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Title: The caloric contribution of commercially packaged beverages among mid-level Primary School Children

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THE CALORIC CONTRIBUTION OF COMMERCIALY PACKAGED BEVERAGES AMONG
MID-LEVEL PRIMARY SCHOOL CHILDREN

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Supervised by

Mrs. June Holdip

2010

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ABSTRACT

Objective – To determine both the individual and cumulative caloric contribution of commercially packaged sugar sweetened beverages among mid-level primary school children, and its possible effect on weight gain.

Design – A cross sectional study.

Subjects – Forty one children, ages 9 to 11 years in a Standard 3 class were conveniently selected to participate in this study.

Measures of Outcome – Information on beverage consumption was obtained using an interviewer administered questionnaire. The caloric contribution was manually calculated using data that was obtained from the Nutrition Facts label.

Results – All of the selected subjects completed the study. The primary school children consumed soft drinks, fruit juice drinks and milk based drinks on a daily basis. The caloric contribution from milk based drinks was the greatest, while fruit juice drinks contributed the least amount of calories. The caloric contribution from soft drinks was greater than that from juice drinks, but less than milk based drinks.

Conclusion – Primary school children need to limit their intake of commercially packaged sugar sweetened beverages as they can contribute a large amount of extra calories to their diets, and can also result in possible weight gain.

INTRODUCTION

The consumption of sugar sweetened beverages (SSBs) such as soft drinks, fruit juice and milk based drinks is a usual practice among children of all ages. This practice has increased over the past years. At the same time, the prevalence of childhood obesity has also risen (11). These drinks are consumed in large amounts during school age years. The majority of the drinks consumed are full calorie (non-diet) beverages and are commercially packaged. These drinks are provided by manufacturing companies in the beverage industry, and are well marketed to attract everyone, especially children.

In recent years there has been a change in the environment of children. Physical activity has reduced and more sedentary lifestyles are now being followed. Along with the ever increasing availability of high energy, high calorie foods and beverages, this has likely contributed to the rise in overweight and obese children (16). Recent evidence suggests an association between the intake of SSBs, increased calorie intake, and body weight. While there can be no single cause to the obesity problem, evidence shows that the consumption of sweetened soft drinks, similar fruit juices and milk- based drinks puts them in the list of leading contributors (1). The purpose of this study was to first determine the caloric contribution of selected sweetened beverages and secondly, to determine if these caloric contributions can possibly result in any significant weight gain in children.

Definitions

- Diet – Any food and/or drink consumed by an individual that provides them with some nutritional benefit
- Empty/Wasted calories – Calories that provide no nutritional benefit
- Sugar sweetened beverages – Non-alcoholic, flavoured beverages usually commercially prepared and packaged

LITERATURE REVIEW

There are many empty calories present in SSBs and these beverages are becoming an increasingly large part of childrens' diets. A recent study published in Pediatrics found that children who consume SSBs, drink an average of 365 calories per day (18). Growing evidence indicates that SSB consumption by children may be contributing to rising obesity rates (1). These beverages can be grouped as soft drinks, fruit juice and milk- based drinks, and they are consumed at a variety of locations namely, home, school, fast food establishments and other restaurants (18).

A strong case has been made that carbonated soft drinks are the most detrimental of all SSBs. Carbonated soft drinks have been reported to be the single largest source of calories in childrens' diets today (1). However, fruit juice and milk based drinks have also been shown to have the same, if not greater impact on childrens' diets (10,12). One Victorian study showed that primary school children who regularly consumed juice and other fruit drinks are about twice as likely to be overweight and obese (12). Fruit juices are believed to be healthier than soft drinks, when in reality they contain more concentrated sugars than soft drinks.

Milk- based drinks have the highest amount of calories and fat among the three categories of SSBs (10). It is reported that a child who drinks more milk- based drinks as compared to children who drink soft drinks and fruit juice drinks, stands to gain twice the amount of weight compared with his counterparts (7).

While these beverages all have their effects individually, it is their combined cumulative effect that concerns researchers greatly. This study will attempt to give some greater insight into the individual and combined effects SSBs have on primary school children.

METHODOLOGY

Subjects

Forty one students attending the Carapo R.C. Primary School were conveniently selected to participate in this study. The students all belonged to the Standard 3 class. The sample comprised of 23 boys and 18 girls, between ages 9 to 11. All of the students gave their verbal consent to participate in the study.

Design

A cross-sectional design, sometimes called prevalence study was selected for this undertaking. A questionnaire consisting of nineteen questions was developed and administered to the study group (see Appendix). The questions sought information regarding the consumption patterns of three different categories of beverages: – soft drinks, fruit juice drinks and milk based drinks.

Procedure

Prior to conducting the actual research, this investigator conducted an observational study at the research school to obtain some insight about the beverages the children normally purchased during school time hours. The study focused on gathering information regarding the beverages most frequently purchased by the students. A questionnaire was developed guided primarily by the findings of this observational study.

There were three categories of beverages for the children to choose from. Each category had 8-9 beverages listed as follows: – Soft drinks (Chubby, Classic Cola, Busta, Apple J, Pear J, Coca Cola, Mountain Dew, Pepsi, 7Up), Fruit juice drinks (Tampico, Kool Kidz, Fruta, Orchard, Minute Maid, Caribbean Cool, Ribena, Tropicana, Welch's), Milk- based drinks (Choc Nut, Peanut Punch, Supligen, Egnog, Nesquik, Milo, Yazoo, Seamoss).

The children were asked to select their three favourite drinks from each category and then answer subsequent questions about the consumption frequency, amount consumed, reasons for consumption and sources of acquisition for their selected beverages.

One week prior to the research, this questionnaire was pre – tested using a small number of Standard 3 students at a different school, namely the D’Abadie Government Primary School. These students were similar in age to the students at the research school. Verbal consent was received from the principals of both schools to use the students as research subjects at their respective schools. No parental consent was needed as it was a non – invasive study.

The pre – test and final administration of the questionnaires were conducted under the same settings. The administration with the study population was conducted over two consecutive days since two Standard 3 classes were used. The class teacher oversaw proceedings while the researcher read each question to the class. Immediately following, the children were allowed a few minutes to answer the question. This process was repeated for all 19 questions. Administration time was approximately 25 minutes with each class.

Data Analysis

The most popular beverage from each of the three categories was selected. The caloric contribution of each drink was manually tabulated using simple mathematic calculations, and the possible resultant effect on weight gain in children was assessed. The results were tabulated and expressed as frequencies using SPSS 17. The frequency data was subsequently exported to Microsoft Excel where pie charts and bar graphs were generated to visually represent the results for each category of beverages.

