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DEPARTMENT OF FOOD TECHNOLOGY AND NUTRITION

SUGAR SWEETENED BEVERAGE INTAKE, PHYSICAL ACTIVITY AND NUTRITIONAL STATUS OF SCHOOL CHILDREN ABOVE FIVE IN KAMPALA

BY

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DECLARATION

I, Siliver Kagoda, declare that the information presented in this thesis is my own work and it has never been presented in this school or any other institute of higher learning for a degree award.

Signed……. Date…5.12.2023…

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This thesis has been submitted for examination to the Directorate of Graduate Training, Makerere School with approval of my supervisors;

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ABBREVIATIONS AND ACRONYMS

SSB	Sugar sweetened beverages
DD	Dietary diversity
PA	Physical activity
WHO	World health organization
FAO	Food and agriculture organization
USA	United states of America
LMICs	Low- and middle-income countries
CDC	Center for disease control
UBOS	Uganda bureau of statistics
DEO	District education officer
IPAQ	International physical activity questionnaire
IBM	International business machine
SPSS	Statistical package for social sciences
Kg	Kilogram

ABSTRACT

Over the last few decades**,** sugar sweetened beverages (SSBs) consumption has been steadily increasing among school going children and in the entire population. SSBs contain a lot of added sugar and provide empty calories. Overconsumption of SSBs and a lack of physical activity are risk factors for life style diseases. Despite the increase in non-communicable diseases (NCDs), there is increased production and consumption of SSBs among school going children. This makes them susceptible to develop NCDs leading to early onset of morbidity which is a serious concern to the population and need to be addressed. This cross sectional study investigated SSB consumption, nutritional status, physical activity level and correlates of SSB intake among primary school children age 9-13 year in Kampala city. A self-administered questionnaire was used to collect data and entered and analysed using SPSS for Windows, Version 28.0, 2021 and Microsoft office Excel 2010 were used for data entry and analysis. The association between variables were established via Chi-square. The study showed that overweight and obesity are on the rise and accounted for 26.4% of the participants. Based on BMI most (69.4%) of the children had a normal BMI, 4.2% were underweight while 17.2% were classified as obese and 9.2% as overweight. Results showed a significant association ($P < 0.05$) between 24 hour dietary diversity and nutritional status. Majority of the pupils (>50%) did not meet WHO recommended vigorous physical activity level of at least 75 minutes per week. Majority of the respondents (62.8%) had consumed soda with added sugar and locally sweetened beverages (93.8%) at least once in 24 hours before the study was conducted. Study found out that for the majority of the pupils, parents/guardians were responsible for buying the SSB consumed (55.2%) and deciding on the type of SSB to be carried to school (56.3%). The buyer of the pupil's favourite SSB was significantly associated ($p <0.05$) with whether the pupil consumed SSBs in the 24 hours prior to the study or not. There were also significant associations ($p <0.05$) between consumption of SSBs and majority of the determinants for its intake. There were also significant associations ($p<0.05$) between SSB consumption and nutritional status, and physical activity with nutritional status. In conclusion, most pupils failed to achieve the levels of vigorous physical activity recommended. The pupils also consumed a lot of SSBs and the prevalence of overweight and obese was high. Efforts should be made to promote physical activity participation and good dietary practices within school and home environments.

CHAPTER ONE

1.0 INTRODUCTION

1.1 Background

Sugar sweetened beverages (SSBs) are non-diet, non-alcoholic beverages which contain pre-added sugar or other caloric sweeteners (Mundus, 2013). The commonly used sweeteners are sucrose, invert sugar, dextrose, fructose, lactose, mannitol, honey, glucose syrup, sorbitol, high fructose Corn syrup (Riordan *et al*., 2016). The SSBs include soft drinks, sports drinks, energy drinks, sweetened tea, coffee drinks, non 100% fruit juice, and powdered fruit drinks. Intrinsic sugars, which are those incorporated within the structure of intact fruit and vegetables and sugars naturally present in milk have not been found to have adverse effects of consumption(WHO, 2018). Therefore plain water, plain milk, 100% vegetable drinks, 100% fruit juice, and alcoholic beverages were excluded from SSBs (Riordan *et al*., 2016).

SSBs contain a lot of pre-added sugar, which gives short-term energy (empty calories) none of the other essential nutrients (Petrova *et al*., 2017). Consumption of large quantities of SSBs exceeding the WHO recommended amount of 5% of total energy intake for children (WHO, 2018) is strongly associated with health risks such as increased body weight, obesity, diabetes, and hypertension (Petrova *et al*., 2017;Ling *et al.*, 2012; Paes et al., 2020; Scharf & DeBoer, 2016)

Increased intake of SSBs amongst a number of other factors such as fast food eating, breakfast skipping, physical inactivity, and increased TV viewing hours, is thought to contribute to weight gain and risk of obesity in pupils ((Petrova et al., 2017). A number of studies have suggested a potential association between SSBs intake and prevalence of nutrition status (Petrova *et al*., 2017;Ling *et al.*, 2012; Paes et al., 2020; Scharf & DeBoer, 2016).

The key to utilizing sugar for energy is to choose healthy sources of sugar (Bryant *et al.*, 2010). Fruit, for example, contains fructose, which is a natural sugar. Eating a serving of fruit, such as a banana, apple, peach, plum or handful of grapes, is nutritious. Fructose gives a quick burst of energy (Bryant *et al*., 2010). Fruits also contain fiber, which counterbalance the effects of fructose by delaying sugar digestion and absorption,(Alberti *et al*., 1978). Sugars in dairy foods, such as

milk and yogurt are healthy choices too, because the foods provide other nutrients, such as protein and calcium in the diet (Bryant *et al.,* 2010).

The estimated prevalence of childhood overweight and obesity in Africa in 2010 was 8.5 % and was expected to reach 12.7 % by 2020 (Onis *et al*., 2010). Additionally the school going age above five years is a dynamic period of growth and development (Koszewski *et al.,* 2012). However, there was no updated data on the relationship that exists between SSB intake, nutritional status, physical activity level as well as the determinants of SSB intake that is why this age group was investigated.

1.2 Problem statement

Lifestyle-related diseases, such as cancers and cardiovascular disease, are on the rise all over the world(Ta et al., 2006). In Uganda, non-communicable diseases (NCDs) are an emerging challenge, accounting for 12% of the disease burden and 33% of all deaths (MOH., 2019;Ahaibwe *et al*., 2021). Despite the increase in these NCDs across sub-Saharan Africa, there is increased production and consumption of SSBs among school going children. The region has become a targeted growth market for SSBs, which are associated with life style diseases (Thow *et al*., 2021).

Among school going children above five, over consumption of SSBs is strongly associated with several lifestyle diseases this being a period of rapid growth and development (Yoshida & Simoes, 2018;Beck *et al*., 2014; Erzse *et al*., 2021; Mathias *et al*., 2013; Mazarello Paes *et al*., 2015; Melbye *et al.*, 2016). About 10% of world's school going children above five are either overweight or obese(Kuẑbicka and Rachoń, 2013).

Despite SSB intake being associated with many lifestyle diseases, their relationship with nutritional status, physical activity levels and the determinants of their consumption among upper primary school children in Uganda remain unknown. The purpose of this research was therefore to investigate how SSB intake relates to nutritional status and physical activity level as well as establishing the determinants of their consumption by school going children above five years of age.

1.3 General objective

The aim of the study was to assess the intake of SSB in primary school children in Kampala city and to examine its association with nutritional status, physical activity levels and dietary habits as well as establishing the correlates for SSB intake in school and home environment

Specific objectives

(i) To establish the relationship between weight status and physical activity levels among primary school children of 9-13 years in Kampala.

(ii) To establish the correlates for SSB consumption among primary school children of 9-13 years in Kampala.

(iii) To determine the relationship between SSB intake and weight status of primary school children of 9-13 years in Kampala.

1.5 Hypotheses

(i) There is no significant relationship between nutritional status and physical activity levels of primary school pupils.

(ii) School and home environment do not significantly influence the consumption of SSBs by primary school children.

(iii) There is no significant relationship between SSBs consumption and nutritional status of primary school pupils.

1.6 Justification of the study

It is estimated that malnutrition costs Uganda 1.8 trillion UGX, an equivalent of 5.6 per cent of its GDP annually (UNICEF, 2019). Malnutrition threatens to destroy a generation of children in Uganda. Between 2013 and 2015, more than 500,000 young Ugandan children died (UNICEF, 2019). Of these deaths, nearly half were associated with malnutrition (UNICEF, 2019).

Children who engage in unhealthy habits such as over consumption SSBs and these who are physically inactive are more likely to develop life style diseases later in life (Lekše *et al*., 2023). The lifestyle diseases impact on learning, school attendance and work force participation (UNICEF, 2019). Good nutrition positions a child for success by not only raising their chance for survival but also promoting cognitive development. This contributes to better outcomes in the

classroom, supporting stronger human capital and economic development outcomes in a country(UNICEF, 2019).

The focus of most countries has been on child survival and welfare programmes which target the pre-school children who are below five years (Hug *et al*., 2016). However, there was need for attention to be given to the school age children above five years, because ensuring optimal child growth and development will accelerate economic development in the future. Additionally, it is difficulty in change health-related habits adopted during childhood later in life (Montaño *et al*., 2015), thus the need for the study.

1.7 Conceptual framework

The conceptual framework for this study (Figure 1) was based on the social cognitive theory which is a widely recognised theory for designing programs on physical activity and nutrition (Bagherniya *et al*., 2018). According to the theory, human behaviour occurs because of interactions between various factors which include environmental and personal factors.

Pupils may adopt poor dietary patterns because during school years children usually stay away from their family and may face different food choices that culminate into poor dietary patterns (Stone *et al.,* 2007). These include consumption of fast food, snacking, high consumption of sugar sweetened beverages, skipping breakfast, and low consumption of vegetables and fruits (Stone *et al*., 2007). Pupil's participation in physical activity and their dietary patterns affect their weight status.

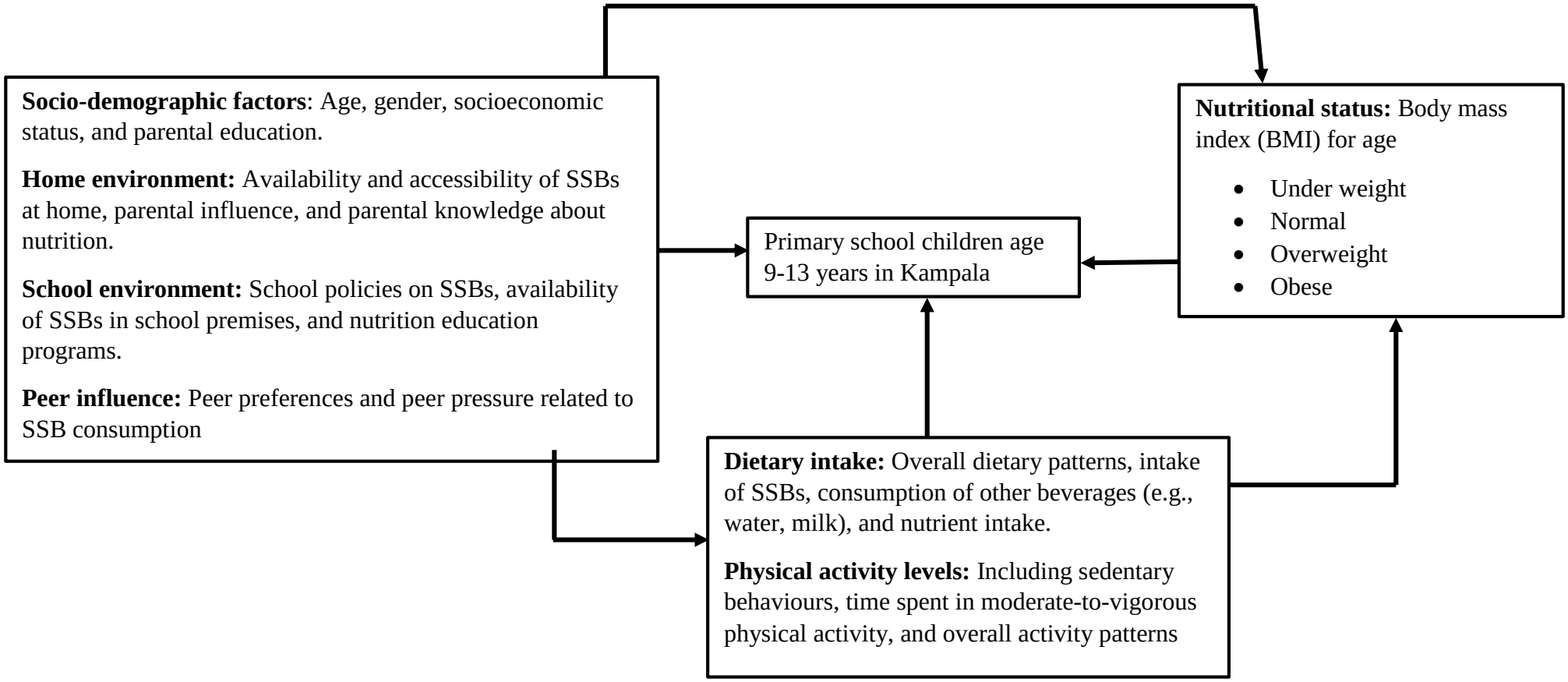
The most direct cause of weight gain is energy imbalance in which more energy is consumed than expended. Overweight and obesity are manifestations influenced by different determinants. Among children, the availability and accessibility of SSBs in schools, home and taste preferences are some of drivers of their consumption (Gaar *et al*., 2017). Other drivers for SSBs include promotions through media advertising, entertainment and sporting venues, children's sports and events (Gaar *et al*., 2017)

Beverage industries have steadily increased bottle sizes over the last 50 years (Erzse *et al*., 2021). In the 1950s the standard serving size was a 200 ml bottle, which increased to at least a 300 ml can, which was superseded by a 500 ml, 600 ml, 1000 ml and 2000 ml bottles. Unfortunately, the

maxim “bigger is better” seems to characterize both customer preferences and marketing efforts. The larger the container, the more people are likely to drink, especially when they assume they are buying single-serve size containers (Erzse *et al*., 2021; Mantzari *et al*., 2018)

As a marketing strategy beverage companies are recently making smaller size bottles which can carry smaller volumes of SSBs (Mantzari *et al.*, 2018). These smaller volumes of SSBs are portable, cheaper thus affordable by majority of people including children. The smaller bottles increase drinking occasion frequency and encourage consumption of numerous bottles in succession(Mantzari *et a* , 2018)

Figure 1 Conceptual Framework Source: Adapted from the social cognitive theory (Bandura, 1986) and literature



CHAPTER TWO

2.0 LITERATURE REVIEW

2.1 Physical activity level among primary school children

Physical activity is any bodily movement produced by skeletal muscles that requires significant energy expenditure (WHO, 2010). Walking, running, dancing, gardening, swimming are some of the examples of physical activities. According to WHO, (2010), 60 minutes per day of moderate-to-vigorous intensity in children can improve health (WHO, 2010). Regular physical activity is proven to help prevent and manage non-communicable diseases such as heart disease, stroke, diabetes and several cancers (WHO, 2010).

