

**THE TUCK SHOP PURCHASING PRACTICES OF GRADE 4 LEARNERS AT
SELECTED PRIMARY SCHOOLS IN PIETERMARTIZBURG, SOUTH AFRICA.**

by

NICOLA LAURELLE WILES

**Submitted in fulfilment of the
requirements for the Degree of
Doctorate of Philosophy (Nutrition)
Dietetics and Human Nutrition,
School of Agricultural, Earth and Environmental Sciences
College of Agriculture, Engineering and Science
University of KwaZulu-Natal
Pietermaritzburg**

December, 2011

DECLARATION OF ORIGINALITY

I, *Nicola Laurelle Wiles*, hereby declare that:

- (i) The research reported in this thesis, except where otherwise indicated, is my original research.
- (ii) This thesis has not been submitted for any degree or examination at any other university.
- (iii) This thesis does not contain other persons' data, pictures, graphs or other information unless specifically acknowledged as being sourced from those persons.
- (iv) This thesis does not contain other author's writing unless specifically acknowledged as being sourced from other authors. Where other written sources have been quoted, then:
 - a) their words have been re-written but the general information attributed to them has been referenced;
 - b) where their exact words have been used, their writing has been placed inside quotation marks, and referenced.
- (v) This thesis does not contain text, graphic or tables copied and pasted from the Internet, unless specifically acknowledged, and the source being detailed in the thesis and in the References sections.

Signed.....

Dated.....

I, *Maryann Green*, chairperson of the Supervisory Committee and

I, *Frederick Veldman*, co-supervisor, approve the release of this thesis for examination.

Signed.....

Signed.....

Dated.....

Dated.....

ABSTRACT

Aim: To determine whether the tuck shop purchasing habits of Grade 4 learners were contributing towards the development of childhood overweight and obesity.

Objectives: To assess the nutritional quality of the food and beverages available for learners to purchase; items regularly purchased from the tuck shop as well as factors influencing the learner's decision to purchase these items; the anthropometric and socio-demographic characteristics of grade 4 learners as well as their nutrition knowledge related to the tuck shop items purchased.

Method: A survey administered to 11 tuck shop managers, a questionnaire administered to 311 Grade 4 learners and two single-sex focus groups of 5 learners each were conducted.

Results: Fifty six percent of the sample were female (n=173) and 44% were male (n=138). Twenty seven percent of the study sample was overweight (n = 83) and 27% were obese (n = 85). Eighty six percent of learners (n = 266) claimed to buy from their school tuck shop. Twenty two percent of learners purchased from their tuck shop at least three times per week (n =58). Learners who purchased from the tuck shop had a significantly higher BMI than those who did not (p = 0.020). Learners who purchased from the tuck shop spent on average R8,38 per day with a minimum of R1 and a maximum of R40 (standard deviation R5.39). The most popular reasons for visiting the tuck shop included "*this is my favourite thing to eat or drink*" (66.5%, n = 177) and "*I only have enough money to buy this item*" (47.0%, n = 125).

Savoury pies were the most popular "lunch" item for all learners for both food breaks (45%, n = 5 schools and 27.3%, n = 3 schools) selling the most number of units (43) per day at eight of the eleven schools (72.7%). Iced popsicles were sold at almost every school, ranked as the cheapest beverage and also sold the most number of units (40.7). Healthy beverages sold included canned fruit juice and water, while healthy snacks consisted of dried fruit, fruit salad, bananas, yoghurt and health muffins. The average healthy snack contained almost half the kilojoules of its unhealthy counterpart (465kJ vs 806kJ). Nutritional analyses of the healthy lunch options revealed total fat contents that exceeded the DRI and South African recommended limit. Perceived barriers to stocking healthy items included cost and refrigeration restrictions.

The average score for the food groups was only 33% indicating that learners were not familiar with the Food Based Dietary Guidelines (FBDG). Further analyses showed that the total knowledge scores of those learners that reported to buy from the tuck shop frequently, was significantly lower when compared to the total knowledge scores of those learners who bought from the tuck shop less frequently (13.0 ± 3.9 and 11.6 ± 3.1 , respectively; $p < 0.05$). Logistic regression analysis confirmed that the total knowledge of a learner could be used to predict whether he or she is more likely to make purchases from the tuck shop (significance = 0.017).

Focus group results revealed that learners are aware of “healthy” and “unhealthy” tuck shop items. Most learners stated that they would continue to purchase items from their tuck shop if all “unhealthy” items were removed.

Conclusion: Primary school tuck shops of well resourced schools in Pietermaritzburg are contributing to childhood overweight and obesity through a combination of factors. These include the poor nutritional quality of the items stocked at the tuck shop as well as the poor tuck shop purchasing practices. Much consultation is required amongst dietitians, school principals and privatised tuck shop managers to overcome barriers to stocking healthy items. School management and government have an important role to play in imposing restrictions on the sale of unhealthy items; along with improving the quality of the nutrition education curriculum to ensure that learners are able to translate their knowledge into healthier purchasing practices.