RESULTS

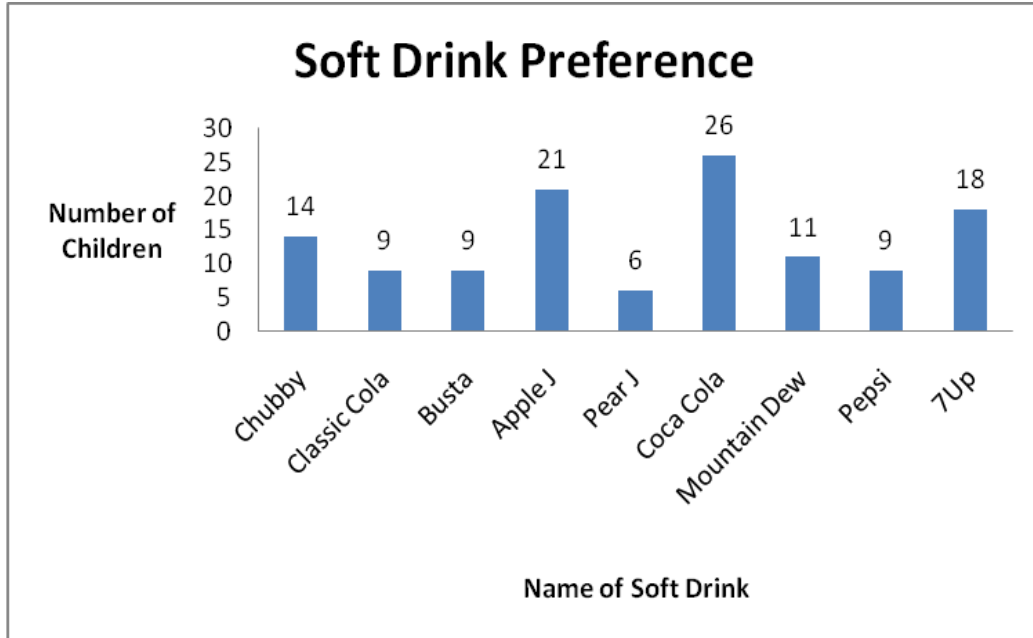


Figure 1 – Soft drink preferences among children

Coca Cola was the most preferred soft drink, it was selected by twenty six (26) children; Apple J was 2nd favourite, being selected twenty on (21) times; 7Up was the 3rd most preferred soft drink with eighteen (18) children selecting it; Chubby was picked fourteen (14) times, as the 4th favourite; Mountain Dew was 5th on the list with eleven (11) children selecting it; Classic Cola, Busta and Pepsi were all selected nine (9) times as the 6th most preferred soft drink; and finally Pear J was selected six (6) times, making it the least preferred soft drink in the category.

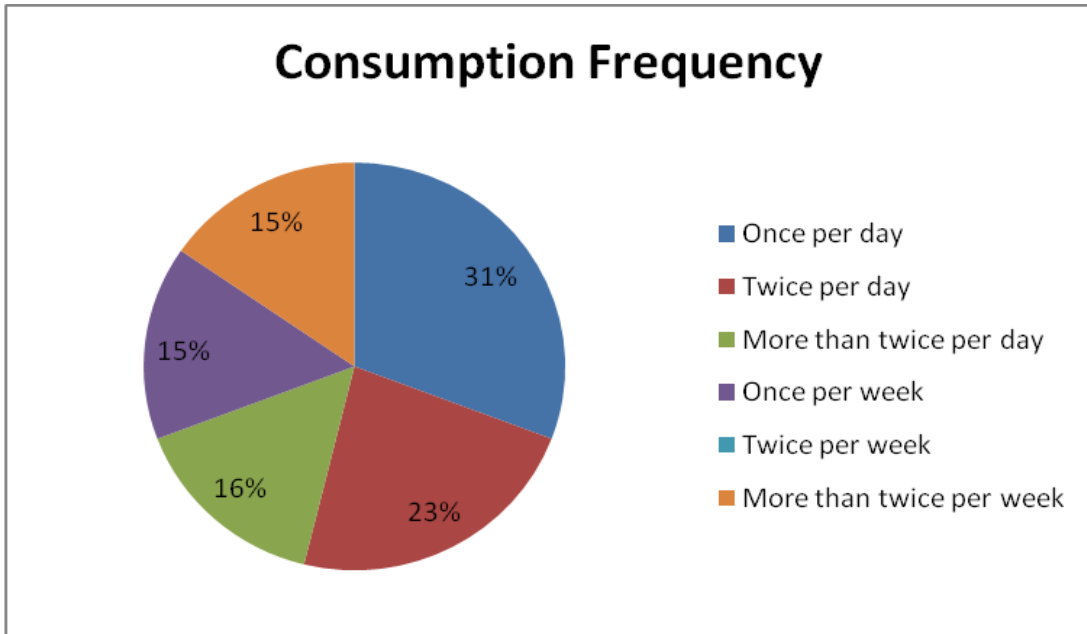


Figure 2 – Consumption frequency of Coca Cola

The consumption frequency of Coca Cola soft drink is as follows - 31% of the children who selected it consumed it once per day; 23% drank it twice per day; 16% had it more than twice per day; and 15% consumed it both once per week and more than twice per week.

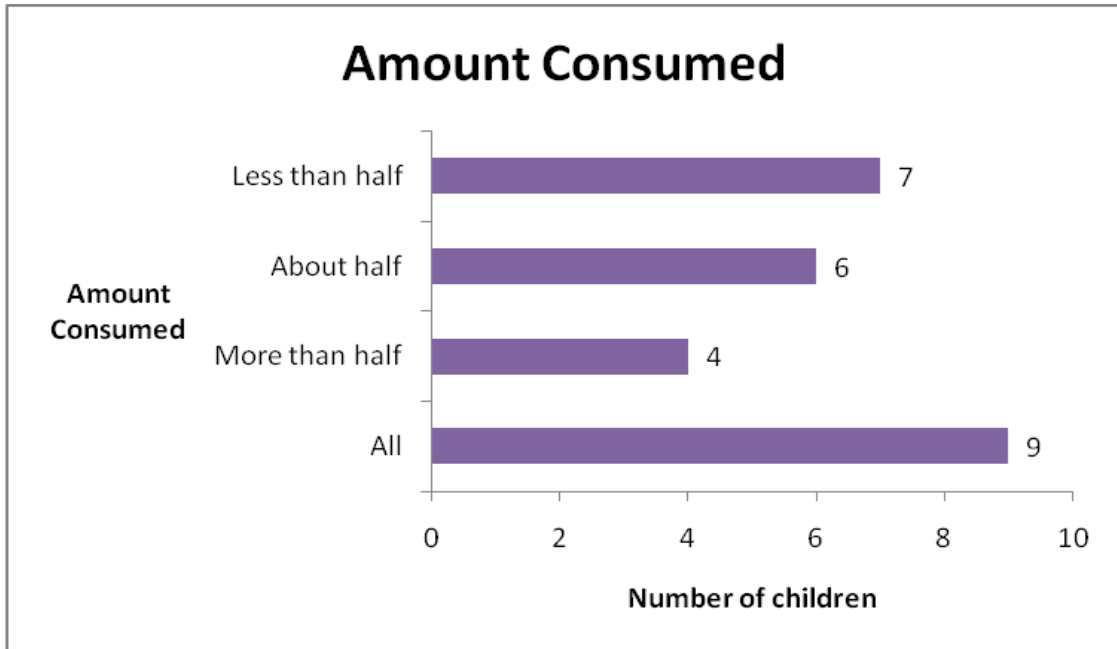


Figure 3 - Amount of Coca Cola consumed

Of the twenty six (26) children who selected Coca Cola, nine (9) indicated that they drank all of the soft drink; four (4) had more than half , six (6) drank about half, and seven (7) consumed less than half.