Physical activity levels have, however, decreased worldwide most likely because of the adoption of a sedentary lifestyle (Popkin *et al.*, 2012). The sedentary life style such as reduced walking to school due to improved access to motorized transportation; decreased occupational physical activity due to automated processes, leading to more sedentary occupation patterns; and increased time spent in sedentary leisure activities (Popkin *et al.*, 2012).

It is difficult to describe children's physical activity status because few countries have established surveillance systems in Africa to assess population level. Majority of the studies on physical activity status have targeted adults. This creates a serious knowledge gap (Hallal *et al*., 2012).on addition, objective measures like accelerometers are very costly. Among adults Latin America is the most inactive region in the world with 43% of those over 15 years old categorized as inactive (Hallal *et al*., 2012).

Evidence of the impact of the school environment on physical activity levels is also scarce in Africa and other low and middle-income countries of which Uganda is inclusive (Brooke *et al.*, 2014). In USA however, most of vigorous physical activity as well as sedentary behaviours are concentrated in the school environment (Bürgi *et al.*, 2015). Higher vigorous physical activity in the schools is associated with higher daily vigorous activity suggesting that increasing school based physical activity could be an effective intervention for increasing overall physical activity in children (Long *et al.*, 2013).

Physical inactivity is described as lack of bodily movement that involves a significant energy expenditure (WHO, 2010). According to WHO, the fourth major cause of mortality in the world is physical inactivity, causing an estimated 3.2 million deaths globally (WHO, 2009). To tackle the rising challenges of non- communicable diseases attributable to physical inactivity, WHO launched a global action plan to reduce physical inactivity by 10% by 2025, and 15% by 2030 (WHO, 2019). Despite the rising cases of obesity among children, most of them do not meet the recommended 60 minutes per day of moderate-to-vigorous physical activity (Micklesfield et al., 2014; WHO, 2010).

A sedentary lifestyle has become a common theme. An increase in sedentary time means a decrease in physical activity (Strauss *et al.*, 2018). Watching television, playing on phones, computers, doing homework and traveling in car to and from school promote a lot of sitting causing children to be more sedentary (Hoffmann et al., 2017). In Europe and United states of America, it is estimated that four to eight hours a day are spent being sedentary (Hoffmann *et al*., 2017). To target many children of different socioeconomic backgrounds, schools are the best place to start in helping to implement the breaking up of time being sedentary and increasing physical activity during the day (Mooses *et al*., 2017)

WHO recommendation for children and adolescents aged 5-17 years are: should do at least an average of 60 minutes per day of moderate-to-vigorous intensity, mostly aerobics across the week; should incorporate vigorous-intensity aerobic activities, as well as those that strengthen muscle and bone, at least 3 days a week; should limit the amount of time spent being sedentary, particularly the amount of recreational screen time (WHO, 2010).

Currently the global progress to increase physical activity has been slow, largely due to lack of awareness and investment. Worldwide, 1 in 4 adults, and 3 in 4 adolescents (aged 11–17 years), do not currently meet the global recommendations for physical activity set by WHO (Ki-moon *et al.*, 2013). As countries develop economically, levels of inactivity increase. In some countries, levels of inactivity can be as high as 70%, due to changing patterns of transportation, increased use of technology and urbanization (Cooper, 2006).

According to (Ndagire *et al*., 2019;Nakabazzi *et al*., 2020), there is inadequate physical activity levels among school going children and this high prevalence of physical inactivity is likely to result into increased body mass among school children and adolescents in Uganda. In a study conducted by (Yiga *et al*., 2021) among women of reproductive age in urban Uganda, inadequate physical activity was very high and was mainly attributed to home and virtual environments. According to (Mpalampa *et al*., 2023), only 22% of primary schools in Kampala offered sufficient time for physical activity. This contributes much to the physical inactivity of primary school children.

In 2013, the global cost of physical inactivity is estimated to be international $ 54 billion per year in direct health care, with an additional 14 billion US dollars attributable to lost productivity (Bull *et al*., 2015). Estimates from both high-income, as well as low- and middle-income countries (LMICs) indicate that between 1–3% of national health care expenditures are attributable to physical inactivity (WHO, 2018).

2.2 Nutritional status of school children

Nutritional status is the condition of the body that results from the stability between food intake and energy expenditure (Pandey *et al*., 2019). It is a proxy indicator for assessing the entire population health status and one of the major predictors of child survival.

Childhood obesity is a global health challenge of the 21st century, especially in developing countries (Onis *et al*., 2010). The worldwide prevalence of childhood overweight and obesity increased dramatically and is expected to increase further (Onis *et al*., 2010;Ansem *et al*., 2014; WHO, 2018). In 2010, the estimated prevalence of childhood overweight and obesity in Africa was 8.5 % (Onis *et al*., 2010). In Uganda the prevalence of obesity and overweight being highest in descending order, in Central, Western, Eastern and Northern Regions, respectively (Sserwanja *et al*., 2021).

Body mass index (BMI) for age is frequently used to determine weight status. It is defined as the ratio of weight in kilograms to height in square meters (CDC, 2020). According to CDC, a child is considered overweight if he or she has a body mass index (BMI) equal to or greater than the 85th percentile, but less than the 95th percentile for their sex and age group. A child or adolescent is considered obese if he or she has a BMI equal to or greater than the 95th percentile for age and sex (CDC, 2020).

Overweight and obesity in children are problematic for a number of reasons. For example, obese children are more likely than healthy weight children to maintain the excess weight problem into adulthood which is a healthy risk(CDC, 2020). The earlier the onset of obesity, the earlier one sees signs of diseases typically found in older adults such as cardiovascular disease, diabetes, and metabolic syndrome, all of which are now being seen at younger ages(CDC, 2020). This may impact on their life expectancy as well as their quality of life (CDC, 2020).

The causes of obesity in children are multifactorial (Ang *et al*., 2013). Some of the main factors are poor dietary choices, sedentary behaviour and being physically inactive (Ang *et al*., 2013). In light of the growing obesity epidemic and the resulting non-communicable diseases in adulthood, it is increasingly necessary to examine the lifestyle choices that today's children make.

Excess energy intake, inadequate physical activity and increased consumption of SSBs have direct positive associations with obesity and weight gain in children (Ang *et al*., 2013). According to (Yiga *et al*., 2021), poor dietary and physical activity behaviours are key contributors among urban women of reproductive age as well as children. In a national survey conducted in Uganda, it was observed that children of mothers who were overweight or obese were more likely to be obese or overweight compared to those with normal weight mothers (Sserwanja *et al*., 2021).

2.3 Sugar sweetened beverages (SSBs)

Sugar sweetened beverages (SSBs) are defined as drinks that contain added sugar, which include cordials, carbonated soft drinks, flavored mineral waters; energy, sports, and electrolyte drinks; fortified waters as well as fruit and vegetable drinks (Brand-Miller & Barclay, 2017). Table 1 shows the classification of SSBs. They can be classified into the following: soft drinks, energy drinks, sports drinks, non 100% fruit and vegetable juice, tea and coffee drinks *(Taber et al*., 2015). Some of the common sugar sweetened beverages are Pepsi, Mountain Dew, Gatorade, Tropicana, 7 Up, Doritos, Brisk, Cheetos, Mirinda, Ruffles, Aquafina, Kevita and Propel which are manufactured by Crown Beverages Limited. Coca-Cola, Thumps Up, Fanta, Sprite, Limca, Kinley, Minute Maid, Maaza, Costa coffee, Rani and Rimzim which are manufactured by Century Bottling Company Limited in Namanve, Mukono. Other famous manufacturers of SSBs are Hariss International Limited and Kiri Bottling Company Limited. However, there is a number of SSBs which are locally made in Uganda by various Small and Medium Scale Enterprises (SMEs) as well as at home.

Table 1 Classification of sugar sweetened beverages

Classification	Attributes of sugar sweetened beverages	References
Soft drinks	Are non-alcoholic beverages typically containing water and a flavoring agent. They are either carbonated or noncarbonated. They constitute a diverse group of products, classified on the basis of their sugar and fruit juice content, flavouring, carbonation level, main non-water ingredients, and functionality. These include: ready-to-drink essence flavored beverages; ready-to-drink beverages containing fruits or fruit juice; beverages ready-to-drink after dilution.	*Kregiel, 2015*
Sports drinks	Are beverages containing a combination of water and electrolytes usually sodium, calcium, magnesium, chloride, bicarbonate and potassium that replenish water and nutrients lost during physical exercise.	*Coombes et al., 2000*
Energy drinks	Beverages that typically contain high levels of energy and other ingredients such as caffeine, taurine, glucuronolactone, vitamins, herbal extracts or amino acids, and marketed as boosting mental alertness and physical stamina.	*Babu et al., 2008*
	Examples include Monster, Red bull, Riham rock boom, Sting gold rush and many others.	*Breda et al., 2014.*
	When caffeine is used as a functional ingredient such as in energy drinks or caffeinated drinks the amount of caffeine in the drink as consumed shall not exceed 320mg/kg.	
Sweetened tea and coffee drinks	These include bottle iced coffees, coffee drinks ordered with sugar and the ordinary form prepared at home and school with added sugar. They have variable composition all over the world.	
Non 100% fruit, vegetable juice and punch	Juice is the extractable fluid contents of fruits or vegetables. The non 100% fruit juice contains added sugar. They have variable composition all over the world. Juice can be locally prepared or industrial made.	

2.3.1 Production of sugar sweetened beverages

Globally SSB production has increased dramatically in the recent decade, accompanied by rapid growth in their consumption. In 2017 China produced over 180 million tons of SSBs that was 12 times that in 2010 (14.9 million tons) and increased 440 times over that in 1992. The average consumption of SSBs in 2014 was nearly 10 times that in 2003 (Li *et al*., 2017).

Coca-Cola Company is the world's leading manufacturer, marketer and distributor of non-alcoholic beverage concentrates and syrups, used to produce nearly 400 beverage brands (Jones & Comfort, 2018). It sells beverage concentrates and syrups to bottling and canning operators, distributors, fountain retailers and fountain wholesalers (Thow *et al*., 2021). The Company's beverage products comprise of bottled and canned soft drinks as well as concentrates, syrups and not ready to drink powder products. In addition to this, it also produces and markets sports drinks, tea and coffee (Li *et al*., 2017).

In Uganda, SSB market changed substantially from 2011-2012. Three new companies entered a market that had previously been dominated by Century Bottling Company limited and Crown Beverages limited increasing the production of SSBs (Ahaibwe *et al.*, 2021;Fitch, 2019). The value of SSBs grew at a rate of 12.4% during the 2015–2018 period, and was projected to grow at an annual average rate of 10.9% from 2019 to 2022 (Fitch, 2019). This is attributable, in part, to relatively cheap marketing in comparison with industrialized environments, concerted advertising, and with little regulation (Fitch, 2019). Coca Cola accounted for 67% of sugar sweetened beverages adverts in Uganda (Dia *et al*., 2021).

2.3.2 Consumption of sugar sweetened beverages

There is growing evidence of the increasing availability and consumption of SSBs in Uganda (Ahaibwe *et al*., 2021). SSBs contribute a significant proportion of the daily energy consumption per person (Basu *et al*., 2014). SSB consumption varies considerably by geographic location, gender, age and socio-economic status. Soda is the most heavily consumed SSB in all age groups (Burns *et al*., 2019).

In terms of gender, boys generally consume more SSBs than girls. SSB consumption increases with age among children ages 2-19 (Blecher *et al*., 2017). Children whose mothers are less educated consume more SSBs than children whose mothers have higher levels of education and children whose mothers are employed consume more SSBs than children whose mothers are not employed (Datar *et al*., 2014). According to (Bleich *et al*., 2018) adolescents and young adults in the United states still consume more than the recommended amount of SSBs set by the 2015-2020 Dietary Guidelines for Americans. Most Mexican American children (87%) consumed either soda or any other SSB. Soda consumption was associated with obesity after controlling for multiple potential confounders (Beck *et al*., 2014).

Consumption of sugar-sweetened beverages(SSB) among primary school children has been found to be positively associated with life style diseases later in life (Gaar *et al.*, 2017). In a study conducted by (Kiwanuka *et al.*, 2006) among school children in Kampala, it was noted that consumption of SSBs had greatly increased. Ahaibwe *et al* (2021) also noted an increase of SSB consumption and availability in Uganda, on addition to contributing a significant proportion of the daily calories per person.

2.4 Nutritional attributes of the SSBs

The body needs sugar to work normally however, it is harmful when it is above normal levels of 4.5-5.5 g/dm^3 in human blood as well as a risk factor non-communicable diseases (Agbazue *et al.*, 2014). Table 2 shows nutritional attributes of different categories of sugar sweetened beverages.

