistically significant association with obesity. Therefore, there is enough evidence to reject the null hypothesis and accept the claim for the statistically significant results. Themes of qualitative data also complement these statistical findings and the study in general as discussed next.

Qualitative Data from Parents and Teachers

It is evident from the above qualitative data that while MAPS has done well in some areas of health promotion, the school has been having the prevalence of overweight/obesity. While the school has encouraged a healthy diet and other health initiatives, the high overweight/obesity rate is its current challenge.

The major challenge seems to be that the school has little control over what the parents decide to offer their children with regards food environment and activity habits the parents create at home. What has also emerged from the study is that it would appear the school did not have a reliable and effective overweight/obesity prevention and intervention strategy.

In many instances, it was difficult to say whether the teachers themselves knew if in fact the school was engaging fully to ensure declination of overweight/obesity. The teachers commented that the school could plan more health seminars for parents, and some teachers were concerned that most of the children brought their lunch to school (consisting of fatty foods and high calories dense, and

processed foods) from home and do not benefit from the healthy vegetarian food the school accords. Further the teachers submitted that the school could do a lot to encourage healthy activity habits at home. The aforementioned together with the fact that there is only one PE teacher at MAPS are worth pointing out as rather disturbing, with respect to encouraging PA among the students.

From the above discussion, and indeed looking at the evidence from the findings, the question that begs is why this school has been having such a high prevalence of overweight/obesity (See literature review: 16% adolescents overweight/obese in 2009, and the rate is higher than most school children in countries studied). Looking at the schedule of the program at the school, it would seem MAPS does have a full program of activities to provide and cater to the health needs of its students.

This is notwithstanding the point made by the teachers that they believed the school is health-promoting. In view of the responses from the interview surveys of teachers and parents, and also in view of what respondents believed need to be done, it appears there is need to fully employ program like providing lunch for school children (Although currently only a small number of students take advantage of such initiatives, it would appear from the teachers and parents comments that the children who advantage of such an initiative are helped in terms of rates of overweight/obesity reduction). The aforementioned, together adding more time in creative PA programs and PE (as well as employing more PE teachers), and the involvement of both teachers and parents in the prevention overweight/obesity programs of the school, would probably a major impact in terms of reducing the rates of overweight/obesity of the school children.

While Mogoditshane Adventist School has done a considerable amount of

work to ensure its continued existence, and parents and teachers have come up with several noble suggestions, it would seem more is needed to ensure the reduction of the overweight/obesity rates. With teachers complaining about timetable clash in promoting PA activities and the children frequently eating the processed and densely saturated fatty packed lunch, the school is faced with a challenge to change the status quo. In the next chapter the researcher will propose recommendations for an overweight/obesity reduction strategy.

CHAPTER 5

SUMMARY, CONCLUSION, AND RECOMMENDATION

Summary

Quantitative

To summarize the results, this study provided that overweight/obesity and obesity among primary school-aged children in MAPS is high, and that prevalence was similar to upper middle income and high-income countries, as well as other private school going school children. Since overweight/obesity and obesity were being analyzed separately, firstly, the result of an adjusted analysis showed that parental concern for child's body weight was identified as the key determinant of overweight/obesity. Then, the result of the multivariate analysis further also showed that whether a child eats breakfast in the morning before school identified as the key determinant of obesity.

The study also found out that, contrary to a myriad of studies around the world, children who take fast food weekly had lower odds of obesity in the present study. This was difficult data to interpret, firstly because of the inconsistency of the finding with the data of numerous studies the world over. Although there was no longitudinal study to verify the following claim but it seemed probable from the qualitative data that through their health promotion the teachers focused their intervention more on the overweight and obese children. Possibly this is why there was a high number of obese students who never or rarely consumed fast food. It would be interesting for a longitudinal study to shed light on this phenomenon and

verify the claims.

Finally, education of participant parent Education of the participant parent was associated with a lower risk of being obese. This finding seemed consistent with similar studies of high-income families perhaps being exposed to adequacy of knowledge of the health risks of overweight and obesity, and adopting healthy eating and PA lifestyle for their children. What is not clear is whether this apparent transformation is as the result of the whole group or sub-groups (Adventist or non-Adventists). More studies will also need to be conducted to determine the aforementioned and to ascertain if the educated and elite in Botswana are transitioning to a healthier level of the nutrition transition.