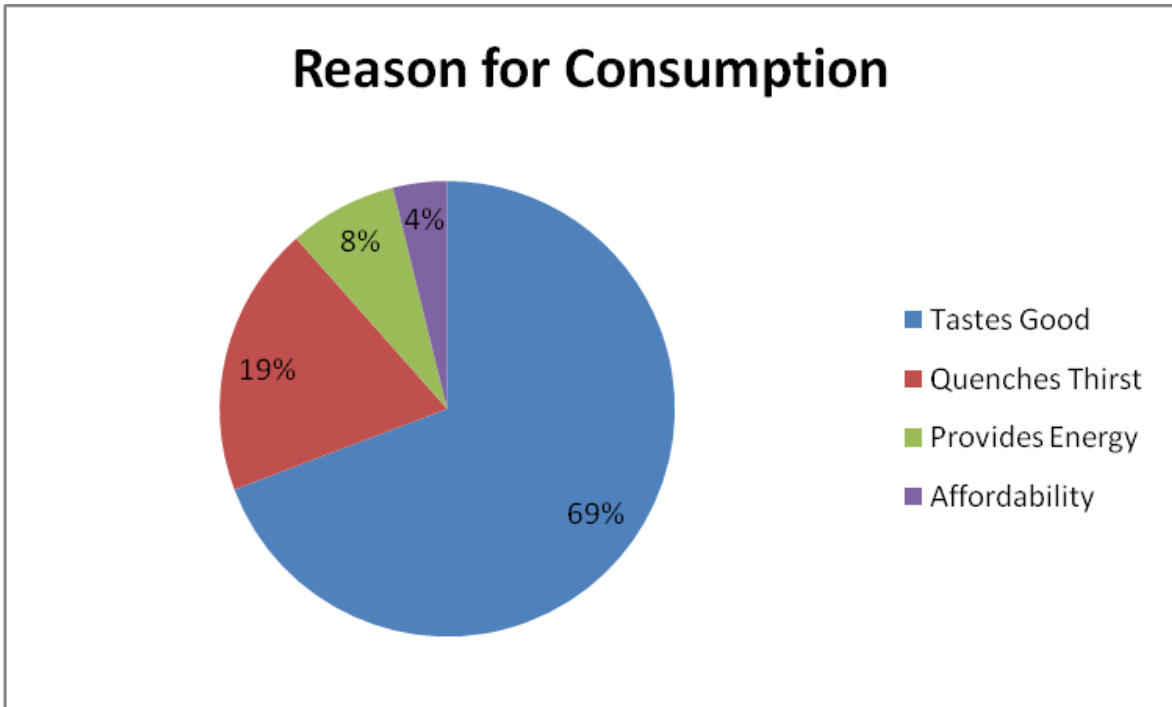


Figure 4 – Reasons for consumption of Coca Cola

69% of the study population who selected Coca Cola indicated that they drank it because of its taste, 19% found it thirst quenching, 8% indicated that it provided them with energy, and 4% consumed it due to its affordability.

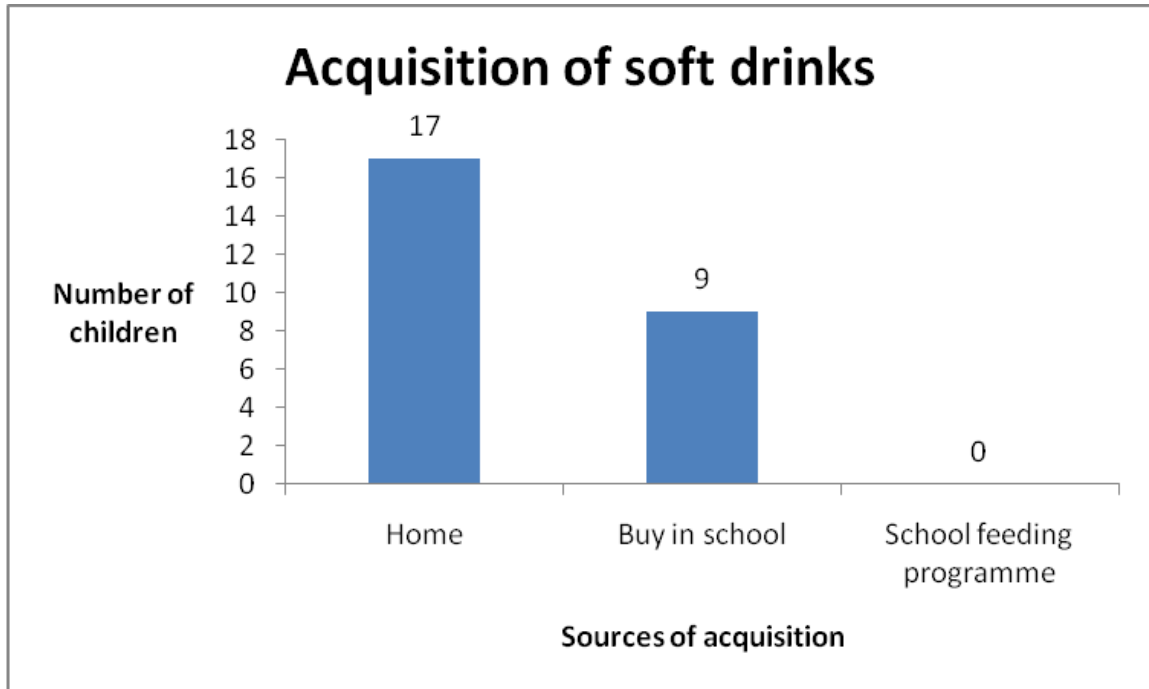


Figure 5 – Sources of acquisition of Coca Cola

Home and school proved to be the two main sources of acquisition for the children. Seventeen (17) of the twenty six (26) Coca Cola drinkers got the soft drink at home, while the remaining nine (9) bought it in school. None of the students got the soft drink from the school feeding programme.