Table 2 Nutritional attributes of the SSBs

Category of SSB	Nutritional attributes of SSBs	References
Non 100% fruit juice	Rich in vitamin C and other vitamins, minerals and naturally occurring phytonutrients that contribute to good health	*Alam et al., 2019*
Soft drinks (Regular soda)	Typically void of vitamins and minerals, healthy dietary fats, such as omega-3s and omega-6s, protein	*Jin, 2016*
Energy drink	High in sugar and calories, caffeine in combination with other presumed energy enhancing ingredients such as taurine, herbal extracts, and B vitamins.	*Heckman et al., 2010*
Sports drinks	Contain the electrolytes of sodium and potassium. Most commercial sports drinks contain sodium in the range of 10-25mmol/L.	*Heckman et al., 2010*
Sweetened tea and coffee drinks	Mainly contain sugar or sweeteners together with other ingredients	

2.5 The determinants for SSB consumption

The consumption of SSBs is widespread in the child population (Scharf *et al*., 2016). SSB consumption is associated with adverse health outcomes (Luger *et al*., 2017). Improved understanding of the determinants will inform effective interventions to reduce SSB consumption in the general population.

There are a number of factors that influence SSB consumption. Among the determinants are child's preference for SSBs, television viewing time, snack consumption, physical activity levels, school nutrition policy and environment, parents' socio- economic status, using food as rewards, parental-perceived barriers, child's age and knowledge, parental knowledge, skills, restrictions, home SSB availability and living near a fast food store or restaurant (Mazarello Paes *et al*., 2015). Thus sugar sweetened beverage consumption in young children is influenced by factors operating at individual, interpersonal and environmental levels which is consistent with the socio-ecological theory (Mazarello Paes *et al*., 2015).

The socio-ecological model of health behaviour suggests that an individual's behaviour is influenced by a multitude of determinants operating at different levels. Unhealthy dietary habits such as SSB consumption are acquired during early childhood and stress the need to understand the correlates influencing these behaviour in children to inform intervention development (Mathias *et al*., 2013).

CHAPTER THREE

3.0 METHODOLOGY

3.1 Research design

The study was a cross-sectional quantitative and qualitative study design conducted in March 2023, aimed at investigating sugar sweetened beverage consumption, physical activity levels and nutritional status of primary school children age 9-13 years in Kampala city. The cross-sectional design was used as it determines the prevailing characteristics in a population at a certain point in time. Both quantitative and qualitative data sets were collected which provided in depth explanations to research objectives.

3.2 Study sites

The study was carried out in Kampala, the capital city of Uganda. The city is divided into five major divisions namely; Kampala Central, Kawempe, Makindye, Nakawa and Rubaga Division. Five schools namely; Sir Apollo Kaggwa primary school, Makerere primary school, Red rock junior school, Shalom primary school and Mengo primary school participated in the study. Kampala city was chosen for the study, because majority of schools canteens were stocked with a variety of foodstuffs including SSBs. In addition, majority of Kampala pupils can easily access restaurants, supermarkets, outlets with SSBs and other food types and sedentary recreational facilities such as computers and television as well as parents being able to pay for them (UBOS, 2017).

3.3 Study population

The participants consisted of children aged 9-13 years attending the five primary schools in Kampala city. Children aged between 9-13 years were selected because this is the period of rapid physical growth as well as of mental development, thus making the children more vulnerable to malnutrition (Benassi *et al*., 2022). Secondly children in this age bracket can adequately identify foods and recall dietary information (Livingstone *et al.,* 2000). Thus, the minimum age for participating pupils was 9 years in accordance with recommendations regarding age appropriateness of available dietary assessment methods (Thompson *et al.,* 1994). Children below 9 years of age have limited cognitive ability to self-report food intake (Livingstone *et al.,* 2000).

3.4 Sample size determination and sampling technique

The sample size of respondents was determined using a formula of Fisher (Fisher, 1992)

$$n = \frac{z^2 pq}{d^2}$$

n = the desired sample size

z =the standard normal deviation at the required confidence level of 95%

p = the proportion in the target population estimated to have characteristics being measured. The prevalence of obesity among primary school children stands at 21.7% in Kampala part of central Uganda (Chebet *et al*., 2014).

q= 1-p

d =the level of statistical significance set in this study.

z = 1.96

Thus $n = \frac{1.96^2 \, x0.217x0.783}{0.05^2}$

$$n = 261$$

A total of 261 pupils were therefore selected through proportional stratified random sampling. A list of registered schools in Kampala city was obtained from the Directorate of Education and Social Services at Kampala Capital City Authority (KCCA). The names of all registered schools were written down on a small separate piece of paper. Each small piece of paper with a school name was folded and placed in an empty dry container. The folded paper with mixed several times and five were then randomly picked from the container. There after the register and details regarding the age of each pupil were then obtained from the school administration. The sample of eligible pupils which is proportionate to the population of each school was computed and randomly selected to make up the total sample size of the participants in the study.

Number of children sampled from each selected school

$$= \frac{\text{Number of pupils in each school}}{\text{Number of pupils in all participating schools}} \text{ X Desired sample size}$$

3.5 Data collection methods

Data was collected using an interviewer administered questionnaires (Appendix 1) under the class teacher's supervision. 30 questionnaires were pre-tested in Buganda road primary school and St. Peter's primary school Nsambya prior to formal implementation of the study. Research Assistants

who assisted with data collection and anthropometric measurements received rigorous training and assessments for three days, prior to commencement of the study. During data collection, the assistants received continued technical support and supervision from the principal investigator.

3.5.1 Dietary intake and diversity

Dietary intake and dietary diversity of children were assessed using a modified 7 days food frequency questionnaire (FFQ) as recommended by FAO. Additionally, pupils were encouraged to mention if they consumed foods that are not identified in the list of foods that was provided. A total of eleven food groups were assessed. The ten food groups are specified in the FAO (2011) guidelines for measuring household and individual dietary intake and an additional food group for SSBs which is not specified. The food groups were: (i) cereals and cereal products (ii) roots and tubers (iii) legumes and lentils (iv) nuts (v) dairy, oils and fats (vi) meat and meat products (vii) poultry and poultry products (viii) fruits (ix) fish (x) vegetables; (xi) Sugar sweetened beverages. The *sugar sweetened beverage group* included energy drinks, sports drinks, soda with added sugar, locally prepared sweetened drinks; the *cereals and cereal products group* included maize, wheat; *roots and tubers food group* included coco yam, cassava, sweet potato; *legumes and lentils group* included beans, cow peas, soya bean; *nuts group* included ground nuts, coconuts; *meat group* included beef, goats meat, mutton, pork; *poultry group* included chicken, duck, turkey, eggs*; fruit group* included bananas, pineapple, oranges, lemon; *fish group* included silver fish, Nile peach, tilapia, mud fish; *vegetable group* included Sukuma wiki, Amarathus, cabbage, tomatoes; diary, *oils and fat group* included milk, butter, cooking oil and fats. The portion sizes of SSBs consumed were also recorded. The participants answered questions such as "How many times a week did you consume SSBs. The response options included; never, once a week, 2–4 days a week, 5–6 days a week.

3.5.2 Correlates for SSBs consumption

The questionnaire consisting of both closed and open-ended questions was used to establish factors influencing the consumption of SSB among children at school. Questions in the questionnaire included (i) Does your school sell sugar sweetened beverages? (ii) Who buys sugar sweetened beverages you carry to school or at home (iii) do your school administrators limit the sales of SSBs at school canteen? (iv)Which physical activity do you do at school or home? (vi) How many days per week do you engage in physical activity? (vii) Many other related questions were also included in the questionnaire.

3.5.3 Assessment of nutritional status

Two basic variables, height and weight were measured following WHO guidelines (WHO, 2004). All the anthropometric measurements were taken following standard techniques. The children were weighed on digital weighing scale (Seca, gmbh & co.kg, 22089 Hamburg, Germany. Model: 8741021654, Serial No: 5874021153138, Max 150 kg d=0.1 kg) without shoes and the weight was recorded to the nearest 0.1 kg. Throughout the study period, calibration was done before and after weighing every child by setting it to zero.

For height measurement, the children were made to stand on the flat surface of the Stadiometer, with feet parallel and with heels, buttocks, shoulders and back of the head touching the scale. The hands were also made to hang loosely at the sides. The head piece of the height board was then lowered to make contact with the top of the head and measurement was taken to the nearest 0.1 centimeter (cm). Body mass index (BMI) for age was calculated using the formula below.

$$\text{Body Mass Index(BMI) for age} = \frac{\text{Mass in kilogramme}}{\text{Height in metres squared}}$$

3.5.4 Physical activity

To quantify the physical activity level of children, modified physical activity questionnaire (PAQ) was used. Physical activity level was categorized mainly into low, moderate and vigorous. Vigorous intensity activities were activities that required high physical effort and caused large increase in breathing or heart rate for at least 60 minutes continuously per day for at least three days a week. Vigorous activities include running, climbing a hill, pushups, gymnastics, swimming, playing basketball, riding a bicycle fast or on hill. Moderate-intensity activities were activities that required moderate physical effort and caused small increase in breathing or heart rate for at least 60 minutes continuously per day for at least three days a week. Moderate physical activities included walking fast, dancing, jumping and skipping. Low physical activities were activities that no increase in the heart rate and include activities of daily living, such as shopping, cleaning, watering plants, taking out the trash, walking the dog, mowing the lawn and gardening.

Participants were asked questions such as: do you do any vigorous-intensity sports, fitness or recreational (leisure) activities that cause large increases in breathing or heart rate like running, aerobics for at least 60 minutes continuously a day for at least 3 days a week? The response was either yes or no. Do you do any moderate-intensity sports, fitness or recreational (leisure) activities

that cause a small increase in breathing or heart rate such as brisk walking for at least 60 minutes continuously for at least 3 days a week? The response was either yes or no.

3.6 Validity and reliability of the instruments.

The questionnaires were validated prior to the formal implementation of the study. The questionnaires were prepared using simple words that were easy to understand. Complicated terms were avoided as much as possible. The questionnaire was written in English just as the medium of communication in the schools. These questionnaires were pretested on 30 pupils of different schools. The pupils were requested to comment on the clarity of the questions and made suggestions where there was need. This minimized question misinterpretation. However these 30 pupils did not participate in the final study.

3.7 Data analysis

Data collected during this study on dietary intake were entered and analyzed using International Business Machines (IBM) Statistical Package for Social Sciences (SPSS) for Windows, Version 28.0, 2021 and Microsoft office Excel 2010. Categorical variables were expressed as proportions and percentages. Basic descriptive statistics were used to analyze participants' socio-demographic characteristics and SSB intake. Chi-square test was used to test the significance of association between dependent variables such as nutritional status and independent variables such as SSBs consumption. Chi square values were considered significant at $P< 0.05$

Ethical consideration

Permission to conduct the study was obtained from the authorities of the participating primary schools and Kampala capital city authority. The teachers were issued with written consent form on behalf of the children since they were all below 18 years. Teachers were given a full explanation about the relevance and purpose of the study. No form of incentive was provided to respondents to share information or participate in the study especially before data collection. To maintain confidentiality, respondents were not identified by name.

CHAPTER FOUR

4.0 RESULTS

4.1 Socio-demographic characteristics of the respondents

Table 3 Socio-demographic characteristics of the respondents

Parameter	Frequency (n=261)	Percentage
Gender		
Male	99	38.2
Female	162	61.8
Formal education level of the parent/guardian		
None	10	3.8
Primary	37	14.1
High school	1	0.4
Tertiary	192	73.4
Unknown	21	8.3
Occupation of father		
Farmer	28	10.7
Salaried employee	65	24.8
Casual laborer	53	20.3
Business owner	100	38.3
Retired	15	5.7
Occupation of the mother		
Farmer	58	22.2
Salaried employee	32	12.3
Casual laborer	27	10.4
Unemployed	29	11.1
Business owner	40	15.3
Housewife	71	27.2
Retired	4	1.5

Source: Survey data

The findings revealed that about two thirds of the pupils (61.8%) were female with a small proportion (3.8%) of the respondents' parents having no formal education while the majority (73.4%) had attained tertiary education. The findings also showed that most of the fathers (94.3%) were gainfully employed with the remainder being retired, while 60.8% mothers were employed, 38.3% were unemployed and 1.5% were retired (Table 3)

4.2 The relationship between nutritional status and physical activity levels

4.2.1 Nutritional status of the pupils

More than two thirds (69.4%) of the children in the present schools studied had a normal BMI, while a fifth (17.2%) were classified as obese and 9.2% as overweight (Figure 2).