Additionally, the study did not produce any statistically significant outcomes for activity habits. Therefore, there is enough evidence to reject the null hypothesis and accept the claim for the statistically significant results afore-mentioned.

Qualitative Data

MAPS has experienced high rates of overweight/obesity for an enormous number/percentage of its students, for one reason or another (as shown above). The purpose of the research thesis was to find out reasons why the problem of high rates of overweight/obesity have overwhelmed this school, and on the basis of the study findings to then suggest a strategy to help reduce the rates of overweight/obesity at this school.

The study explored possible reasons for the high prevalence. Although the quality of food (vegetarian) offered by MAPS was not seen as a possible cause for the high rates of overweight/obesity, concern was however, expressed to the effect that MAPS lacked a vibrant health promotion program to encourage the majority of the

parents to enlist their children. A substantial number felt that MAPS only has some of its health initiatives in books but these promising initiatives (NEWSTART, CREATIONS, and CELEBRATIONS) are in fact never initiated, i. e. they are as good as a relic from the past. The insufficiency of one PE teacher was also identified as a challenge at this school. It was not surprising therefore that the majority of the teacher participants aired that they did not have the time to do PE or PA with the students because of the multitude of events they themselves have to do in the busy schedule of the professional courses they teach.

A number of other factors blamed for the comparatively high number of overweight/obesity, such as 'lack of sports during vacation' and not being able to workshop the teachers, parents, and on health principles on healthy eating and PA habits that they can engage in at home and in the school to role model a healthy lifestyle for their children. Children themselves, particularly the upper classes it was suggested should also be given health workshops. Emphasis was made that the lower classes should be allowed time for PA, during the day, at least 2 hours. It is on the basis of these findings that a child overweight/obesity prevention intervention strategy is recommended in the last section of this chapter.

Conclusion

Like a number of other schools in Botswana (Wrotniak et al., 2012), MAPS has been facing challenges particularly in respect of issues around rates of overweight/obesity reduction. Children can be said to be the heart of any school function; without these pupils maintaining optimum health and pleasantly attending school, their full involvement in studies and extra-curricular studies will be hindered, and the school itself will not be enabled to carry out its function of educating these children effectively.

A school that does not promote the health of its students is destined to fail to fulfill its mission – hence the need to do everything possible to ensure the prevention of overweight/obesity in school children. Clearly, MAPS is facing a serious challenge in regard to rates of overweight/obesity reduction or prevention, given that a significant number of its students are experiencing high rates of this condition. Therefore, the leadership at MAPS needs to take deliberate steps to arrest the challenge of adiposity. It is not acceptable for the school to continue business as usual when corpulence continues to drain health from its school children. Measures ought to be taken by MAPS that its student body maintains normal weight and those afflicted by overweight to be helped to stop the progress of the condition to ensure optimum health.

Recommendations

Recommendations for Future Research and Limitations of the Study

The study had a number of limitations. The first limitation of this study was, the comparatively small sample size predominantly composed of Batswana in Mogoditshane. This is particularly problematic because the prevalence of overweight/obesity among adults (among both men and women) in Botswana has been shown to be slightly less than of this current study of school children (Studies on adolescents also showed lower prevalence).

It is, therefore, necessary to conduct other studies that will represent the entire country. This is critically important especially that it is known that overweight/obesity is higher in urban dwellers and private school-going children.

Additionally, and for instance, different people groups and religious groups have different diets and weight advantages and disadvantages to Adventists.

Therefore, the suggestion is that pathways of influence may differ between groups (Birch & Fisher, 2000). Thus the recommendation is that this study should be conducted on a larger sample composed of devise subgroups and socioeconomic populations to more satisfactorily understand the effects of different ethnic and religious groups and socioeconomic status on child overweight/obesity. This will enable the application of the results to other ethnic and religious groups in Botswana.

As a growing number of studies show the small sample size of the study may not have enough statistical power to spot an association between a factor of interest and the child overweight/obesity status. Perhaps, these explain the statistical insignificance of the majority of the associations the current study analyzed.

In this study, the data was collected using an administered questionnaire with about half of the participants. The other half of the respondents that could not complete the questionnaire at school or be followed at work or home asked to fill it on their own. The self-administration of half of the questionnaire is the second limitation of this study. With self-reported questionnaire, it is possible for parents to choose desirable answers. Wardle et al. (2002), assert that it is questionable if parents are accurate reporters of their own habits.