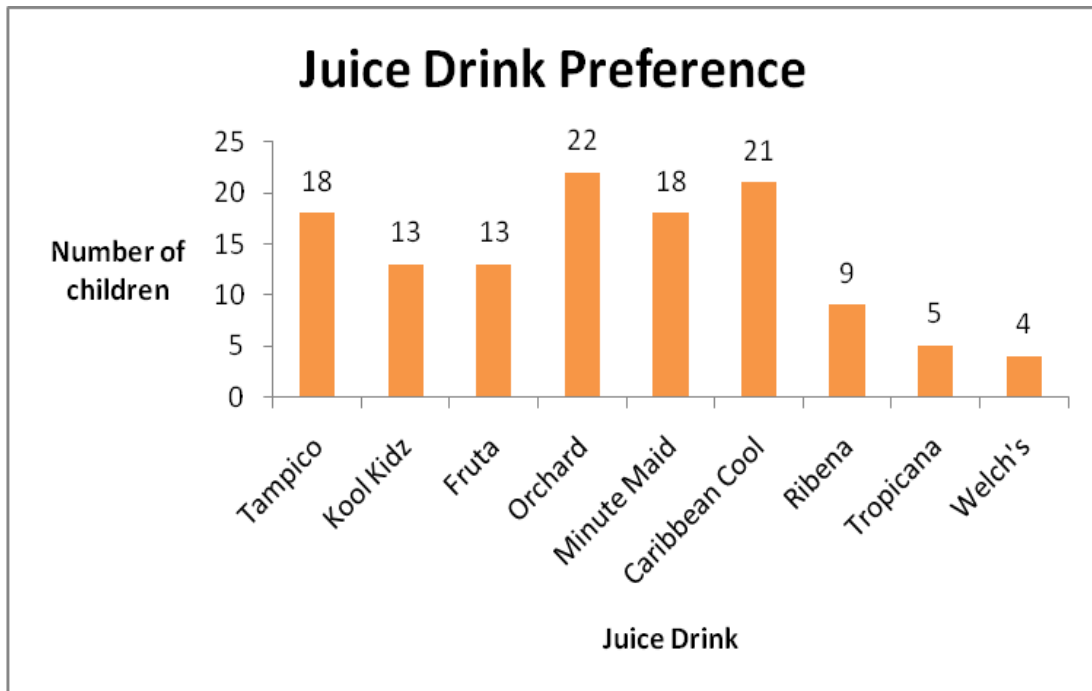


Figure 6 – Juice drink preferences among children

Orchard was the most preferred juice drink, being selected twenty two (22) times; Caribbean Cool was 2nd with twenty one (21) children selecting it; Minute Maid received eighteen (18) selections coming in 3rd, both Fruta and Kool Kidz were tied for 4th with thirteen (13) selections; Ribena was 5th with nine (9) selections; Tropicana got five (5) selections in 6th place; and Welch's was the least preferred juice drink with only four (4) children selecting it.

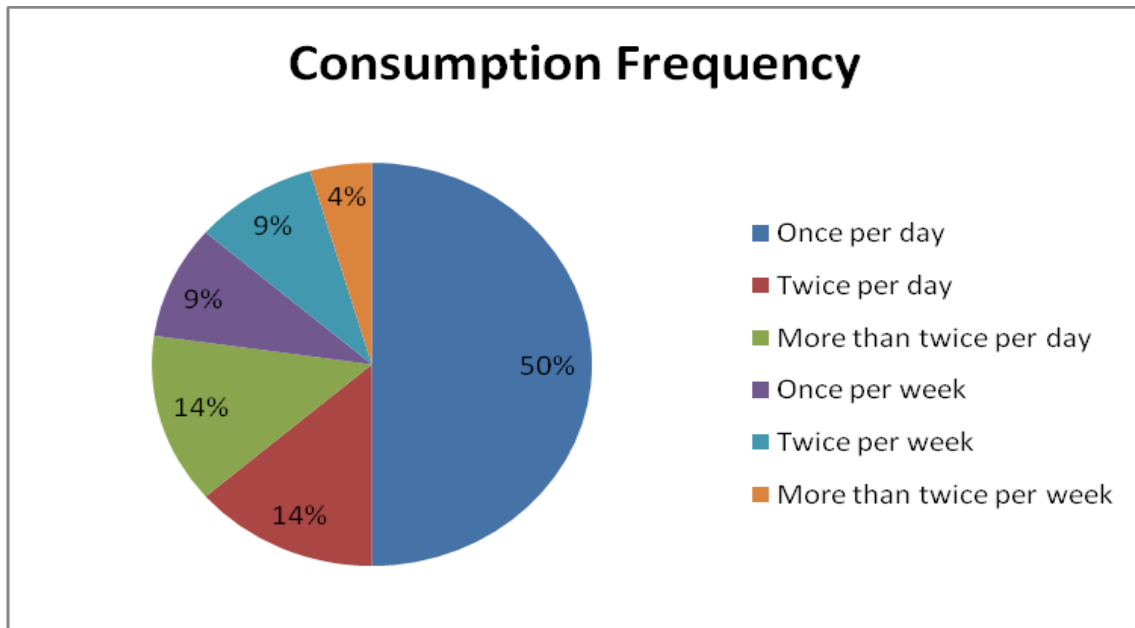


Figure 7 – Consumption frequency of Orchard juice drink

The consumption frequency of Orchard juice drink is as follows :- 50% of the children who selected it drank it once per day, 14% consumed it both twice per day and more than twice per day; 9% drank it both once and twice per week; and 4% consumed it more than twice per week.

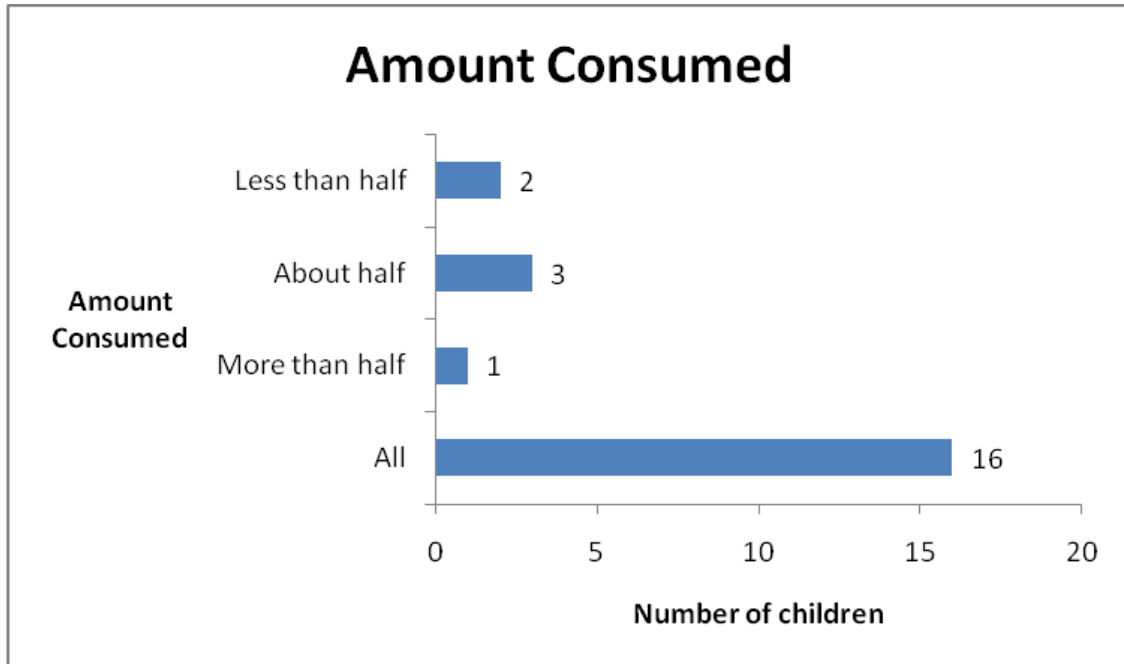


Figure 8 – Amount of Orchard juice drink consumed

Sixteen (16) of the twenty two (22) students who selected Orchard consumed all of the juice drink, one (1) child drank more than half of it, three (3) had about half of the contents, and two (2) drank less than half.