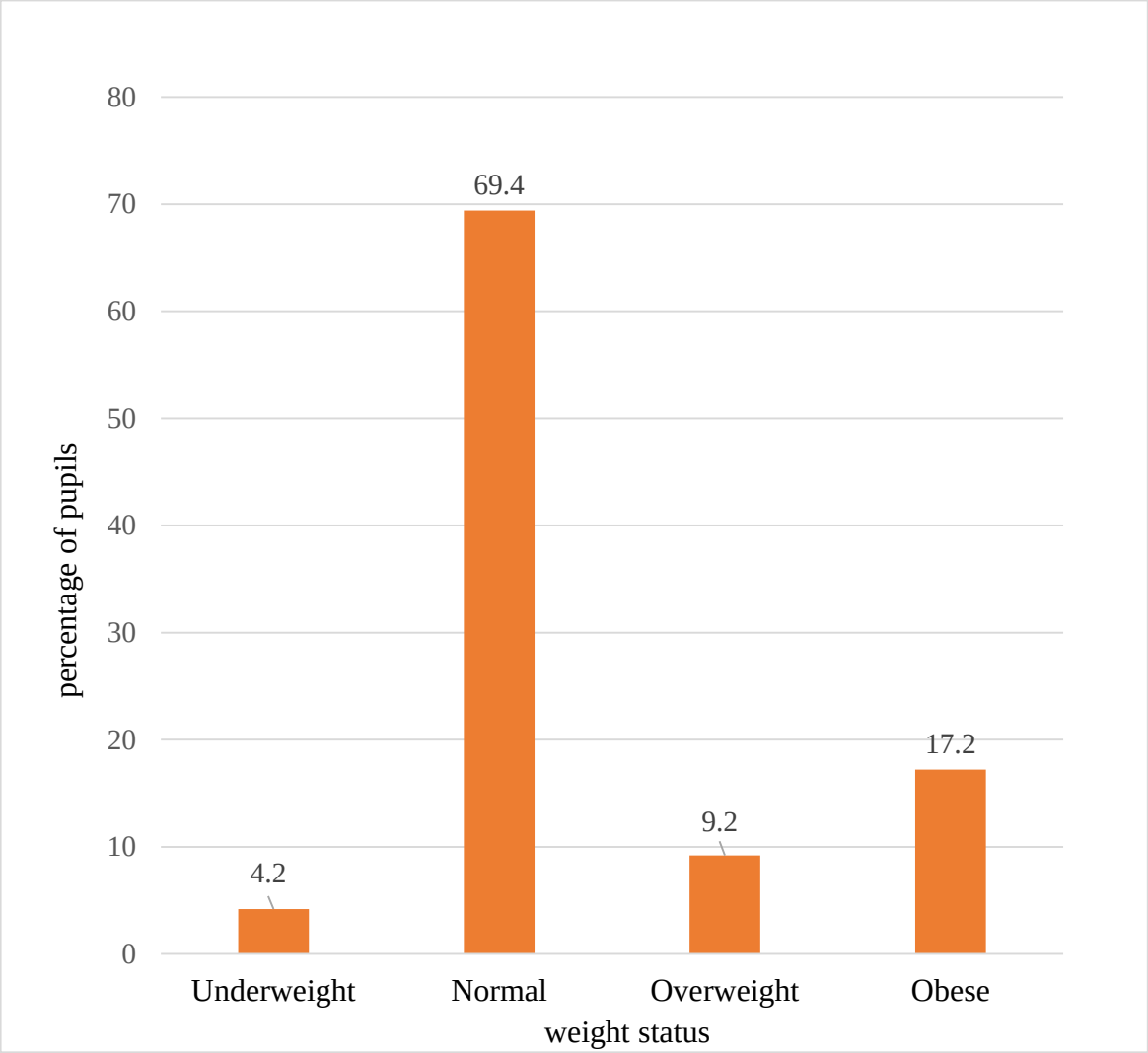


Figure 2. Nutritional status of respondents

4.2.2 Physical activity of respondents

Table 4: Physical activity of respondents

Physical activity participation of the respondents	Percentage (%)
Engage in physical activity while at school or home	75
School has a program for all pupils to engage in compulsory physical activity	94
Means of transport to school (motorized means)	28
Did vigorous intensity sports, or recreational activities that cause increased breathing	74
Meets recommended weekly vigorous physical activity levels (75 minutes)	39
Did moderate intensity sports, or recreational activities that cause increased breathing	74
Meets recommended weekly moderate physical activity levels (150 minutes)	15
Actively spent leisure in the past 7 days	26

It was observed that although majority of the respondents engaged in physical activity while at school or home, they used non-motorized means of transport to school, actively spent their leisure time and were in schools that had a program for all pupils to engage in compulsory physical activity. Overall the findings revealed that school going children in the present study did not meet the recommended weekly moderate and vigorous physical activity levels.

4.2.3 Association between physical activity and nutritional status

Table 5: Association between physical activity and nutritional status of respondents.

	nutrition status				
Physical activity participation N = 261	Under malnutrition	Normal	Over weight	Obese	Chi square p-value
Meets recommended weekly vigorous physical activity	5(4.9)	97(95.1)	0(0)	0(0)	0.011*
Does not meet recommended weekly vigorous physical activity	6(3.8)	84(52.8)	45(28.3)	24(15.1)	
Meets recommended weekly moderate physical activity	9(23.7)	29(76.3)	0(0)	0(0)	0.009*
Does not meet recommended weekly moderate physical activity	2(0.9)	152(68.2)	45(20.2)	24(10.8)	
Uses non-motorized means of transport to and from school	8(4.3)	180(95.7)	0(0)	0(0)	0.026*
Uses motorized means of transport to and from school	3(4.1)	1(1.4)	24(32.9)	45(61.6)	
Spends most of weekly leisure time actively	11(5.7)	181(94.3)	0(0)	0(0)	0.017*
Spends most of weekly leisure time inactively	0(0)	0(0)	45(65.2)	24(34.8)	

*Significant at $p<0.05$; the values in brackets are the Chi square value

There is significant association ($P<0.05$) between weekly moderate, vigorous physical activity levels with nutrition status of the pupils. The significant association also exits between means of transport that pupils use to go to school, mode of spending weekly leisure time and nutritional status of respondents.

Respondents that met recommended weekly moderate or vigorous physical activity levels, those that used non-motorized means of transport to and from school and those that actively spent weekly leisure time were likely to have a normal nutritional status.

4.3 The relationship between dietary patterns and nutritional status

4.3.1 Dietary patterns among pupils

Majority of the pupils had consumed foods from almost all food groups with the exception of eggs (Table 6). Four food groups of SSB, grains, roots and tubers, nuts and dairy products, were consumed by all respondents in the schools studied. Vegetables were the least consumed of all the food groups. More than half of the respondents (140) consumed at least four food groups (Table 6). About 95% of respondents in the schools studied consumed four to seven food groups.

Table 6. Food groups consumed by students prior to the survey

Food category	Percentage of total (N=261)
Sugar sweetened beverages	100
Cereals and cereal products	100
Roots and tubers	72.3
Legumes and lentils	62.7
Nuts	43.5
Dairy, oils and fats	98.5
Meat and meat products	88.1
Poultry and poultry products	33.8
Fruits	45.9
Fish	27.1
Vegetables	19.5

Source: Survey data

Table 7. Dietary diversity score of school children.

Number of food groups consumed	N=261
≤2	4
3	9
4	130
5	48
6	40
7	30

Recommended dietary diversity was determined following (FAO, 2013)

4.3.2 Frequency of SSB consumption in 24 hours

The findings revealed that majority (90%) of the respondents consumed locally sweetened beverages and about a third (37.2%) consumed soda with added sugar during the last 24 hours (Table 8). The study also found that none of the respondents consumed any energy drink or sport drink in 24 hours prior to the time of the study.

Table 8. Frequency of SSB consumption in 24 hours

Parameter	Frequency (n=261)	Percentage
Frequency of consuming soda with added sugar in 24 hours		
0 Times	97	37.2
1-2 Times	75	28.7
3 Times & Above	89	34.1
Frequency of consuming energy drinks in 24 hours		
0 Times	261	100
1-2 Times	0	0
3 Times & Above	0	0
Frequency of consuming sport drinks in 24 hours		
0 Times	261	100
1-2 Times	0	0
3 Times & Above	0	0
Frequency of consuming locally prepared sugar sweetened beverages at home and school in 24 hours		
0 Times	16	6.2
1-2 Times	10	3.8
3 Times & Above	235	90

Source: survey data (Author)

4.3.3 Quantities of SSB consumption in 24 hours

About half of the respondents consumed more than 350 ml of soda with added sugar (49.4%) and majority (93.5%) respondents consumed locally prepared sugar sweetened beverages (Table 8). All the respondents had not consumed any amounts of energy drinks or sport drinks in 24 hours before the study was conducted.

Table 9: Quantities of SSB consumption in 24 hours

Parameter	Frequency (n=261)	Percentage
Volume of Soda with added sugar consumed in 24 hours		
Above 350 ml	129	49.4
Less than 350 ml	47	18
No drink at all	85	32.6
Volume of energy drinks consumed in 24 hours		
Above 350 ml	0	0
Less than 350 ml	0	0
No drink at all	261	100
Volume of sport drinks consumed in 24 hours		
Above 350 ml	0	0
Less than 350 ml	0	0
No drink at all	261	100
Volume of Locally prepared sugar sweetened beverages at home and school consumed in 24 hours		
Above 350 ml	244	93.5
Less than 350 ml	1	0.4
No drink at all	16	6.1

Source: Survey data 4.3.4 Dietary diversity (DD) and nutritional status

The results show a significant association ($P<0.05$) between 24 hour dietary diversity and nutritional status (Table 9). A similar association was observed between weekly dietary diversity and nutritional status. Having a low 24 hour and weekly dietary diversity likely resulted in respondents being undernourished. Respondents with a recommended 24 hour and weekly dietary diversity were likely to have a normal BMI for age.

Table 10: Association of dietary diversity (DD) and nutritional status

	N = 261				
Dietary diversity	Underweight	Normal	Over weight	Obese	Chi square
Low 24 hour DD	11(91.7)	0(0)	1(8.3)	0(0)	0.030*
Recommended 24 hour DD	0(0)	181(72.7)	44(17.7)	24(9.6)	
Low weekly DD	11(84.6)	0(0)	2(15.4)	0(0)	0.001*
Recommended weekly DD	0(0)	181(73.0)	43(17.3)	24(9.7)	

*Significant at $p<0.05$. Source: Survey data. Values in brackets are Chi square values.

4.3.5 SSB consumption and nutritional status

The results show a significant association (P<0.05) between the amounts of all SSBs consumed and nutritional status (Table 10). Respondents that consumed more than 350 ml of soda with added sugar, energy drinks, sports drinks or locally prepared sugar sweetened beverages 24 hours prior to the study were likely to be overweight or obese. Also, respondents that consumed no soda with added sugar, energy drinks, sports drinks or locally prepared sugar sweetened beverages 24 hours prior to the study were likely underweight.

Table 11: SSB consumption and nutritional status

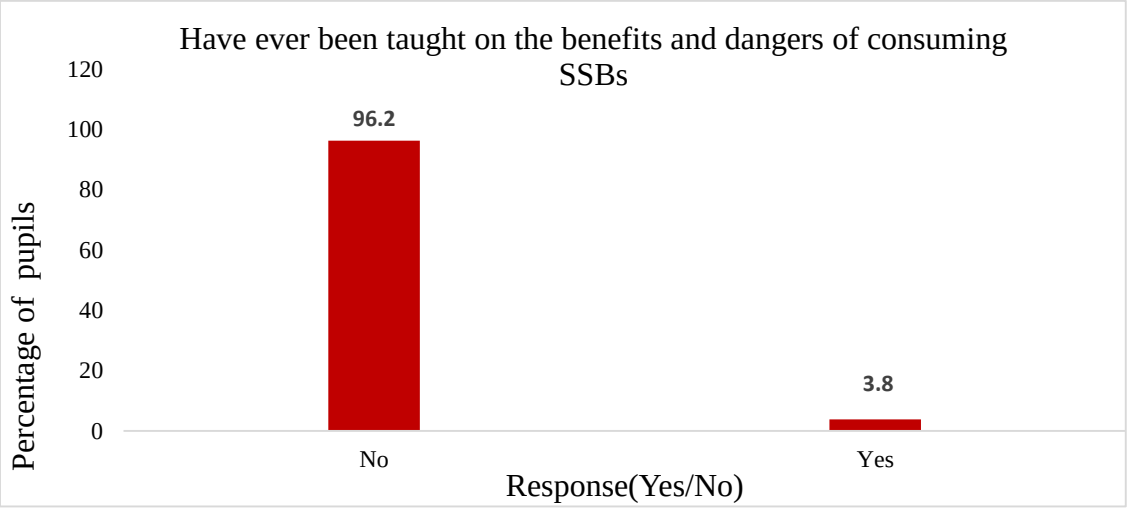
N = 261					
Quantities of SSB consumed	Under weight	Normal	Over weight	Obese	Chi-square
Consumed more than 350 ml of soda with added sugar in past 24 hours prior to the study	1(0.8)	59(45.7)	45(34.9)	24(18.6)	0.041*
Consumed less than 350mls of soda with added sugar in past 24 hours prior to the study	0(0)	47(100)	0(0)	0(0)	
Did not consume any soda with added sugar in past 24 hours prior to the study	10(11.8)	75(88.2)	0(0)	0(0)	
Consumed more than 350 ml of locally prepared sugar sweetened beverages in past 24 hours prior to the study	1(0.4)	174(71.3)	45(18.4)	24(9.8)	0.005*
Consumed less than 350 ml of locally prepared sugar sweetened beverages in past 24 hours prior to the study	0(0)	1(100)	0(0)	0(0)	
Did not consume any locally prepared sugar sweetened beverages in past 24 hours prior to the study	10(62.5)	6(37.5)	0(0)	0(0)	

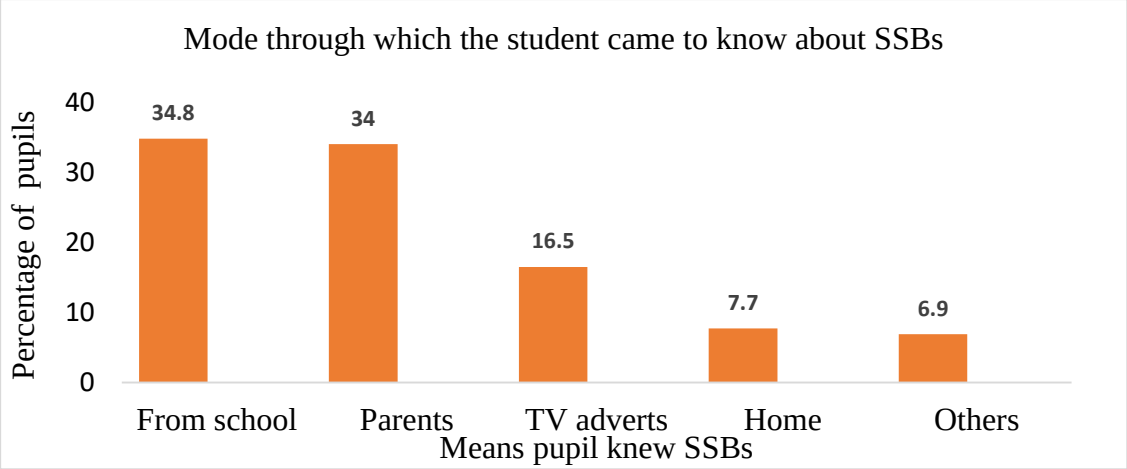
*Significant at p<0.05. Values in brackets are Chi square values.