Finally, this being a cross-sectional study, the direction of a relationship cannot be established between children's overweight/obesity and a healthy diet or activity factor even if the relationship is significant (the analysis only produced likelihood). For a more informed knowledge of the association of the healthy eating and activity habit factors with a child's overweight/obesity status, a longitudinal research design needs to be conducted in future studies in Botswana.

Recommendation of a Childhood Overweight/ Obesity Prevention Strategy

The study recommends the creation of a childhood overweight/obesity prevention strategy which, if well implemented has the potential to arrest the problem of overweight/obesity at MAPS. Themes that are identified in the context of the childhood overweight/obesity strategy include issues to do with the major areas to help prevent its onset and progress i.e. Health promotion, Diet, and PA's other inactivity and activity habits (Sleep time, sedentary behaviors like screen time).

Concerning health promotion the strategy should include regular seminars on overweight/obesity prevention to teachers/parents/school children, seminars on creating anti obesogenic environments at school and home, and healthy eating seminar, identifying new students to encourage their assimilation into school overweight/obesity program, ensuring psychological (counseling included) and moral support to teachers, parents, and students in fighting the overweight/obesity epidemic, vigorously promoting complete or total health (failure in one area may influence overweight/obesity since its risk factors are multifaceted), getting students to participate in the school overweight/obesity intervention to help others and for their own benefit, creating health clubs and committee for constant review of the overweight/obesity programs.

Next, the strategy should include cooking schools to parents, teachers, providing more options and encouraging healthier ones, changing school regulation to provide healthy lunch to the majority of the students, seminars on healthy lifestyle role-modeling to teachers and parents, feedback, assessment, and evaluation to record constantly improve the food environment to meet emerging needs for a healthy diet, and identifying barriers parents and teachers face at home, school and in the community to eat healthy, and the strategy to help them find ways to eat healthily.

Lastly, the overweight/obesity on PA and activity habits to include conducting PA seminars for parents, teachers and upper-class children, regularly promoting the WHO recommendation that children should accumulate at least 60 minutes of moderate to vigorous intensity PA daily (most of the daily PA being aerobic), involving children in physical exercise at break times, increasing the number of PE teachers to at least two (other teachers maybe employed with PE qualification in addition to their subject teaching qualifications), ensuring that PE is effective by meeting the PA needs of the students and helping them to be attentive in class (50% of the time should be PA), seminars and implementation on changes at home, school, and community for children to engage in PA, countering barriers during PA by constantly assessing and evaluating the built environment and the resource challenge and implementing changes, promoting health through lectures on parental and teacher influence to reduce overweight/obesity, engaging instruments like the Physical Education Curriculum Tool to align the school with international standards (A comprehensive self-assessment for physical education programs), improving opportunities to increase on the level of PA at school during class breaks and recess, and encouraging parents to implement the recommended sleep time and screen time for their children.

For the recommendations to work (later the strategy) to succeed, there has to be buy-in not only by the school administrators and the office workers but by the entire leadership of MAPS, including the parent-teacher association. The administrators and the teachers, in particular, will need to ceaselessly work towards creating at this school an anti-obesogenic environment that would counter the onset of overweight/obesity. If these anti-obesity environments are encouraged at home,

school, and the community, they will help in reducing the rates overweight/obesity in school.

APPENDICES

APPENDIX A

QUESTIONNAIRES

Eating Behavior and Activity Habit Survey: Parent Questionnaire

Good morning/afternoon my name is Mpho Mponwane, a Public Health student with the Adventist University of Africa. I am conducting a study about factors associated with childhood overweight/obesity in Mogoditshane. This study is expected to generate evidence-based recommendations for assisting in development of effective health promotion strategies to prevent overweight/obesity in school-going children. This will be an interviewer-administered questionnaire. Your identity will be kept confidential. All answers you provide in this survey will be kept confidential, therefore feel free to respond as accurately as possible to the questions. Participation in this study is entirely voluntary. If you choose to participate, please sign below (Please, note that the BMI, height and weight measurements will be taken at MAPS).

A. Demographics

1. Gender of child _____Parent_____
2. Age of child _____Parent_____
3. Height of child_____
4. Weight of child_____
5. BMI _____
6. Place of residence_____
8. Name of Church_____
9. Marital Status_____
10. Occupation_____
11. Occupation of your spouse/partner_____
12. Nationality_____
13. Nationality of your spouse/partner_____
14. Education_____
15. Education of your spouse/partner_____
16. Family Income (Upper middle class, lower middle class or lower class)_____
17. Vegetarian or Non Vegetarian? _____
18. Are you concerned about your child's weight?