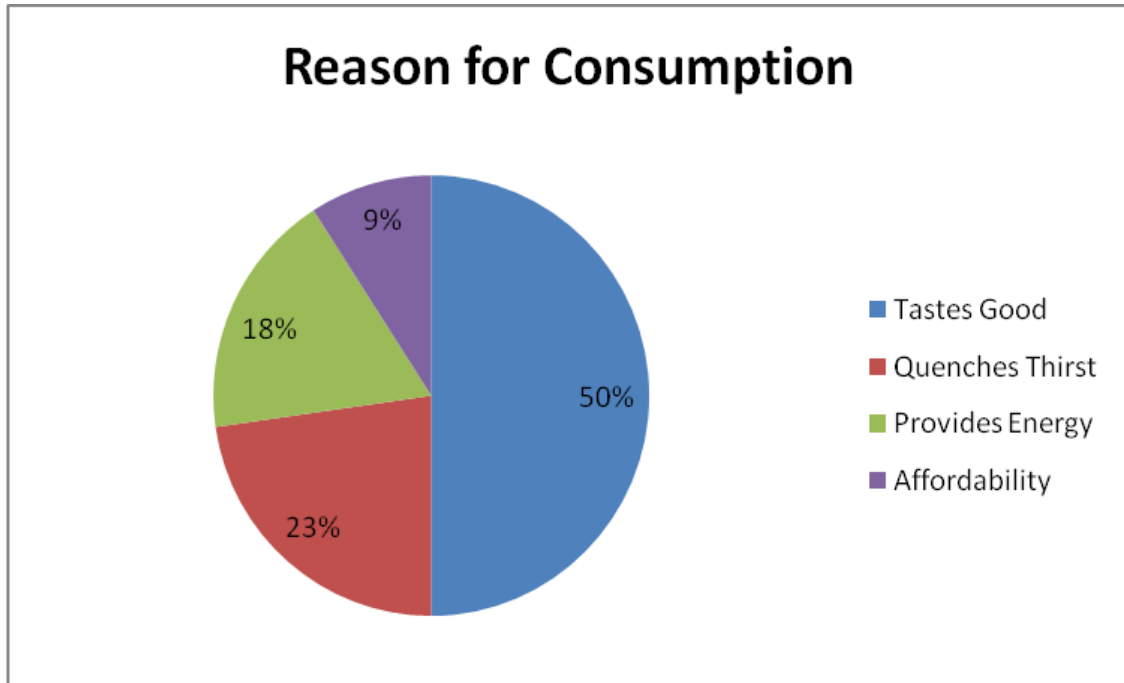


Figure 9 – Reasons for consumption of Orchard juice drink

50% of those who consumed Orchard juice drink did so because of its taste, 23 % because it quenched their thirst, 18% due to it providing them with energy, and 9% due to its affordability.

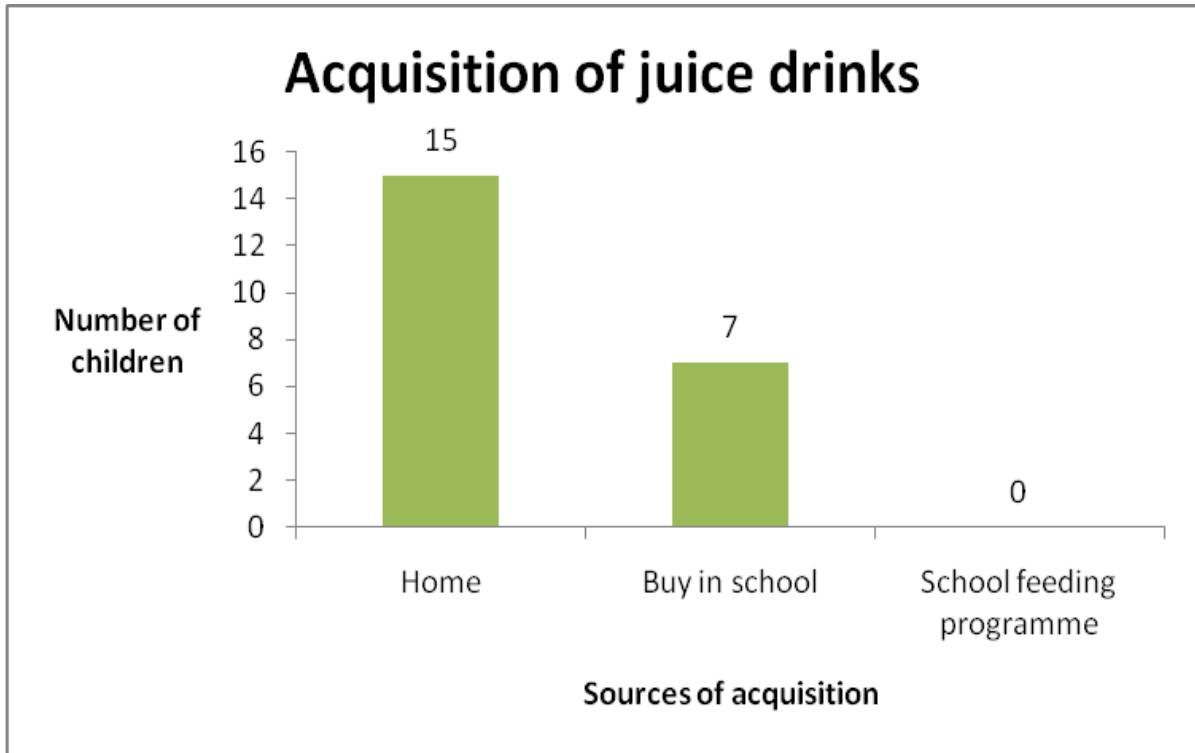


Figure 10 – Sources of acquisition of Orchard juice drink

Fifteen (15) of the twenty two (22) students who drink Orchard juice drink acquired it from home, while seven (7) of them purchased it in school. As with the Coca Cola soft drink, none of the children got the juice drink from the school feeding programme.