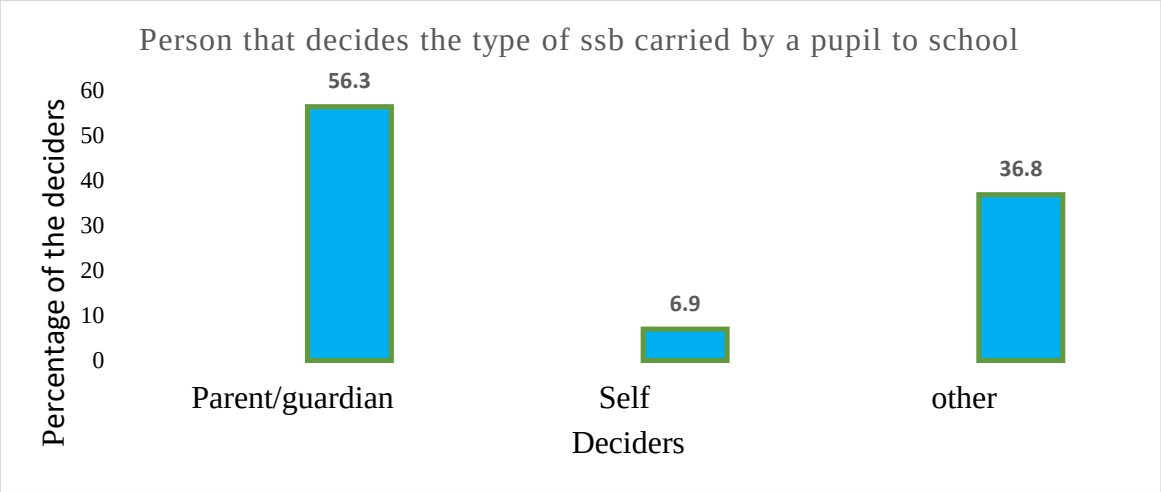
4.4 The determinants for SSB consumption among primary school children in Kampala

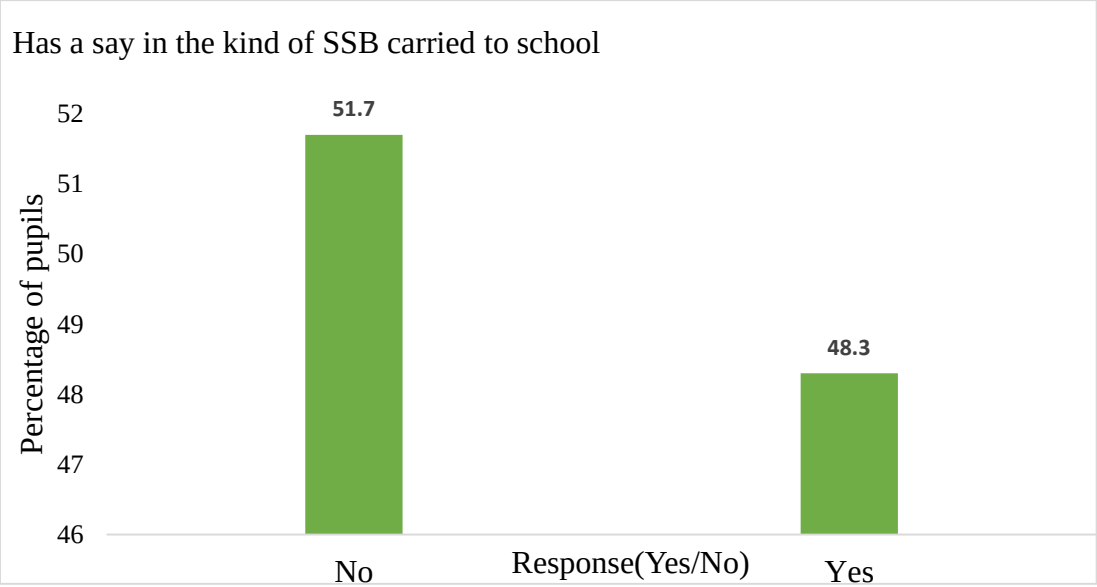
The study found out that more than half of the pupils who participated, their parents/guardians were responsible for buying SSB they consumed (55.2%) and deciding on the type of SSB to be

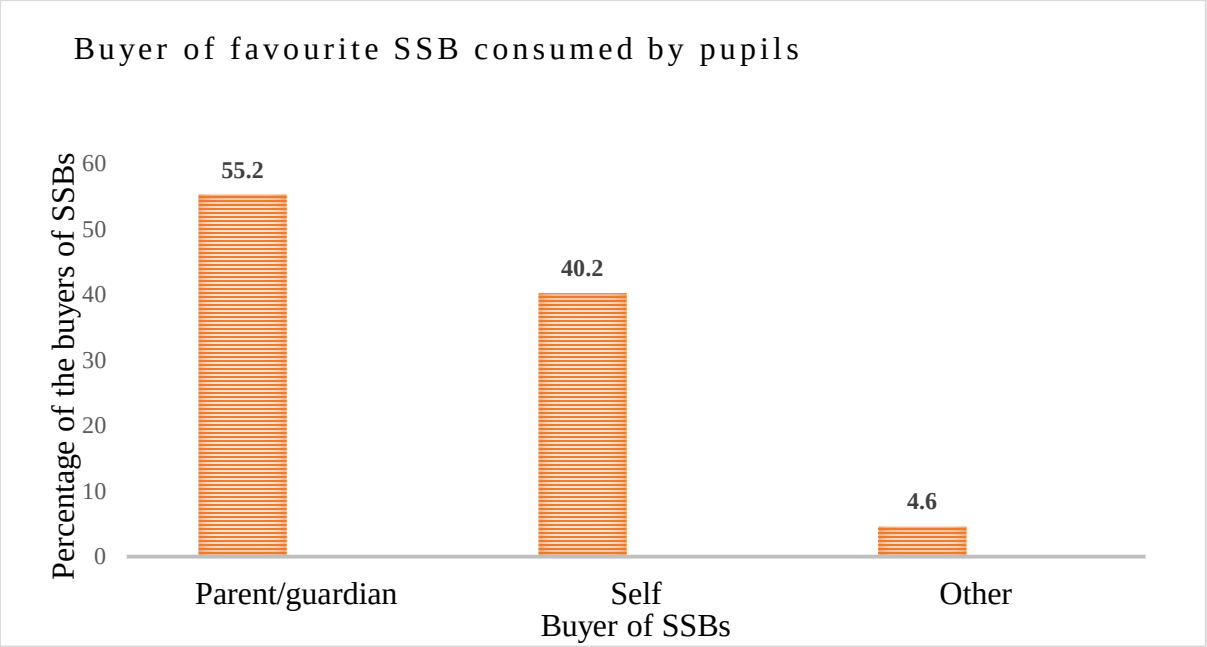
carried to school (56.3%) (Figure 5). The study also investigated the mode through which the respondents came to know about the SSBs that they consume. Results also show that all the respondents had never read nutritional facts on SSBs, majority of the pupils (82%) were served tea or porridge with already added sugar at school, and have never been discouraged by family members (65.5%) or friends (80.9%) from consuming SSBs. It was observed that the majority of the respondents had family members (80.8%) and friends (82%) consuming SSBs and had come to know about SSBs from school (34.8%) and parents (34%).

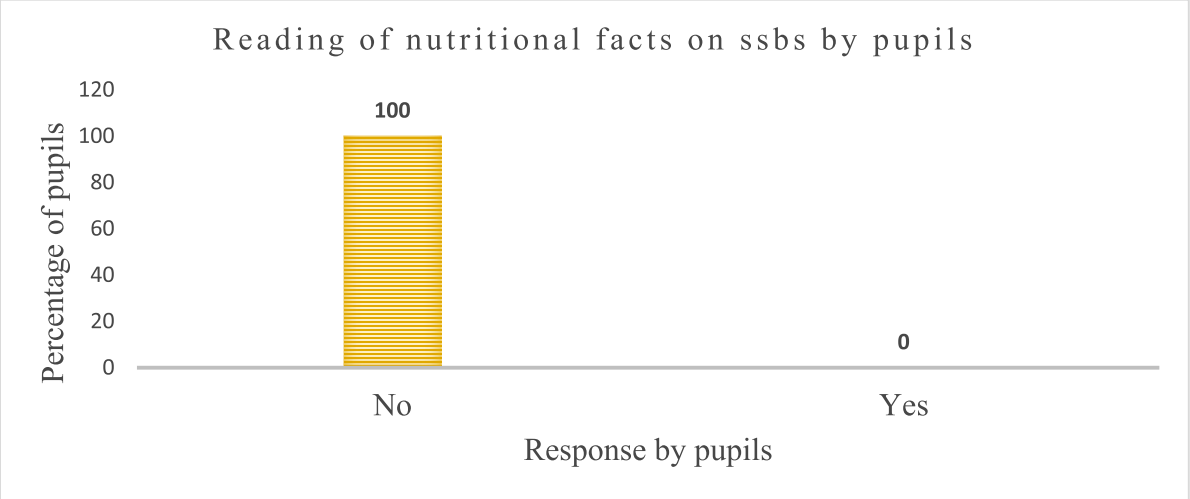


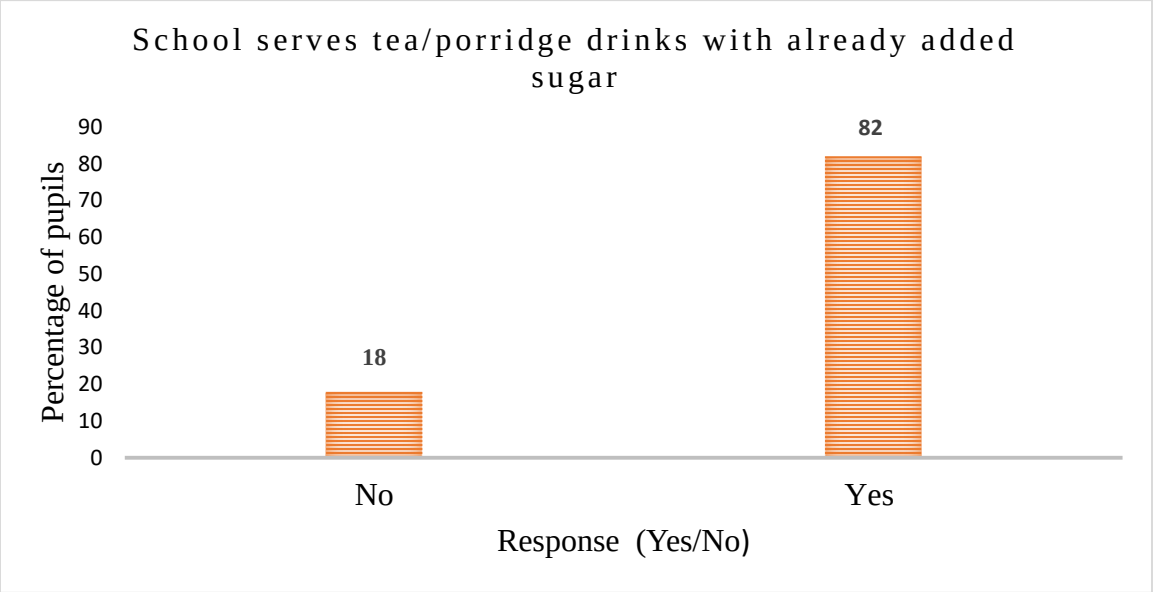


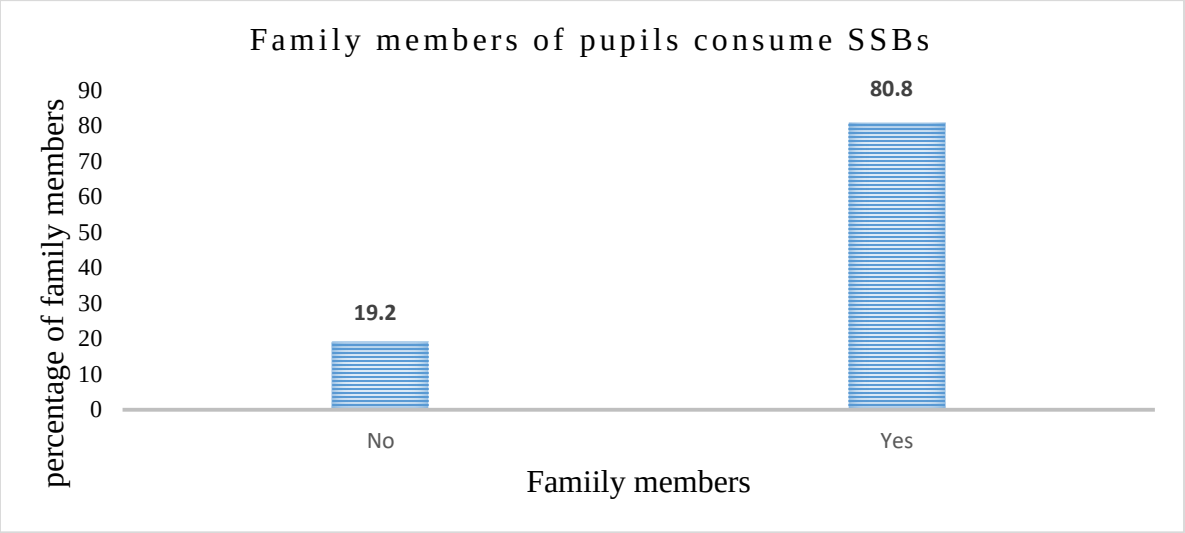

Person that decides the type of ssb carried by a pupil to school
Percentage of the deciders
60
50
40
30
20
10
0
56.3
6.9
36.8
Parent/guardian
Self
other
Deciders