Yes__ No__

Please use the following scale to rate your views. **Only circle one option that best applies to you for each question.**

Obese = 5
Overweight = 4
Normal = 3
Underweight = 2
Extreme Underweight = 1

19	What do you think about your weight as a parent?	5	4	3	2	1
20	What do you think about your child's weight?	5	4	3	2	1

B. Magnitude of overweight/obesity in School children.

1. Please tell us if there is anything that could be done to make it easier for parents and care-giver to get help if their child's weight is of concern?

_____

_____

_____

2. If you have ever received any professional assistance to help your child achieve a healthy weight, please, share the comments on the experience here.

_____

_____

C. Available programs (Eating Behavior and Activity Habits)

i) Eating Behavior

Please use the following scale to rate your views as you circle your response for each statement. **Only circle one option that best applies to you for each question.**

Always = 5
Often = 4
Sometimes = 3
Rarely = 2
Never = 1

1	What my child eats is important to me	5	4	3	2	1
2	How much my child eats is important to me	5	4	3	2	1
3	What my child weighs is important to me	5	4	3	2	1
4	Is your child teased for his/her body weight?	5	4	3	2	1
5	Not counting juice, how often does your child eat fruit on an average day?	5	4	3	2	1
6	On an average day, how often does each child eat vegetables	5	4	3	2	1
7	On a weekly basis how often does your child eat fast food (Nandos, Chicken Licken, Burger King, Hungry Lion)?	5	4	3	2	1
8	On a daily basis, how often does your child drink sodas?	5	4	3	2	1
9	I use food to reward my child	5	4	3	2	1
10	My child take caffeinated drinks	5	4	3	2	1
11	Meals in my house are served at a regular time	5	4	3	2	1
12	I allow my child to snack between meals	5	4	3	2	1
13	My child eats breakfast before attending school in the morning	5	4	3	2	1
14	I am responsible for deciding what my child's meal portion size should be	5	4	3	2	1
15	I am responsible for deciding the right kind of food my child should eat	5	4	3	2	1

16. If you encourage your child to eat breakfast before attending school in the morning, please describe the breakfast you provide?

_____

_____

_____

17. If you provide packed lunch for your child, please describe the packed lunch you

provide?

_____
_____
_____
_____

18. What are your child's top three favorite meals you provide at home?

_____
_____
_____
_____

Effectiveness

19. Please, suggest ways parents, and caregivers' maybe supplied with enough information to cook healthy food for their children.

_____
_____
_____
_____

20. Please, suggest ways the community may improve in providing for healthy meals to their children.

_____
_____
_____
_____

ii) Activity Habits

Please use the following scale to rate your views as you circle your response for each statement. **Only circle one option that best applies to you for each question.**

Strongly Disagree = 5
Disagree = 4
Not Sure = 3
Agree = 2
Strongly Agree = 1

1	Some people are born to be fat and some thin; there is not much you can do to change this.	5	4	3	2	1
2	How many lifelong recreation skills my child develops is important	5	4	3	2	1
3	How much exercise a child gets is important	5	4	3	2	1
4	I encourage my child to be active	5	4	3	2	1
5	My child is active in sports, recreation, or play activities during the week	5	4	3	2	1

6. About how many hours do you estimate your child sits and watches TV, play video games, or use the computer or handheld devices (like smartphones) on an average school day?

Less than 2 hours__ More than 2 hours__ Not Sure__

7. How many hours does your child sleep at night?

Less than 8 hours__ 8 hours or more__ Not Sure__

8. How many hours per week does your child play or exercise enough to make him/her sweat and breathe hard for 30 or more minutes?

Less than 7 hours__ More than 7 hours__

Effectiveness

9. Please, suggest ways parents and caregivers' maybe supplied with enough

information to encourage children's physical activity.

_____
_____
_____
_____

10. Please, suggest ways the community may improve in providing for sports and other physical activities in the community.

_____
_____
_____
_____

11. Please, add here the few physical activities, play activities, recreation and sports your child gets involved in regularly, and please do say how often in a week.