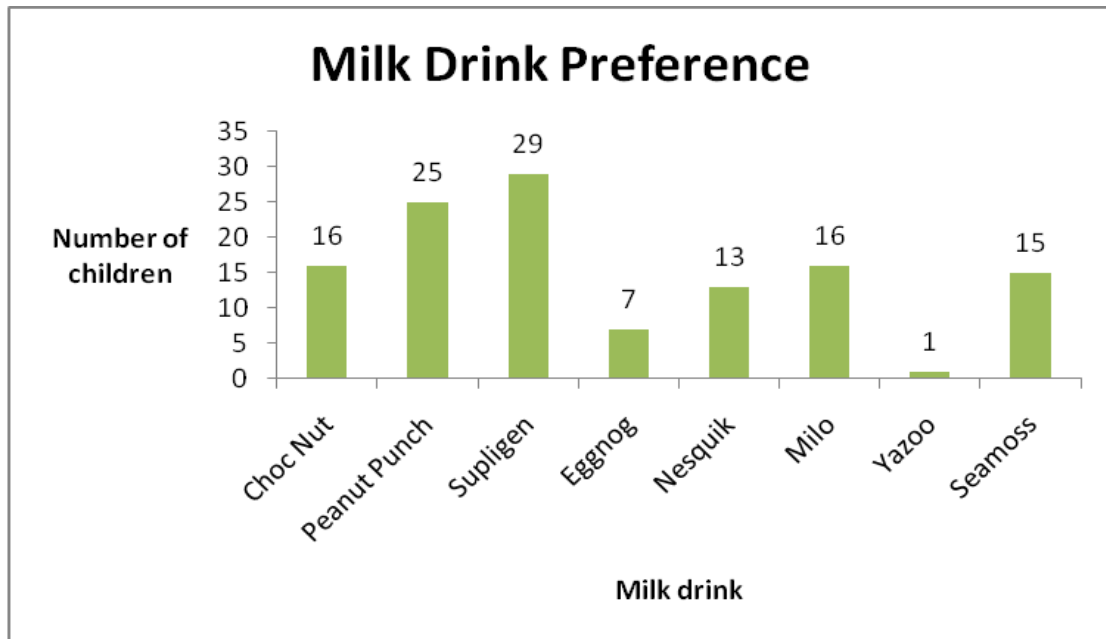


Figure 11 - Milk drink preferences among children

Supligen was selected twenty nine (29) times making it the most preferred milk drink; Peanut Punch was 2nd with twenty five (25) children selecting it; Milo and Choc Nut tied for 3rd with sixteen (16) selections; Seamoss was 4th favourite with fifteen (15) children selecting it; Nesquik was selected thirteen (13) times as the 5th favourite milk drink; and Egnog was the least preferred with only seven (7) children selecting it.

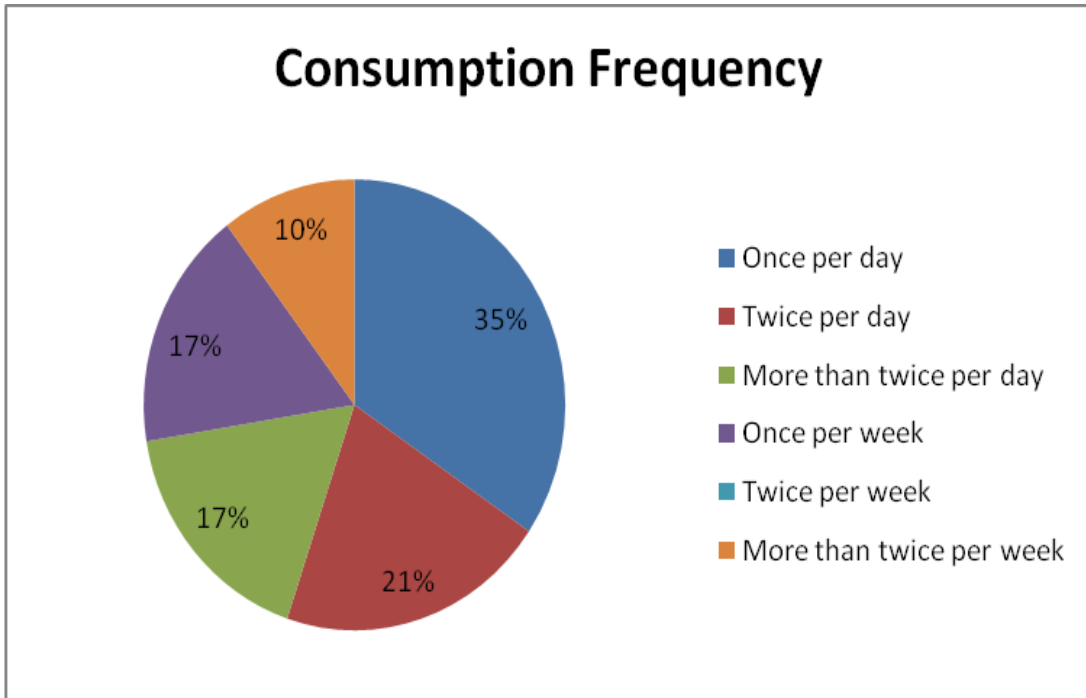


Figure 12 – Consumption frequency of Supligen milk drink

Supligen is the most preferred milk drink with 29 students selecting it. Its consumption frequency is as follows – 35% drank it once per day, 21% twice per day, 17% had it both more than twice per day and once per week, and 10% consumed it more than twice per week.

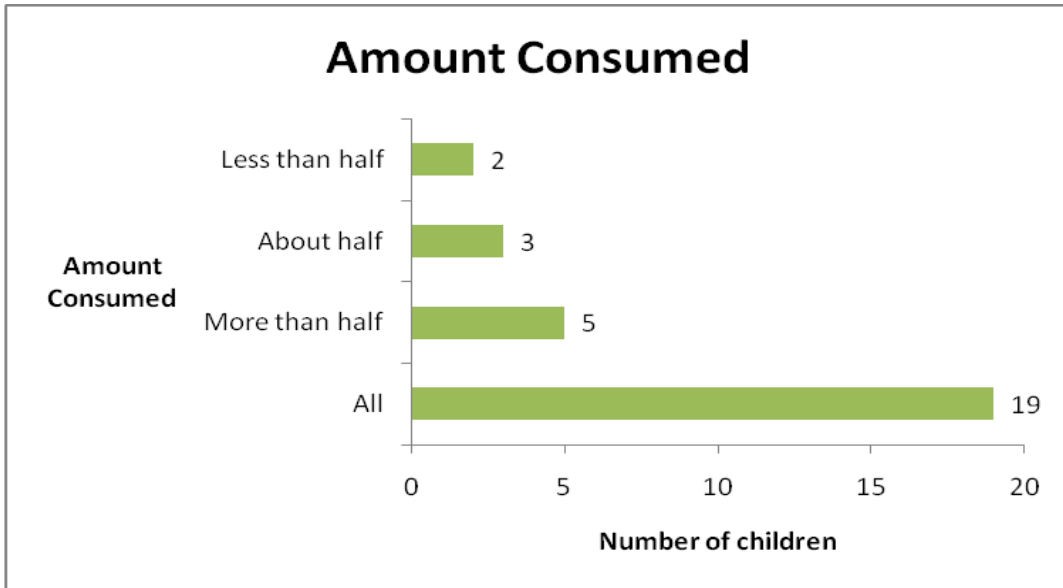


Figure 13 – Amount of Supligen milk drink consumed

Of the twenty nine (29) students who selected Supligen – nineteen (19) consumed all of it, five (5) drank more than half, three (3) had about half of it and, two (2) consumed less than half.