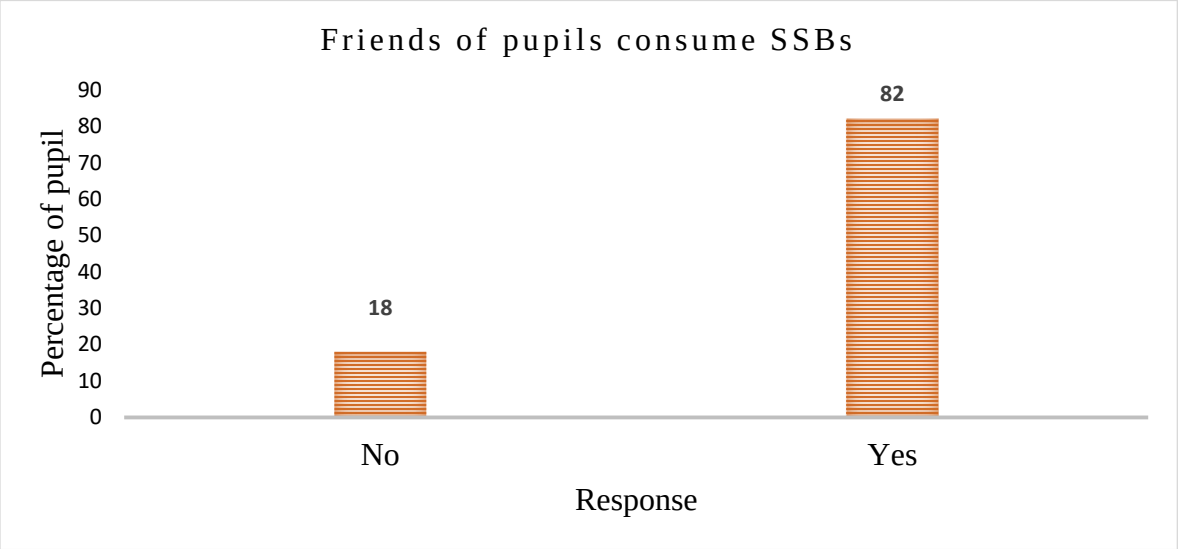

Has a say in the kind of SSB carried to school
Percentage of pupils
52
51
50
49
48
47
46
51.7
48.3
No
Response(Yes/No)
Yes

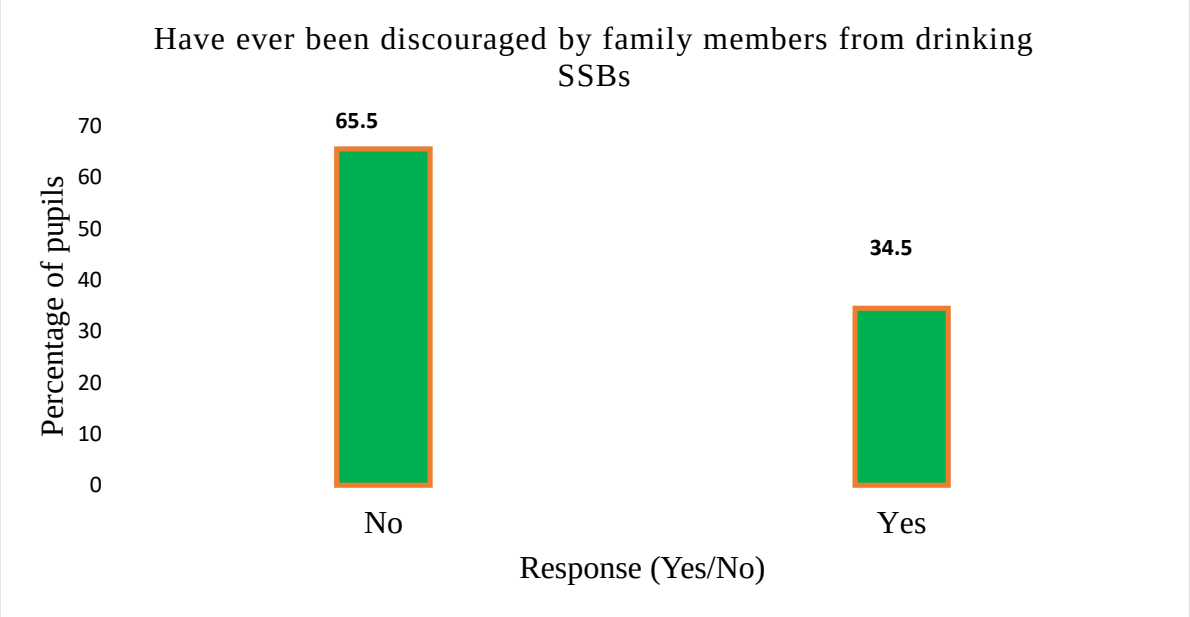

Buyer of favourite SSB consumed by pupils
Percentage of the buyers of SSBs
60
50
40
30
20
10
0
55.2
40.2
4.6
Parent/guardian
Self
Other
Buyer of SSBs


Reading of nutritional facts on ssbs by pupils
Percentage of pupils
120
100
80
60
40
20
0
100
0
No
Yes
Response by pupils


School serves tea/porridge drinks with already added sugar
Percentage of pupils
90
80
70
60
50
40
30
20
10
0
18
82
No
Yes
Response (Yes/No)


Family members of pupils consume SSBs
percentage of family members
90
80
70
60
50
40
30
20
10
0
19.2
80.8
No
Yes
Famiily members


Friends of pupils consume SSBs
Percentage of pupil
90
80
70
60
50
40
30
20
10
0
18
82
No
Yes
Response


Have ever been discouraged by family members from drinking SSBs
Percentage of pupils
70
60
50
40
30
20
10
0
65.5
34.5
No
Yes
Response (Yes/No)

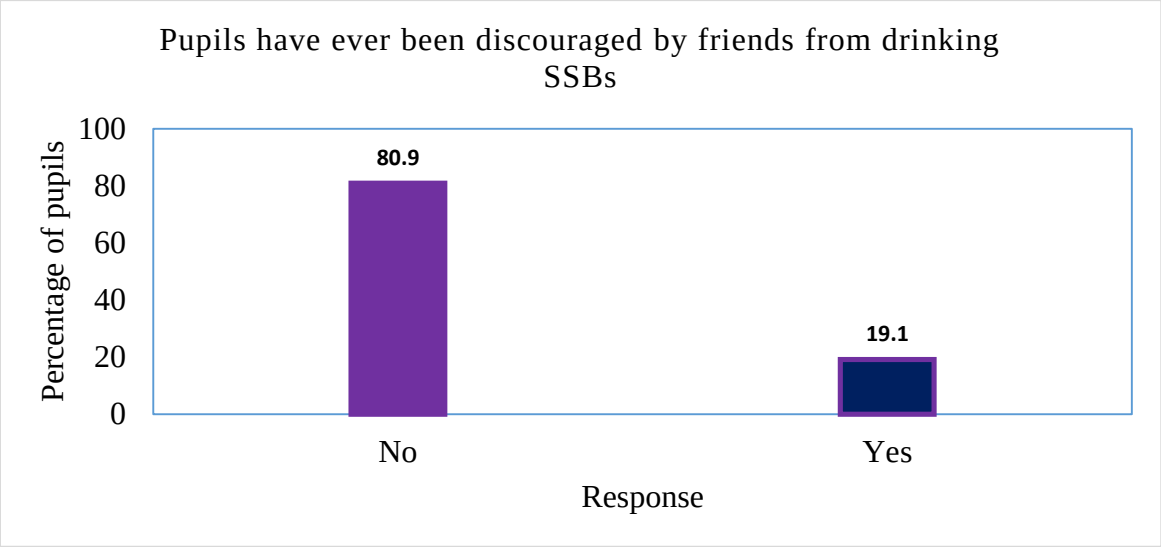


Figure 3. Determinants of SSB consumption and home environment.

4.4.1 SSB consumption and its determinants

There was a significant association ($p < 0.05$) between consumption of at least one SSB and the source from which the pupil got information about SSBs (Table 11). The buyer of the pupil's favourite SSB was significantly associated ($p < 0.05$) with whether the pupil consumed SSBs in the 24 hours prior to the study or not. There were also significant associations ($p < 0.05$) between consumption of SSBs by pupils and whether the family members or friends of the pupils have ever discouraged the pupils from consuming SSBs or not.

Table 11. Determinants of SSB consumption

SSB determinants	N=261 Consumed at least one SSB in the last 24 hours	Did not consume any SSB in the last 24 hours	Chi square p-value
The type of SSB carried to school is decided by parent or guardian	140(94.6)	8(5.4)	0.289
The type of SSB carried to school is decided by self	18(100)	0(0)	
The type of SSB carried to school is decided by others	93(97.9)	2(2.1)	
Heard about SSB from parent	90(97.8)	2(2.2)	0.024*
Heard about SSB from other people at home	19(100)	0(0)	

Heard about SSB from TV adverts and promotions	40(93)	3(7)	
Heard about SSB from school	86(97.7)	2(2.3)	
Heard about SSB from other sources	18(100)	0(0)	
Favourite SSB for the child is bought by a parent or guardian	134(93.1)	10(6.9)	0.015*
Favourite SSB for the child is bought by the children themselves	105(100)	0(0)	
Favourite SSB for the child is bought by others	12(100)	0(0)	
Family members of the pupils consume SSBs	205(97.2)	6(2.8)	0.088
Family members of the pupils do not consume SSBs	46(92)	4(8)	
A child has never been taught about the dangers and benefits of consuming SSBs	241(96)	10(4)	0.520
A child has ever been taught about the dangers and benefits of consuming SSBs	10(100)	0(0)	
Friends of pupils consume SSBs	208(97.2)	6(2.8)	0.065
Friends of pupils do not consume SSBs	42(91.3)	4(8.7)	
A child has ever been discouraged by friends from consuming SSBs	45(90)	5(10)	0.011*
A child has never been discouraged by friends from consuming SSBs	206(97.6)	5(2.4)	
A child has ever been discouraged by family members from consuming SSBs	83(92.2)	7(7.8)	0.016*
A child has never been discouraged by family members from consuming SSBs	168(98.2)	3(1.8)	

*Significant at $p<0.05$. The values in brackets are chi square values.

CHAPTER FIVE

5.0 DISCUSSIONS

5.1 Nutritional status of the pupils

In the schools studied, a quarter of the pupils were either overweight (9.2%) or obese (17.2%). These values are much higher than the value of 2.9% for the overweight reported by demographic health report (GNR, 2022) and 6.5% reported for obesity in urban areas (FANTA-2, 2010; Peltzer & Pengpid, 2011). Furthermore, Baalwa *et al.,* (2010) also reported that 4.4 % of children in Kampala were obese whereas 10.2% were overweight. The findings in this study are in agreement with the observations made by previous researchers (GNR, 2022) who noted that overweight and obesity in children on the increase in Uganda.

5.2 The relationship between nutritional status and physical activity levels

Although a big portion of the respondents (75.1%) reported that they engaged in physical activity at home or at school, majority of the respondents did not meet recommended weekly vigorous physical activity levels (60.9%) and moderate physical activity (85.4%) respectively. The findings are in line with those obtained by Ndagire *et al*., (2019) who reported that only 14% of the pupils and pupils aged 5-18 years attending primary and secondary schools in Kampala district met their recommended vigorous and moderate physical activity levels. Although the findings of this study indicated that 93.9% of the respondents reported that their school had a program to engage in compulsory physical activity, the majority of the respondents did not meet the recommended weekly physical activity levels. This can be attributed to the schools not providing sufficient time for physical activity since the average time for the break in the surveyed schools was 30 minutes. In all the schools surveyed in the present study, half the break time was used for snacks and half the time was available for the pupils to engage in active play. These findings are in agreement with study conducted in primary schools in Makindye major Division in Kampala (Mpalampa *et al.*, 2023).

The study also revealed a significant association between vigorous/moderate physical activity with nutritional status of respondents. These findings are consistent with those reported by Aarnio *et al.,* (2002); Beck *et al., (*2014) who found an significant association between children's physical activity and obesity. However the findings in the present study are not in agreement with the

findings of Coelho *et al.,* (2012) who found an inverse correlation between physical activity and overweight among school children between 10 and 13 years in Brazil. According to study conducted among Mozambican children, there was no significant association between nutritional status and physical activity of children aged between 6 and 17 years (Nhantumbo *et al.,* 2013).

5.2 The relationship between SSBs consumption and nutritional status

5.2.1 Dietary patterns among pupils and nutritional status

The results from the study showed that a larger portion of pupils in Kampala (95%) were meeting the recommended dietary diversity. This is more than 66.8% which was reported by Tukahirwa (2021). In a study conducted in urban northwest Ethiopia, Birru *et al.,* (2018) found that 75.4% of the school adolescents surveyed met the recommended dietary diversity.

The results of the study (Table 8) also show that there was a significant association ($P<0.05$) between dietary diversity and nutritional status with the majority of the respondents that were meeting the recommended dietary diversity having a normal nutritional status. This findings are in line with the findings of Ocampo-Guirindola *et al.* (2016) and Maila *et al.* (2021) who found out that meeting the recommended dietary diversity was protective against underweight and wasting.

Khamis *et al.* (2019) also found that consumption of a diverse diet was significantly associated with a reduction of stunting, wasting and being underweight in children in Tanzania. The strong association between nutrition status and dietary diversity has previously been attributed to the higher education levels of parents and guardians and schools administrators having positive attitudes towards nutrition and health wellbeing of school going children (Maila *et al.* 2021).

5.2.2 Consumption of SSBs among pupils

Results show that majority of the respondents had at least consumed soda with added sugar or caloric sweeteners and locally prepared sugar sweetened beverages whereas no respondent consumed energy drinks and sport drinks in 24 hours prior to the time of the study. These findings are in agreement with findings among Mexican American children of which 64% children consumed soda and while 69% consumed other SSBs in past 24 hours (Beck *et al.,* 2014). A study conducted in Kenya revealed that 87.6% children in Wetlands suburbs of Nairobi city on a daily basis while at school, consumed at least one SSB. The high consumption of sugar sweetened beverages among school going children can be attributed to number of factors which include

school policies, accessibility, availability, knowledge, attitude and socio-economic status of the parents.