_____
_____
_____

D. Parents Perceptions and Suggestions on Factors influencing obesity.

1. Do you know if your child is obese or not?

_____
_____
_____

2. What do you think are the reasons children become obese?

---

3. On a scale from 1 to 5, how much influence do you think you have as parents to help reduce the rates of childhood obesity?(1=no influence and 5 = a big influence)
1__ 2__ 3__ 4__ 5__

4. What other ideas do you have as parents to help reduce obesity in children and how do you think that can help?

_____
_____
_____

Interviewee signature..... Interviewer signature.....
Questionnaire Number..... **Date of interview**.....

THE EATING BEHAVIOR AND PHYSICAL ACTIVITY ASSESSMENT: THE TEACHER'S QUESTIONNAIRE

Good morning/afternoon my name is Mpho Mponwane, a Public Health student with the Adventist University of Africa. I am conducting a study about factors associated with childhood overweight/obesity in Mogoditshane. This study is expected to generate evidence-based recommendations for assisting in development of effective health promotion strategies to prevent overweight/obesity in school-going children. This will be an interviewer-administered questionnaire. Your identity will be kept confidential. All answers you provide in this survey will be kept confidential, therefore feel free to respond as accurately as possible to the questions. Participation in this study is entirely voluntary. If you choose to participate, please sign below.

A. Demographics

1.Grade teaching_____

2. Number of years as a teacher_____

3. Length of time at MAPS_____

4. Academic qualification_____

5. Subject learnt at school_____

6. Other teaching experiences_____

7. Religious affiliation_____

8. Church_____

9. Vegetarian or Non-Vegetarian_____

10. Nationality_____

B. Magnitude of problem of obesity in School children.

1. Do you consider overweight/obesity to be a problem among students at this school?
Yes__ No___ Don't Know__

2. Do you believe there is a childhood obesity problem in Mogoditshane/Gaborone?
Yes__ No__ Don't Know__

3. What do you understand a healthy weight to be?

_____

_____

_____

C. School programs to promote health and their effectiveness.

Eating Behavior

1. What is a typical lunch served at your school like?

_____

_____

2. How do you decide about what food items to serve to children?

_____

_____

_____

3. Are you managing to provide options and at the same time encourage students tomake healthy choices by providing access to only the healthy foods?

_____

_____

_____

_____

4. Are there any changes you have tried or are planning to try to encourage healthier dietary habits among students?

_____

_____

_____

5. Do you feel the school food environment plays any role or influence in childhood obesity in any way?

Yes___ No___ Don't Know___

6. In an ideal world, what do you think, the school food service program at this school would be?

_____

_____

_____

7. What would your role be as a teacher in that ideal world?

_____

_____

_____

8. Do you have HE (Healthy Eating) training or expertise?

Yes__ No__

If yes please explain

_____

_____

_____

9. How many teachers have HE (Healthy Eating) training or expertise

None__ Little__ Some___ A lot__

Effectiveness

10.Please, explain why or why not you consider your school nutrition programs effective?

_____

_____

_____

10. Are there barriers that parents in the community face in helping their children to eat healthy foods?

_____

_____

11. What barriers does the school (or you as a teacher) encounter to offering healthy eating?

_____

_____

_____

12. What suggestions do you have for changes in school that would help children eat healthy foods?

_____

_____

_____

_____

Physical Activity

1. How much physical activity should children get each day?

_____

_____

What types and for how long?

_____

_____

Questions 2,3 and 4 for PE Teacher and Administration only.

2. How many minutes of recess do students at your school get each day? ____minutes
3. How many days do students have physical education each week? _____days
4. How many minutes per day do students have physical education? _____minutes
5. Do you think children in the community have opportunities to be physically active? Yes__ No__ Don't Know__
6. What are some of the activities you are aware of?

_____
_____
_____

7. Do you have PE training or expertise? Yes__ No__
If yes please explain

_____
_____
_____

How many teachers have PE training or expertise
None__ Little__ Some___ A lot__

Effectiveness

8. Please, explain why or why not you consider physical activity programs in your school effective?

_____
_____

9. What suggestions do you have for changes at home, in schools, and in the community that would help children engage in physical activity?

_____
_____
_____

10. What barriers does the school (or you as a teacher) encounter to offering physical activity program?

_____
_____
_____
_____

D. Teachers Perceptions and Suggestions on Factors influencing obesity.

1. Do you know of some pupils who are obese?

_____
_____
_____

2. What do you think are the reasons pupils become obese?

_____
_____

3. On a scale from 1 to 5, how much influence does the school have to help reduce the rates of childhood obesity? (1=no influence and 5 = a big influence)
1__ 2__ 3__ 4__ 5__

4. What school-based obesity programs do you think should be introduced and how do you think they will be helpful in reduce obesity in pupils?