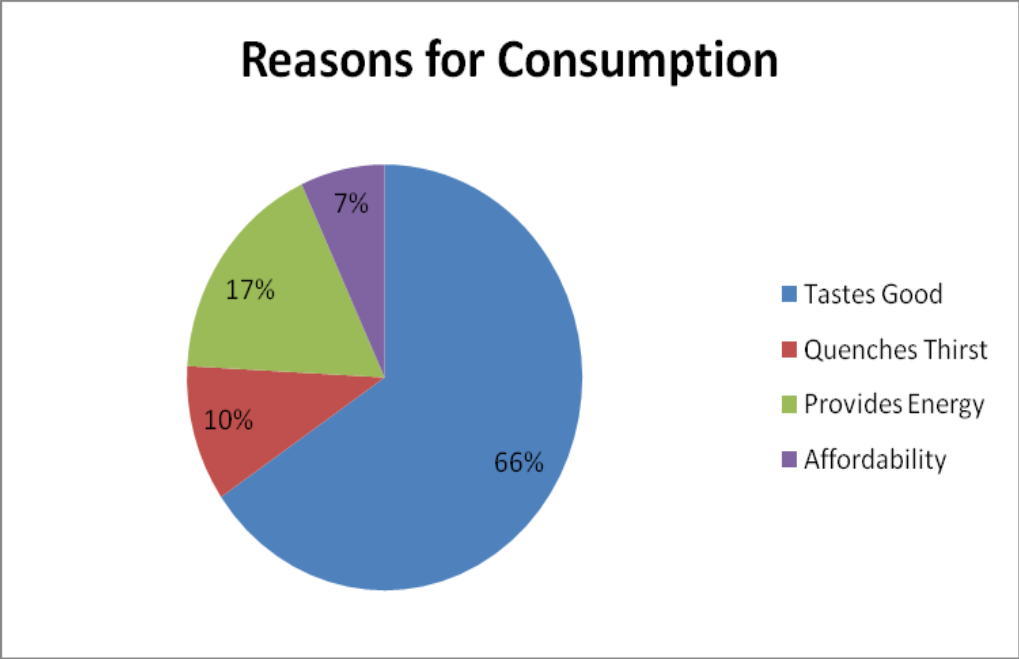


Figure 14 – Reasons for consumption of Supligen milk drink

Among Supligen drinkers, 66% consumed it due to its taste, 10% drank it as a means of quenching their thirst, 17% drank it as a source of energy and, 7% consumed it because they could afford it.

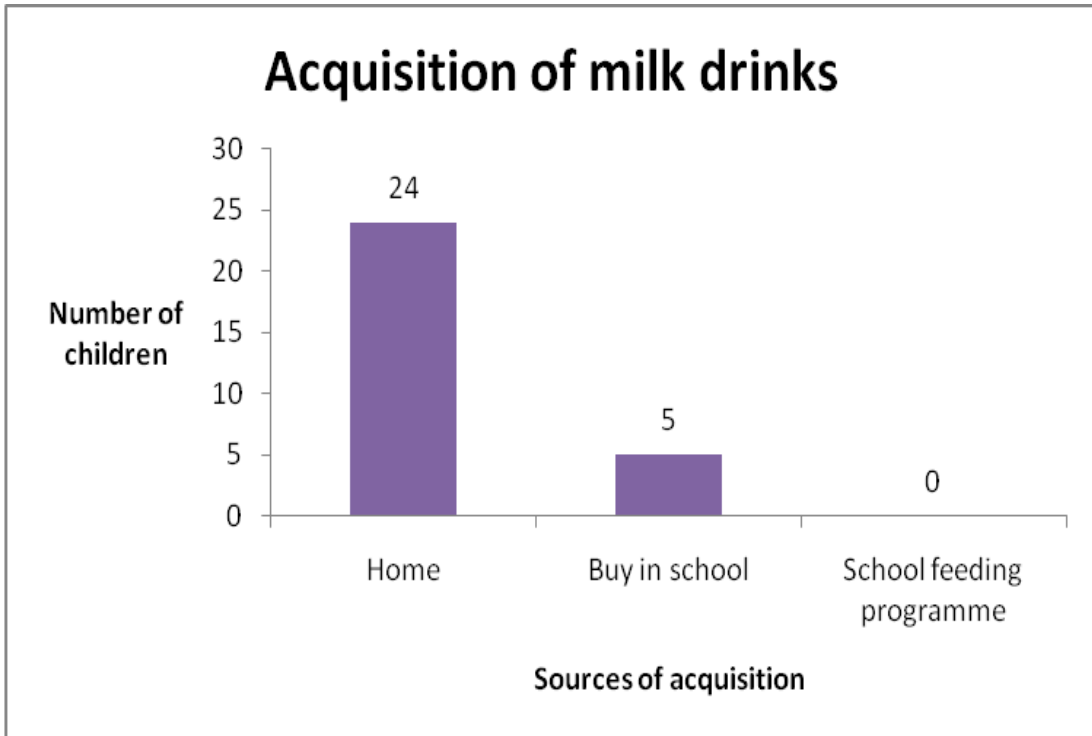


Figure 15 – Sources of acquisition of Supligen milk drink

Of the twenty nine (29) students who consume Supligen – twenty four (24) acquire the drink at home and five (5) buy it in school. None of the students get the milk drink from the school feeding programme.

Beverages	Volume (mL)	Approximate Serving Size (mL)	Calorie Content per serving
Coca Cola	591	246	100
Orchard	250	250	130
Supligen	250	250	285

Table 1 – Calorie Content per serving of Coca Cola, Orchard and Supligen beverages provided by the Nutrition Facts label

Coca Cola has a net content of 591mL, an approximate serving size of 246 mL, and provides 100 calories per serving; Orchard has a net content and approximate serving size of 250mL, and provides 130 calories per serving. Supligen also, has a net content and approximate serving size of 250mL, and provides 285 calories per serving.

DISCUSSION

When it comes to drinking sugar sweetened beverages (SSBs) such as soft drinks, juice drinks and milk-based drinks, there can be many health consequences. Soft drinks contain high amounts of fructose corn syrup, the consumption of which has been associated with the development of dental caries in children (5). They also contain caffeine, which is a diuretic that can cause dehydration (11). Soft drinks also contain many empty calories. These calories are added to one's diet without any additional nutritional benefit, and add extra sugar to the diet. The consumption of these calories has been highly linked with the development of childhood obesity (3-7). To fully understand the impact of soft drink consumption, let us consider the extra calories and how they translate into pounds.

Coca Cola will be used as the example in this case, as it was the preferred soft drink of choice among the study population. 31% of the students who selected Coca Cola indicated that they drink it once a day (see Figure 2), and 35% said they consume the entire contents of the soft drink (see Figure 3). The soft drink has a net content of 591mL and provides 100 calories per serving; one serving is 246mL. Consuming the entire contents of the soft drink is equivalent to having approximately 2.4 servings ($591 \div 246$) of Coca Cola instead of one. Therefore, by consuming the entire soft drink the child consumes 240 calories (2.4×100) per day. If this continues everyday for a month (using a 30 day average for a month) that results in 7200 calories being consumed per month. Over the period of one year the child can consume 86,400 calories. Because 1pound (lb) of body weight is equivalent to 3500 calories (11) – 86,400 calories is equal to approximately 25lbs ($86400 \div 3500$). What seems like one harmless bottle of Coca Cola a day, is equal to approximately 25lbs of weight gain over a year.

Many people view fruit juice as the healthier alternative compared to soft drink. However, juice is not as healthy as people think. Many of the juice drinks available today only contain 10% or less real fruit juice. The majority of the drinks are comprised of concentrated sugars. As a result, juice drink consumption has been linked with an increase in tooth decay among pre-school children. Drinking juice

drinks, as mentioned before with respect to soft drinks does not fill a person up, it just adds more sugar and empty calories to one's diet (12). The consumption of these extra calories can potentially lead to weight gain.

Orchard fruit juice will be used as an example to express the possible effect caloric intake from juice can have on a child's weight. Orchard has a net content of 250mL, it is one serving and provides 130 calories per serving (see Table 1). 50% of the students who selected Orchard indicated that they drink it once a day (see Figure 7), and approximately 73% said that they consume the entire drink (see Figure 8). The child consumes 130 calories per day; which equates to 3900 calories on a monthly basis; and over a period of one year a child can consume up to 46,800 calories. In terms of pounds that is equivalent to approximately 13lbs of weight gain over the course of a year.