Furthermore, a significant association between SSBs consumed and nutritional status is in agreement to the findings of Hawes-dawson *et al.,* (2017) and Yoshida & Simoes, (2018) who observed a link between SSB consumption with obesity among school going children. Recently, Jimoh, (2016) and Bhula, (2023) also observed that high sugary beverage consumption have significantly contributed to prevalence of overweight and obesity whereas Beck *et al.,* (2014) observed that soda consumption was associated with obesity among Mexican American children. It was again observed by Audain *et al.,* (2019) that SSB consumption that was linked to an additional 4·8% overweight and 2.3% obesity in sub Saharan Africa. The strong association of SSBs and obesity, has been elucidated by Harrington, (2014), that consuming SSBs is a key risk factor for overweight and obesity because of their high sugar content, low satiety, high glycemic load, and subsequent incomplete compensation for total energy.

5.3 The determinants for SSB consumption among primary school children in Kampala

There was a significant association between the source of information of the SSB consumed by the pupil and whether the pupil consumed SSB or not. Majority of the respondents that consumed at least one SSB in 24 hours prior to the study reported that they first heard about SSBs from their parents or guardians. Knowledge possessed by parents or guardians has previously been positively correlated with level of SSB intake among school children (Zahid et al., 2017). Also a systematic review and meta-analysis by Yee *et al.,* (2017) highlighted how parents play significant roles in shaping children's dietary quality and intake.

Findings in this study show that parents/guardians who bought the favourite SSB for their children or those who decided on the type of SSB to be carried by a child to school is significantly associated with obesity or overweight among pupils. This is likely because children perceive their parents as legitimate executives of rules and regulations within the food consumption domain and accept their parents' regulations and advice concerning food (Melbye *et al.,* 2016). According to Hawes-dawson *et al.,* (2017), children consumed less SSBs if their parents had less positive attitude towards SSBs, consumed only small quantities of the SSBs themselves, and did not keep SSBs in

the home. Gaar *et al.,* (2017) further noted that parenting practices, and parental modelling were positively associated with the child's SSB intake. This observation is reinforced by the findings of Ansem *et al.,* (2014) who noted that mothers had a great influence on SSB consumption by the children.

On the other hand, a smaller number of respondents in this study further revealed that having knowledge about the risks and benefits of consuming SSBs had no significant association with consuming at least one SSB or not in 24 hour period prior to the time of the study. This is in line with the findings of Miller *et al.,* (2022) who postulated that among low income earners and low educated people consuming at least 600 ml of SSB mainly soda every day is a health risk in the future.

CHAPTER SIX

6.0 CONCLUSIONS AND RECOMMENDATIONS

6.1 CONCLUSION

The results from the study have shown that obesity and overweight remain challenges among primary school going children with prevalence rates higher than those reported in previous studies. There was a significant association between dietary diversity and weight status of the respondents. Majority of the primary school pupils surveyed had meet the recommended daily and weekly dietary diversity intakes.

Consumption of SSBs among primary school pupils is very high with a majority of the respondents consuming at least one SSB in the 24 hours prior to the time of the study and within the past 7 days. The energy intake from SSBs exceeds 5% of the total daily caloric intake recommended by WHO. SSB consumption had a significant association with nutritional status (weight status).

There was a significant association between physical activity and nutritional status of the children studied. Majority of the surveyed respondents did not meet recommended weekly moderate and vigorous physical activity levels. More pupils in the overweight and obese category participated mainly in moderate physical activity Therefore, fitness irrespective of body weight should be the focus of interventions.

Source of information from where the pupils first heard about SSBs, the buyer of the child's favourite SSB, and whether a child has ever been discouraged by a family member or a friend from consuming SSBs were found to be significantly associated with of SSBs intake.

6.2 RECOMMENDATIONS

6.2.1 Recommendations for practice

- Schools should put in place measures aimed at increasing participation of pupils in sports and co-curricular activities.
- Schools should put in place interventions like nutrition education, use of visual aids that encourage limiting SSB consumption and promoting consumption of water and healthy beverages.

- Schools should further limit quantities and varieties of SSBs sold in their premises and instead promote selling of healthier drinks in the school canteens.
- Schools should restrict companies that manufacture SSBs from sponsoring school events and doing open advertisement of their products in schools.
- Schools should enhance their cooperation with parents and work together through conducting wellness and nutrition sensitive seminars with parents to enhance physical activity and nutrition practices of the children.

6.2.2 Recommendations for further studies

More research should be done to:

- Explore interventions that can be put in place to control SSB consumption at school level such as water-only school policy.
- Determine the relationship between knowledge, attitudes, and consumption of SSBs.
- Investigate challenges and motivations in participating in vigorous physical activity of school children at school.

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APPENDICES

APPENDIX 1: DATA COLLECTION TOOL
PART ONE: INFORMATION SHEET AND CONSENT FORM

Research title: sugar sweetened beverage consumption and nutritional status of primary school children age 9-13 years in Kampala city

My name is **Kagoda siliver** and I am a master student at Makerere University. I am doing research, which will help our government and the general community do more to help children to become and stay healthier. I am going to give you information and invite you to be part of a research study. You can choose whether or not you want to participate. There may be some words you do not understand or things that you want me to explain more about because you are interested or concerned. Please be free to ask me.

Consent: I have read the information on the proposed study and was provided the opportunity to ask questions and given adequate time to rethink the issue. The aim of the study is sufficiently clear to me. I have not been pressurized to be participant. I understand that participation in this study is completely voluntary and that I may withdraw from it at any time and without giving reasons. I am fully aware that the results of this study will be used for scientific purposes and may be published. I agree to this, provided my privacy is guaranteed.

I hereby give consent to participate in this study

Name of child……
Signature of child ……..

Date……

RESEARCHER ADMINISTERED QUESTIONNAIRE

Research title: Sugar sweetened beverage consumption, physical activity levels and nutritional status of primary school children age 9-13 years in Kampala city

This questionnaire consists of parts which will include: demographics, anthropometric measurements, dietary patterns, sugar sweetened beverages, physical activity status and their determinants.

Code of the respondent…….…….

Code of the school…….……

Date of data collection…….…….....…….……...……..

Instructions: Give only your personal opinion not what others think. Remember this is not an exam therefore all responses are acceptable.

PART TWO: DEMOGRAPHIC AND SOCIAL ECONOMIC DATA

2.1 Age (in years) [ ]

2.2 Sex

Male 2.3 [ ] Female [ ]

2.3 Class of the participant [ ]

2.4 Ethnicity

Black		Asians	
White		Others	

2.5 You are staying with:

Parent(s)		Others	
Relatives			

2.6 If you are living with parent(s), Please tick the highest level of formal education completed by father

None		Tertiary	
Primary		Unknown	
High school			

2.7 Please tick the highest level of formal education completed by mother

None		Tertiary	
Primary		Unknown	
High school			

2.8 If you are not living with your parents, then please tick the highest level of formal education completed by local guardian/caregiver

None		Tertiary	
Primary		Unknown	
High school			

2.9 What is your father's occupation?

Occupation	**Tick below**
Farmer	
Salaried employee	
Casual labourer	
Unemployed	
Business owner	
Retired	
Informal business owner	

2.9.0 What is your mother's occupation?

Occupation	**Tick below**
Farmer	
Salaried employee	
Casual labourer	
Unemployed	
Business owner	
Housewife	
Retired	
Informal business owner	

PART THREE: ANTHROPOMETRY

Name	Weight nearest to 0.5kg				Height nearest to 0.1 cm			
	1	2	3	Average	1	2	3	Average

PART FOUR: TWENTY FOUR HOUR (24) RECALL

A 24-hour dietary recall (24HR) is a structured interview intended to capture detailed information about all foods and beverages consumed by the respondent in the past 24 hours, most commonly, from midnight to midnight the previous day. A key feature of the 24Hr is that, when appropriate, the respondent is asked for more detailed information than first reported. This open ended response structure is designed to prompt respondents to provide a comprehensive and detailed report of all foods and beverages consumed.

What is the frequency of consumption of the following food within 24 hours?

Food	Yes-Y No-X	Break First	Lunch	Supper	Any other time of the day
Cereals (including any locally available cereals)					
Millet					
Maize (whole and posho)					
Barley					
Rice					
Sorghum					
Wheat					
Cereal flour products					
Bread					
Cakes					
Spaghetti (Macaroni)					
Pan cakes					
Biscuits					
Others specify					
Roots & stem tubers					
Cassave					

Sweet potatoes					
yams					
Irish potatoes					
Caroots					
Others specify					
Legumes					
Beans					
Cow and garden peas					
Soya bean					
Others specify					
Nuts					
Bambara nuts					
Ground nuts					
Simsim (sesame)					
Coconut					
Other nuts (specify)					
Dairy, fats, Oils and their products					
Milk					
Butter					
Margarine/blue band					
Cooking fat/oil					
Any other (please specify)					
Meat products					
Beef (cattle meat)					
Goat meat					
Mutton (sheep meat)					
Pork (pig meat)					
Rabbit meat					
Sausage					
Hot dog					
Others specify					
Poultry Product					
Chicken					
Turkey					
Duck					
Eggs (boiled or fried)					
Others (specify)					
Fish					
Nile perch					
Mud/cat fish					
Tilapia					

Silver fish					
Others, specify					
Vegetables (Consider locally available vegetables)					
Amaranthus (dodo)					
Sukumawiki					
Tomatoes					
Nakati (Solonium)					
Cabbage					
Cassava leaves					
Chili, Green pepper					
Onion					
Pumpkin leaves					
Egg plants					
Tomatoes					
Other specify					
Fruits					
Avocado					
Bananas					
Jack fruit					
Lemon					
Mango					
Oranges					
Pawpaw					
Pineapple					
Guavas					
Passion fruit					
Others specify					
Milk and milk products					
Cow's milk					
Goat milk					
Sour milk					
Yoghourt					
Other drinks specify					
Sugar sweetened beverages					
Soda with added sugar					
Fanta					

Coca cola					
Spirite					
Mirinda					
Mountain dew					
Novida					
Pepsi					
Stoney					
Evervess					
Riham cola					
Sky view					
Riham fun time					
Others specify					
(b) Energy drinks					
Riham rock boom					
Sting gold rush					
Power play					
Riham X energy					
Predator					
Red bull					
Rockstar					
Monster					
Others specify					
(c) Sport drinks					
Accelerade					
Gatorade					
Powerade					
Fast twitch					
Body armor lyte					
Zoa zero					
Morning buzz					

Ghost energy					
Others specify					
(d) Locally prepared sugar sweetened beverages at home and school					
Fruit juice					
Vegetable juice					
Tea					
Coffee					
Porridge					
Milk					
Others specify					

PART FIVE: FOOD FREQUENCY (DIETARY PATTERN) PER WEEK

Food groups	**Yes - Y N0-X**	**Daily**	**1-3 times**	**4-6 times**	**Never**
Cereals (including any locally available cereals)					
Millet					
Maize (whole and posho)					
Barley					
Rice					
Sorghum					
Wheat					
Cereal flour products					
Bread					
Cakes					
Spaghetti (Macaroni)					
Pan cakes					
Biscuits					
Others specify					
Roots & stem tubers					
Cassave					
Sweet potatoes					
Coco yams					
Irish potatoes					

Yam					
Caroots					
Others specify					
Legumes					
Beans					
Cow and garden peas					
Soya bean					
Others specify					
Nuts					
Bambara nuts					
Ground nuts					
Simsim (sesame)					
Cashew nuts					
Coconut					
Other nuts (specify)					
Dairy, fats, Oils and their products					
Milk					
Butter					
Margarine/blue band					
Cooking fat/oil					
Any other (please specify)					
Meat products					
Beef (cattle meat)					
Goat meat					
Mutton (sheep meat)					
Pork (pig meat)					
Rabbit meat					
Sausage					
Hot dog					
Others specify					
Poultry Product					
Chicken					
Turkey					
Duck					
Eggs (boiled or fried)					
Others (specify)					
Fish					
Nile perch					
Mud/cat fish					
Tilapia					
Silver fish					

Others specify					
Vegetables (Consider locally available vegetables)					
Amaranthus (dodo)					
Sukuma wiki					
Tomatoes					
Nakati (Solonium)					
Cabbage					
Cassava leaves					
Chili, Green pepper					
Onion					
Pumpkin leaves					
Egg plants					
Tomatoes					
Other specify					
Fruits					
Avocado					
Bananas					
Jack fruit					
Lemon					
Mango					
Oranges					
Pawpaw					
Pineapple					
Guavas					
Passion fruit					
Others specify					
Milk and milk products					
Cow's milk					
Goat milk					
Sour milk					
Yoghourt					
Sugar sweetened beverages consumption					
Soda with added sugar					
Fanta					
Coca cola					

Spirite					
Mirinda					
Mountain dew					
Novida					
Pepsi					
Stoney					
Evervess					
Riham cola					
Sky view					
Riham fun time					
Others specify					
(b) Energy drinks					
Riham rock boom					
Sting gold rush					
Power play					
Riham X energy					
Predator					
Red bull					
Rockstar					
Monster					
Others specify					
(c) Sport drinks					
Accelerade					
Gatorade					
Powerade					
Fast twitch					
Body armor lyte					
Zoa zero					
Morning buzz					
Ghost energy					

Others specify					
(d) Locally prepared sugar sweetened beverages at home and school					
Fruit juice					
Vegetable juice					
Tea					
Coffee					
Porridge					
Milk					
Others specify					

PART SEVEN: DETERMINANTS OF SUGAR SWEETENED BEVERAGE (SSB) INTAKE (FACTORS ASSOCIATED WITH CONSUMPTION OF SSB)

1. Name some of the sugar sweetened beverages sold within the school or around home

……
……

2. Who decides the type of SSBs you carry to school in case you do so?

……..