_____
_____
_____

Interviewee signature..... Interviewer signature.....
Questionnaire Number..... **Date of interview**.....

APPENDIX B

CONSENT FORMS

Consent to Participate in a Research Study

Title of the study: Factors Associated with Overweight/Obesity among Children in Mogoditshane Adventist Primary School

Investigator:
Name: Mpho Mponwane
Phone Number +267 71498053
Place of Work South Botswana Conference/Home Health Education Service

Introduction

You are being requested to be in a research study to find out the factors associated with overweight/obesity among children in Mogoditshane Adventist Primary School (children five to thirteen years old). You were selected as a possible participant because there were overweight/obesity cases (past adolescent overweight/obesity studies) reported from your area (Corbett Brown, 2014) and your response would valuable in our endeavor to identify specific factors linked to overweight/obesity increase. If you are unable or would rather not read this form, the researcher can tell you what it says and answer any of your questions before you sign the form.

Purpose of the Study

The purpose of the study is to understand factors linked to overweight/obesity increase. Information gathered will help to come up with strategies to reduce overweight/obesity incidence in children five to thirteen years old in Mogoditshane and surrounding areas. Ultimately, this research may be presented as a paper or published in international journals of diseases.

Description of the Study Procedures

If you agree to be in this study, you will be asked to respond to questions from a survey questionnaire, which will take approximately 30 minutes to complete.

Risks/Discomforts of Being in this Study

There are no reasonable foreseeable (or expected) risks for participating in this study (Although this was the assertion made to the participants, the researcher observed that some participants experienced discomfort being asked or when answering questions about overweight and obesity and therefore the researcher and research assistants made efforts to be sensitive to minimize the discomfort).

Benefits of Being in the Study

The benefit of participation is that this study may lead to reduce the incidence of overweight/obesity in children five to 13 years in Mogoditshane and surrounding areas.

Confidentiality

This study is anonymous. We will not be collecting or retaining any information about your identity.

The records of this study will be kept strictly confidential. Research records will be kept in a locked file and all electronic information will be coded and secured using a

password-protected file. We will not include any information in any report we may publish that would make it possible to identify you.

Payments

You will not receive any payment or reimbursement for participating in this study.

Right to Refuse or Withdraw

The decision to participate in this study is entirely up to you. You may refuse to take part in the study *at any time* without affecting your relationship with the investigators of this study. Your decision will not result in any loss of benefits to which you are otherwise entitled. You have the right not to answer any single question, as well as to withdraw completely from the interview at any point during the process; additionally, you have the right to request that the interviewer not use any of your interview material.

Right to Ask Questions and Report Concerns

You have the right to ask questions about this research study and to have those questions answered before, during or after the research. If you have any further questions about the study, at any time feel free to contact me, Mpho Mponwane, by email at mponwanem@aua.ac.keor by telephone at +267 71498053. If you like, a summary of the results of the study will be sent to you. If you have any other concerns about your rights as research participants that have not been answered by the investigator, you may contact SBC Health Ministries at +2673973639. Alternatively, concerns can be reported to HRDC at 3633201.

Consent

Your signature below indicates that you have decided to volunteer as a research participant for this study and that you have read and understood the information provided above. You will be given a signed and dated copy of this form to keep, along with any other printed materials deemed necessary by the study investigator.

Participant's Name (Print).....
Participant's Signature..... Date.....
Investigator's Signature.....Date.....

APPENDIX C

LETTERS

PRIVATE BAG 0038
GABORONE
BOTSWANA
REFERENCE:

REPUBLIC OF BOTSWANA
MINISTRY OF HEALTH AND WELLNESS

TEL: (+267) 363 2500
FAX: (+267) 391 0647
TELEGRAMS: RABONGAKA
TELEX: 2818 CARE BD

REFERENCE NO: HPDME 13/18/1 **20th November 2018**

Health Research and Development Division

Notification of IRB Review: **New application**

Mpho Mponwane
P O Box 378
Mogoditshane

Dear Mpho Mponwane

Protocol Title: **FACTORS ASSOCIATED WITH OVERWEIGHT/OBESITY IN MOGODITSHANE ADVENTIST SCHOOL CHILDREN**

HRU Approval Date:	16 November 2018
HRU Expiration Date:	15 November 2019
HRU Review Type:	Expedited Review
HRU Review Determination:	Approved
Risk Determination:	Minimal risk

Thank you for submitting new application for the above referenced protocol. The permission is granted to conduct the study.