Milk is viewed as the healthiest beverage choice for children, next to water. However just like soft drinks and fruit juice drinks, milk based drinks contain high levels of concentrated sugars. They also have higher levels of fats and empty calories than the other two beverage categories. Hence, it leads to the assumption that milk drinks will provide the greatest caloric contribution of the three beverage categories, and any associated weight gain will also be the largest.

Supligen will be used as an example to see if there is any truth to these assumptions. Supligen has a net content of 250mL, it is one serving and provides 285 calories per serving (see Table 1). 35% of the students who selected Supligen drank it once a day (see Figure 12), and approximately 66% indicated that they consume the drink in its entirety (see Figure 13). Therefore, the child consumes 285 calories per day, which over a month results in 8550 calories being consumed, and if consumed for one year the child will consume 102,600 calories. That is equivalent to 29 lbs. Thus, the child can have a 29lb increase in weight solely from Supligen consumption over the course of one year.

Children rarely consume one type of beverage solely. In most cases they consume drinks from all three categories on a daily basis. Due to this, we will now look at the combined caloric contribution of the beverages and their effect on any weight gain. The assumption being made on this scenario, is that the entire contents of the beverages are consumed. Coca Cola – 240 calories, Orchard – 130 calories, Supligen – 285 calories. That gives us a combined total of 655 calories per day. Over the course of one month a child will consume 19,650 calories. If this consumption pattern is maintained for an entire year the resultant caloric intake will be 235,800 calories. That equates to approximately 67lbs. By consuming all three drinks over the course of a yr, a child can have a 67lb increase in body weight.

There are some limitations to this study. Firstly, the results are not reflective of the entire school population because a convenient sample consisting of only Standard 3 students were used. Secondly, the analysis was not adjusted for gender or socio-economic status, so these findings may not be applicable to all populations of primary school children. Finally, certain soft drinks, fruit juice and milk- based drinks were used in this study – hence the results are not applicable to all SSBs, only those used in the study.

CONCLUSION

From the findings we can see that individually, fruit juice drinks make the smallest contribution both in terms of calories and possible weight gain for a child. Soft drinks contribute a much larger amount in terms of both calories and potential weight gain, but milk drinks contribute the most in both areas. When all three beverage categories are combined they contribute almost 2-3 times more calories and weight gain than they do individually. The results of this study support other scientific reports stating that the caloric content of SSBs has a strong association with the likely development of childhood obesity.

RECOMMENDATIONS

The beverage consumption patterns of children need to be changed drastically. With respect to soft drinks, primary schools should try implementing soft drink policies. For example, soft drinks could be sold only once during the course of a school day. This would help limit the amount of soft drink consumed in school. Also, the government could consider implementing taxes on soft drinks. This would increase the price of soft drinks and might result in a decrease of soft drink sales. 100% fruit juices should also be introduced into more school vending outlets; these juices have more fruit juice and less concentrated sugars in them.

Children should also eat more fruits, which have fewer calories and will fill the children more than just drinking juice does. The milk based drinks can be made using low fat milk, which will half the amount of fat and calories in the drink. Schools can develop programmes to educate children about the ill effects of consuming SSBs. The media can also have an active role in educating children about making healthier choices. Marketing and advertising campaigns can be geared towards children telling them about the benefits of drinking more water and having an active lifestyle.

From the results we can clearly see that the majority of the participants acquire their beverages from home. Thus, the parents are giving these drinks to their children. Parents and adults in general should be educated about consumer buying practices, and how to read the nutrition facts label on the beverage packages. Also, the nutritional information must be made available and easily understood by all manufacturers.

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APPENDIX



Questionnaire No. ____

THE UNIVERSITY OF THE WEST INDIES

CONSUMPTION OF COMMERCIALY PACKAGED BEVERAGES AMONG MIDDLE - LEVEL PRIMARY SCHOOL CHILDREN

- 1) Age : _____ years 2) Sex : Boy
 Girl
- 3) Where do you live? (If you choose 'Other', please state where)
 Carapo Arima La Horquetta Other _____
- 4) Do your parents work? Yes No (If yes, how many?)
 Both work One works
- 5) Which are your top 3 favourite soft drinks from the list below? Write the numbers 1, 2 or 3 in the box next to your choices. (If you choose 'Other', please state the name of the drink)
 Chubby Apple J Mountain Dew Other _____
 Classic Cola Pear J Pepsi
 Busta Coca Cola 7 Up

6) How often do you drink these soft drinks? (Check one box for each soft drink)

Drink No.	Name of Drink	Once per day	Twice per day	More than twice per day	Once per week	Twice per week	More than twice per week
1							
2							
3							

7) How much soft drink do you usually drink? (Check one box for each soft drink)

Drink No.	Name of Drink	All	More than half	About half	Less than half
1					

2					
3					

8) Why do you drink these soft drinks? (Check one box for each soft drink)

Drink No.	Name of Drink	It tastes good	It quenches my thirst	It gives me energy	I have money to buy it	Some other reason (please state)
1						
2						
3						

9) Where do you get your soft drinks most times?

- At home
 Buy them in school
 School feeding programme

10) Which are your top three favourite juice drinks from the list below? Write the numbers 1, 2 or 3 in the box next to your choices. (If you choose 'Other', please state the name of the drink)

- Tampico
 Orchard
 Ribena
 Other _____
 Kool Kidz
 Minute Maid
 Tropicana
 Fruta
 Caribbean Cool
 Welch's

11) How often do you drink these juice drinks? (Check one box for each juice drink)

Drink No.	Name of Drink	Once per day	Twice per day	More than twice per day	Once per week	Twice per week	More than twice per week
1							
2							
3							

12) How much juice drink do you usually drink? (Check one box for each juice drink)

Drink No.	Name of Drink	All	More than half	About half	Less than half
1					
2					
3					

13) Why do you drink these juice drinks? (Check one box for each juice drink)

Drink No.	Name of Drink	It tastes good	It quenches my thirst	It gives me energy	I have money to buy it	Some other reason (please state)
1						
2						
3						

- 14) Where do you get your juice drinks?
 At home Buy them in school School feeding programme

- 15) Which are your top three favourite milk drinks from the list below? Write the numbers 1, 2 or 3 in the box next to your choices. (If you choose 'Other' please state the name of the drink)
- Choc Nut Eggnog Yazoo
 Peanut Punch Nesquik Seamoss
 Supligen Milo Other _____

- 16) How often do you drink these milk drinks? (Check one box for each milk drink)

Drink No.	Name of Drink	Once per day	Twice per day	More than twice per day	Once per week	Twice per week	More than twice per week
1							
2							
3							

- 17) How much milk drink do you usually drink? (Check one box for each milk drink)

Drink No.	Name of Drink	All	More than half	About half	Less than half
1					
2					
3					

- 18) Why do you drink these milk drinks? (Check one box for each milk drink)

Drink No.	Name of Drink	It tastes good	It quenches my thirst	It gives me energy	I have money to buy it	Some other reason (please state)
1						
2						
3						

- 19) Where do you get your milk drinks?
 At home Buy them in school School feeding programme

Thank you for participating.