3. Do you have a say in the kind of SSBs you take to school?

……..

4. What is your best choice of SSB and why?

……..

5. How did you come to know about this SSB? (Possible answers could be from the parents, from TV adverts, Billboard adverts, children at school and others)

……

6. Who buys your favourite SSB

……..

7. Which day of the week do you buy more SSB in case you have the money?

……

8. Do they teach you about the benefits or possible dangers of consumption of SSBs?

……

9. How much do usually carry to school and how long do you take to complete them?

……
……

10. Do you read nutritional facts on the sugar sweetened beverages before buying them to ascertain what you are going to take?

……..

11. Does your school use SSBs Company as events' sponsor during school functions like sports day?
    ……
    …….
12. Does the school serve tea/coffee/porridge drinks with already added sugar?

……

13. Do you add sugar to tea/coffee/porridge in case it is served without it by the school and why?

……
…….

14. When do you normally take sugar sweetened beverages?

……
……

15. Do you engage yourself in physical activity while at school or home and why?

……
……

16. Does the school has a programme for all pupils to engage themselves in compulsory physical activities?

……

17. If you are a day scholar, how do you usually travel to school and why?

……
……
……
……

18. How often do you eat breakfast before going to school? (Please tick one appropriate box)

Every morning	
Few times a week	
Once a week or less often	

19. During a regular day, how many meals do you usually eat?

……...

20. During a regular day, how many snacks do you usually eat?

……

21. How often do you eat fast food? (Please tick one appropriate box)

Never		2-3 times a week	
Occasionally		Once a day	
Once a week		More often	

22. How many hours of television, video games and computer time (non-work related) do you spend on a weekday? (Please tick one appropriate box)

None		4 hours	
1 hour or less		5 hours	
2 hours		6 hours	
3 hours		7 hours or more	

23. Do your family members drink SSBs?

.....

24. Do your family members ever discourage you from drinking SSBs? (Please tick one appropriate box)

Never	

Rarely	
Sometimes	
Usually	
Always	

25. Do your friends drink SSBs?

……

26. Do your friends ever discourage you from drinking soft drinks? (Please tick one appropriate box)

Never	
Rarely	
Sometimes	
Usually	
Always	

27. Please read this statement "Increased drinking of SSB causes harm" (tick what you think is appropriate)

True ☐ False ☐ Do not Know ☐

PART EIGHT: PHYSICAL ACTIVITY QUESTIONNAIRE FOR CHILDREN

Next I am going to ask you about the time you spend doing different types of physical activity in a typical week. Please answer these questions even if you do not consider yourself to be a physically active person.

In answering the following questions **'Vigorous-intensity activities'** are activities that require hard physical effort and cause large increases in breathing or heart rate.

'Moderate-intensity activities' are activities that require moderate physical effort and cause small increases in breathing or heart rate.

VIGOROUS-INTENSITY ACTIVITIES AND MODERATE TO INTENSITY ACTIVITIES

1. Do you do any vigorous-intensity sports, fitness or recreational (leisure) activities that cause large increases in breathing or heart rate like [running, aerobics,] for at least 60 minutes continuously?

☐ Yes ☐ No

2. In a typical week, on how many days do you do vigorous-intensity sports, fitness or recreational (leisure) activities? ……. Days

3. How much time do you spend doing vigorous-intensity sports, fitness or recreational activities on a typical day?

……. Hours……. Minutes

4. Do you do any moderate-intensity sports, fitness or recreational (leisure) activities that cause a small increase in breathing or heart rate such as brisk walking, (cycling, swimming, and volleyball) for at least 60 minutes continuously?

☐ Yes ☐ No

5. In a typical week, on how many days do you do moderate-intensity sports, fitness or recreational leisure activities? ……. days

6. How much time do you spend doing moderate-intensity sports, fitness or recreational (leisure) activities on a typical day? ……. Hours……. Minutes

8.2 Travel to and from places

The next questions exclude the physical activities that you have already mentioned. Now I would like to ask you about the usual way you travel to and from places for example going to class, for shopping, to market and to place of worship etc.

7. Do you walk or use a bicycle (pedal cycle) for at least 60 minutes continuously to get to and from places?

☐ Yes ☐ No

8. In a typical week, on how many days do you walk or bicycle for at least 60 minutes continuously to get to and from places? ……. Days

9. How much time do you spend walking or bicycling for travel on a typical day?

Hours…… Minutes…….

8.3 Sedentary behaviour

Includes sitting or reclining at work, at home, getting to and from places or with friends including time spent sitting at a desk, sitting with friends, travelling in vehicle, reading, playing cards, Ludo or watching television etc. but does not include time spent sleeping

10. How much time do you usually spend sitting or reclining on a typical day

Hours…… Minutes…….

11. During the past 7 days, how did you spend most of your leisure time? (Choose one)

Sleeping…… ☐

Watching television……. ☐

Reading…… ☐

Playing out door games (like football) …… …… ☐

Playing in door games…… ……. ☐

12. In the last 7 days, what time did you usually go to bed? (Tick only one)

Between 7:00 pm – 8:00pm…… ☐

Between 8:00pm – 9:00pm…… ☐

After 9:00pm…… ☐

13. What means of transport do you usually use to come to school?

Walk…… ☐

Ride a bicycle……..…… ☐

Car/motorcycle…… ☐

14. How many hours do you spend watching TELEVISION from Monday to Friday?

Never…… ☐

Less than 1 hr. …… ☐

1-2 hrs. …… ☐

3-4 hrs. …… ☐

More than 5 hours …… ☐

15. How many hours do you spend watching TELEVISION on a weekend (Saturday and Sunday)?

Never …….

Less than 1 hr. ……

1-2 hrs.……

3-4 hrs. ……

More than 5 hours ……

16. During the past 7 days, how many times did you engage in physical activity such as (running, jumping, jogging, bicycle riding, or playing soccer) after school?

Never …….

Once ……..……

2-3 days……

4 or more days ……..……

17. During the past 7 days, on how many days were you physically active for a total of at least 60 min. per day?

None ……

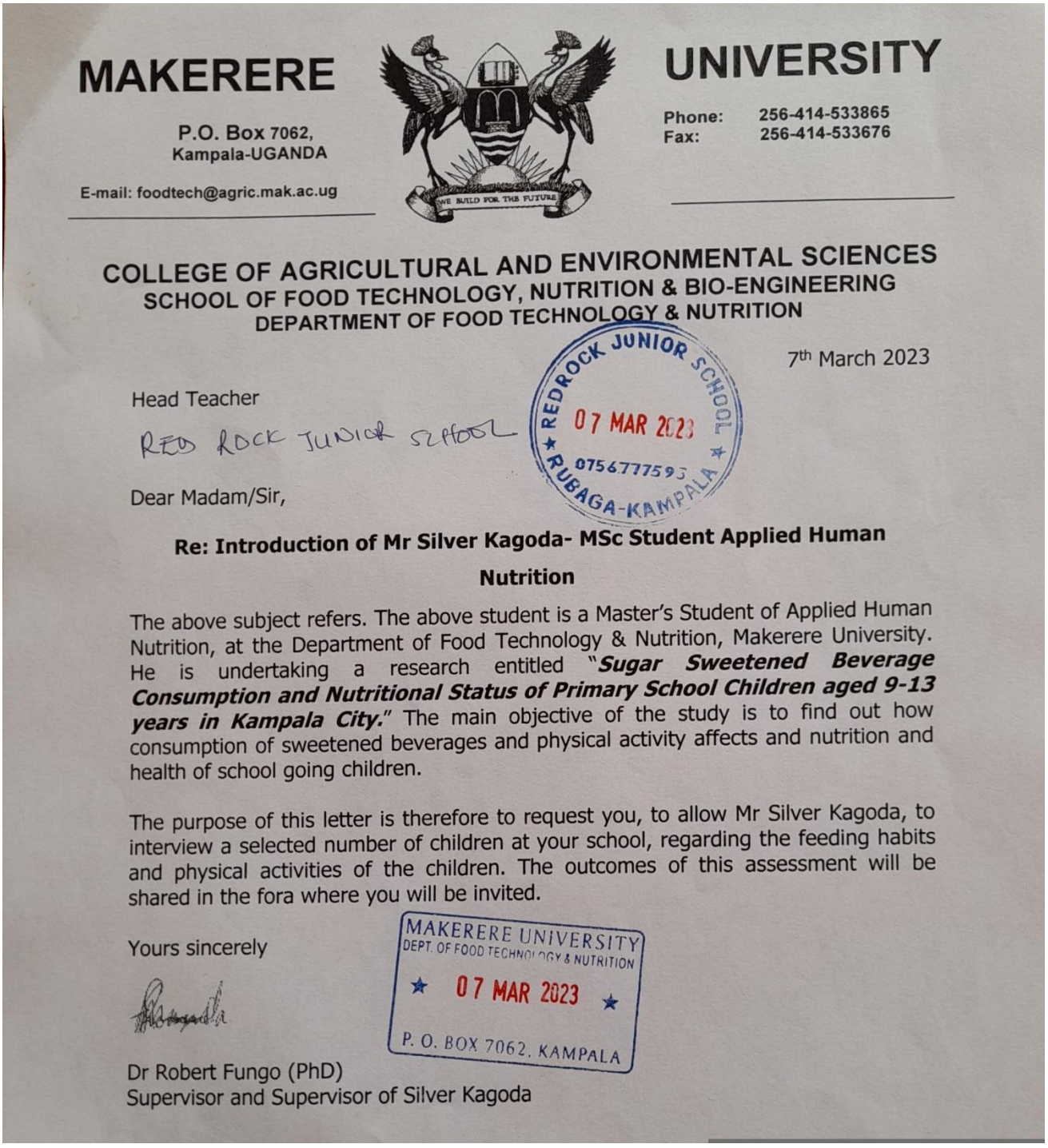
Once ……

2- 3 days ……

4-7days ……

Thank you for your time and cooperation

Appendix 2: Acceptance letters for conducting research in primary schools



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COLLEGE OF AGRICULTURAL AND ENVIRONMENTAL SCIENCES
SCHOOL OF FOOD TECHNOLOGY, NUTRITION & BIO-ENGINEERING
DEPARTMENT OF FOOD TECHNOLOGY & NUTRITION

7th March 2023

REDROCK JUNIOR SCHOOL
07 MAR 2023
0756777595
RUBAGA-KAMPALA

Head Teacher

RED ROCK JUNIOR SCHOOL

Dear Madam/Sir,

Re: Introduction of Mr Silver Kagoda- MSc Student Applied Human Nutrition

The above subject refers. The above student is a Master's Student of Applied Human Nutrition, at the Department of Food Technology & Nutrition, Makerere University. He is undertaking a research entitled "***Sugar Sweetened Beverage Consumption and Nutritional Status of Primary School Children aged 9-13 years in Kampala City.***" The main objective of the study is to find out how consumption of sweetened beverages and physical activity affects and nutrition and health of school going children.

The purpose of this letter is therefore to request you, to allow Mr Silver Kagoda, to interview a selected number of children at your school, regarding the feeding habits and physical activities of the children. The outcomes of this assessment will be shared in the fora where you will be invited.

Yours sincerely

MAKERERE UNIVERSITY
DEPT. OF FOOD TECHNOLOGY & NUTRITION
07 MAR 2023
P. O. BOX 7062, KAMPALA

Dr Robert Fungo (PhD)
Supervisor and Supervisor of Silver Kagoda

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DEPARTMENT OF FOOD TECHNOLOGY & NUTRITION

7th March 2023

Head Teacher

SHALOM PRIMARY SCHOOL

SHALOM PRIMARY SCHOOL 06 MAR 2023 GOD IS LOVE P.O.BOX 21648 KAMPALA

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E-mail: foodtech@agric.mak.ac.ug

Phone: 256-414-533865
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COLLEGE OF AGRICULTURAL AND ENVIRONMENTAL SCIENCES
SCHOOL OF FOOD TECHNOLOGY, NUTRITION & BIO-ENGINEERING
DEPARTMENT OF FOOD TECHNOLOGY & NUTRITION

7th March 2023

Head Teacher

NTUNGO PRIMARY SCHOOL

Received. Appointment for 8/08/2023 at 9:00 am.

NTUNGO PRIMARY SCHOOL DEPUTY H/M DATE 8/8/2023 P.O. BOX 7062 KAMPALA

Dear Madam/Sir,

Re: Introduction of Mr Silver Kagoda- MSc Student Applied Human Nutrition

The above subject refers. The above student is a Master's Student of Applied Human Nutrition, at the Department of Food Technology & Nutrition, Makerere University. He is undertaking a research entitled "***Sugar Sweetened Beverage Consumption and Nutritional Status of Primary School Children aged 9-13 years in Kampala City.***" The main objective of the study is to find out how consumption of sweetened beverages and physical activity affects and nutrition and health of school going children.

The purpose of this letter is therefore to request you, to allow Mr Silver Kagoda, to interview a selected number of children at your school, regarding the feeding habits and physical activities of the children. The outcomes of this assessment will be shared in the fora where you will be invited.

Yours sincerely

MAKERERE UNIVERSITY DEPT. OF FOOD TECHNOLOGY & NUTRITION 07 MAR 2023 P. O. BOX 7062, KAMPALA

Dr Robert Fungo (PhD)
Supervisor and Supervisor of Silver Kagoda

MAKERERE UNIVERSITY

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7th March 2023

Head Teacher

SIR APOLLO KAGGWA
PRIMARY SCHOOL

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07 MAR 2023
P. O. BOX 7062, KAMPALA

Dr Robert Fungo (PhD)
Supervisor and Supervisor of Silver Kagoda

SIR APPOLLO KAGGWA PR. SCH.
MENGO
06 MAR 2023
P.O. BOX [illegible]
TEL: 0414[illegible]
HEADMISTRESS

Received
Mwesa Geoffrey
6/3/2023

MAKERERE UNIVERSITY

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TEL: 0414[illegible]
HEADMISTRESS

Received
Mwesa Geoffrey
6/3/2023