This permit does not however give you authority to collect data from the selected sites without prior approval from the management. Consent from the identified individuals should be obtained at all times.

The research should be conducted as outlined in the approved proposal. Any changes to the approved proposal must be submitted to the Health Research and Development Division in the Ministry of Health for consideration and approval.

Furthermore, you are requested to submit at least one hardcopy and an electronic copy of the report to the Health Research, Ministry of Health and Wellness within 3 months of completion of the study. Approval is for academic fulfillment only. Copies should also be submitted to all other relevant authorities.

Continuing Review

In order to continue work on this study (including data analysis) beyond the expiry date, submit a Continuing Review Form for Approval at least three (3) months prior to the

protocol's expiration date. The Continuing Review Form can be obtained from the Health Research Division Office (HRDD), Office No. 7A.7 or Ministry of Health website: www.moh.gov.bw or can be requested via e-mail from Mr. Kgomotso Motlhanka, e-mail address: kgmmotlhanka@gov.bw As a courtesy, the HRDD will send you a reminder email about eight (8) weeks before the lapse date, but failure to receive it does not affect your responsibility to submit a timely Continuing Report form

Amendments

During the approval period, if you propose any change to the protocol such as its funding source, recruiting materials, or consent documents, you must seek HRDC approval before implementing it. Please summarize the proposed change and the rationale for it in the amendment form available from the Health Research Division Office (HRDD), Office No. 7A 7 or Ministry of Health website: www.moh.gov.bw or can be requested via e- mail from Mr. Kgomotso Motlhanka, e-mail address: kgmotlhanka@gov.bw . In addition submit three copies of an updated version of your original protocol application showing all proposed changes in bold or "track changes".

Reporting

Other events which must be reported promptly in writing to the HRDC include:

- Suspension or termination of the protocol by you or the grantor
- Unexpected problems involving risk to subjects or others
- Adverse events, including unanticipated or anticipated but severe physical harm to subjects.

If you have any questions please do not hesitate to contact Ms Seeletso Mosweunyane at smosweunyane@gov.bw, Tel +267-3632018 and Mr. K. Motlhanka at kgmmotlhanka@gov.bw, Tel +267-3632751. Thank you for your cooperation and your commitment to the protection of human subjects in research.

Yours sincerely

Ms S. Mosweunyane
for /PERMANENT SECRETARY

Mogoditshane Adventist Primary School and Little Lambs Pre - School

EDUCATING THE HEAD, HEART AND THE HAND

Private Bag 51
Mogoditshane
Botswana. Africa
Plot: 1024, Ledumadumane
Mogoditshane
Tel: +267 3923127
Fax: 267 3923128

22 November 2018

TO WHOM IT MAY CONCERN

Dear Sir/Madam

RE: RESEARCH FOR - PASTOR MPHO MPONWANE

Greetings to you in the name of our redeemer Jesus Christ.

This letter serves to introduce Pastor Mpho Mponwane, who is doing his studies in Public Health with approval from the Ministry of Health Research Committee. The School has allowed him to carry out.

His research on the topic entitled "Factors Associated with Overweight/Obesity in Mogoditshane Adventist School children". We kindly ask you to assist him in any way possible as he will be working with you and your children.

Your assistance and cooperation in this regard will be highly appreciated.
Thank you in advance.

Yours faithfully

Mrs. Nani Brown
Principal

AUA
Adventist University of Africa

Private Bag Mihagathi
00503 Nairobi, Kenya
Tel (254) 2068030734660330
Fax. (254) 20 660 3150
Email: info@aua.ac.ke
WEB: www.aua.ac.ke

Location:
Advent Hill, Magadi Road, Ongata Rongai

November 14, 2018

TO WHO IT MAY CONCERN

Dear Sir/Madam,

INTRODUCTION OF MPHO MPONWANE

Greetings from the Adventist University of Africa (AUA), Kenya. This letter is to introduce to you **Pastor Mpho Mponwane** who is a student at the Adventist University of Africa, School of Postgraduate Studies located in Ongata Rongai with student identification number S2016046 offering Master of Public Health at AUA.

Mpho is currently undertaking a research leading to the production of a thesis on the subject: ***"Factors Associated with Overweight/Obesity in Mogoditshane Adventist School Children".*** As part of the research process, he needs to conduct a survey by distributing questionnaires to School Children, parents and teachers of Mogoditshane Adventist School. His proposal has been approved by the research panel and he is ready to gather data for his study.

May I request your kind assistance in granting Mpho whatever help he may need to enable him gather data for his research work. Be assured that any information that Mpho will gather for his research will be treated in the strictest confidence and none of his participants will be individually identifiable in the resulting study.

Thanking you in advance for your assistance and support in furthering this research endeavor.

Yours faithfully,

Professor Daniel Ganu
Dean, School of Postgraduate Studies

Email: ganud@aua.ac.ke
Mobile: +254 736656843

APPENDIX D

APPROVAL

BOTSWANA BUREAU OF STANDARDS

Member of International Organization for Standardization (ISO) WM No. 1283

Plot No: 55745, Main Airport Road Block 8, Gaborone Private Bag BO 48 Gaborone Botswana Tel: (267) 3903200 Fax: (+267) 3903120 E-mail: info@bobstandards.bw
Insurance House Plot 13393/4/5 Second Floor Private Bag 465 Francistown Botswana Tel: (267) 2416233 Fax: (267) 2416251 Email: info@bq.bobstandards.bw

RC/TM/P02/F02 — Test Sheet for Non Automatic Weighing Instruments — Issue No 2

1. **Business Details**
Name of Business: Adventist University of Africa
Postal Address: Box 378 Mayfair Bure
Tel: 7149853 Fax: –
Physical Address: –
Email: –
Test Site: BoBS

2. **Verification Details**
Verification officer: Phinyane
Date of Verification: 2019/01/31
Signature: HA

3. **Instrument Details**
Make: Tanita Model: BC-731
Serial No: 350130 Approval. No: 37954
Class: I II III IV

4. Traceability of standards: BSTmw 2016008

5. Visual Inspection (tick as appropriate) Yes / No Comments

	Yes	No	Comments
Is the instrument complete?	✓		
Is the instrument suitable for use for trade?		X	For research purposes
Is the instrument erected on a suitable place?	X		
Has the instrument been previously assized?		X	
Has the instrument passed the visual inspection?	X		

Scale Ranges

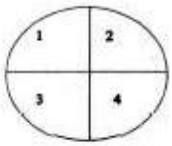
Max	Scale interval	Min. Load	Tick here
6/15kg	e=2/5g	40g	
15kg	e=5g	100g.	
20kg	e=5g	100g	
150 kg	10g	220g	–

6. Eccentricity

Number of Supports		Load Applied	

Record Weight Position here

				–



Position	Indication	Error	Pass/Fail
1			
2			
3			
4			
5			
6			
7			
8			
9			
10			

7. Linearity Test

Load	Indication ↑	Indication ↓	MPE ±	Error ↑	Error ↓	Pass/Fail ↑	Pass/Fail ↓
0.2	0.2	0.2	5	–	–	✓	
10.0	10.0	10.0	5	–	–	✓	
50.0	49.9	50.0	10	0.1	–	✓	
100.0	99.8	99.8	15	0.2	0.2	✓	
120.0	119.9	–	15	0.2	–		
–	–	–					

Results/ Comments: Safe within limits of error.

Paid P 75 Receipt No: R132704
Customer's name: Mpho Mpofu

To be invoiced ☐
Signature

2011/07/12

APPENDIX E

FREQUENCY TABLE OF OCCUPATION

```
. tab job Church
```

Occupation	Name of Church		Total
	Non-adven	Adventist	
Primary/high school t	10	7	17
Government/private se	29	21	50
Agriculture	1	2	3
Health care	8	9	17
Manufacturing/constru	9	12	21
Military	1	4	5
Student	2	3	5
Unemployed	1	0	1
Other	10	7	17
Total	71	65	136

```
. tab job_spouse Church
```

Occupation of your spouse/partner	Name of Church		Total
	Non-adven	Adventist	
Primary/high school t	10	3	13
Government/private se	18	22	40
Agriculture	2	1	3
Health care	5	4	9
Manufacturing/constru	15	17	32
Military	2	1	3
Unemployed	1	0	1
Other	6	5	11
Total	59	53	112

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