ACKNOWLEDGEMENTS

Many thanks to the following people for all their input and support during the completion of this research project:

My supervisors Professors Maryann Green and Frederick Veldman – thank you for your valuable input and all the guidance and support that motivated me to achieve my goals and deadlines.

My fieldworkers Zanele Tshabalala, Atlehang Makakole, Mphilonhle Ncwane and Nophiwe Job – thank you for your hard work and positive attitudes during the data collection process.

The LEAP/Carnegie foundation– thank you for the fantastic job opportunity. It has been a great privilege to lecture at UKZN and study toward a PhD.

The University of KwaZulu-Natal for the Competitive Grant funding opportunity.

My friends, colleagues and family – thank you so much for all of your love, support and encouragement during this project.

TABLE OF CONTENTS

CHAPTER 1: INTRODUCTION: THE PROBLEM AND ITS SETTING	1
1.1 Background to the importance of the study	1
1.2 Statement of the problem	2
1.3 Sub problems	3
1.4 Type of study.....	4
1.5 Study constraints	5
1.6 Study parameters	6
1.7 Assumptions	6
1.8 Definition of terms	6
1.9 Abbreviations	7
1.10 Summary	8
1.11 Thesis outline	8
1.12 Referencing style.....	9
1.13 Ethical clearance and permission to use the schools.....	9
References	9
CHAPTER 2: REVIEW OF THE RELATED LITERATURE	12
2.1 Background to the childhood overweight and obesity problem.....	12
2.1.1 The prevalence of childhood overweight and obesity in South Africa	12
2.1.2 The aetiology of childhood overweight and obesity	13
2.1.3 The classification of healthy and unhealthy food.....	15
2.1.4 The school setting as a contributing factor to childhood overweight and obesity	16
2.1.5 Factors affecting the eating behaviour of children.....	17
2.2 The purchasing practices surrounding the food and beverages available at school	19
2.2.1 The food and beverages consumed at school	19
2.2.2 Factors influencing the purchase of food and beverages at school	24
2.2.3 Levels of nutrition knowledge of learners.....	26
2.3 Summary	27
References	29

CHAPTER 3: The variety, popularity and nutritional quality of the food and beverages sold to Grade 4 learners	35
3.1 Introduction	35
3.2 Research design.....	36
3.3 Methodology	37
3.3.1 Sample selection.....	37
3.3.2 Research instruments.....	37
3.3.3 Data analysis	38
3.4 Results	38
3.4.1 School recommendations regarding tuck shop stock and use by learners	38
3.4.2 Variety of tuck shop items available for sale	39
3.4.3 Popularity of learners as tuck shop customers and tuck shop items available for sale	41
3.4.4 Nutritional quality of tuck shop items.....	42
3.5 Discussion	47
3.5.1 School recommendations regarding tuck shops.....	48
3.5.2 Variety and popularity of food and beverages	48
3.5.3 Nutritional quality of tuck shop food and beverages	49
3.5.4 Barriers to stocking “healthy” items	51
3.6 Conclusion.....	52
References	52

CHAPTER 4: The anthropometric and socio-demographic characteristics, and levels of nutrition knowledge of Grade 4 learners related to tuck shop purchasing practices	55
4.1 Introduction	55
4.2 Research design.....	56
4.3 Methodology	56
4.3.1 Sample selection.....	56
4.3.2 Research instrument	57
4.3.3 Data analysis	58
4.4 Results	58

4.4.1	Anthropometric data.....	58
4.4.2	Socio-demographic background.....	61
4.4.3	Food consumed at home and brought from home to eat at school.....	62
4.4.4	Tuck shop purchasing practices	63
4.4.5	Nutrition knowledge levels	68
4.5	Discussion	73
4.5.1	Anthropometric data.....	73
4.5.2	Socio-demographic backgrounds	74
4.5.3	Food consumed at home and brought from home to eat at school.....	76
4.5.4	Items bought from the tuck shop.....	76
4.5.5	Motivating reasons for purchasing items	77
4.5.6	Nutrition knowledge levels	78
4.6	Conclusion.....	80
	References	81

**CHAPTER 5: Determination of factors influencing the tuck shop purchasing practices
of Grade 4 learners through focus group discussions.....** 85

5.1	Introduction	85
5.2	Research design.....	87
5.3	Methodology	87
5.3.1	Sample selection and data collection process	87
5.3.2	Research instrument	88
5.3.3	Data analysis	89
5.4	Results	89
5.4.1	Characteristics of focus group learners	89
5.4.2	Anthropometric results.....	89
5.4.3	Socio-demographic factors.....	90
5.4.4	Food brought from home.....	90
5.4.5	Perceptions of healthy and unhealthy foods.....	90
5.4.6	Tuck shop purchasing practices	92

5.4.7	Nutrition knowledge scores.....	94
5.5	Discussion	94
5.6	Conclusions	97
	References	98
CHAPTER 6: FINAL CONCLUSIONS AND RECOMMENDATIONS		101
6.1	Summary of the research approach	101
6.2	Findings and conclusions.....	102
6.2.1	Presence of school food policies and nutritional quality of tuck shop items.....	103
6.2.2	Factors influencing the purchase of tuck shop items and learners nutrition knowledge related to tuck shop purchasing practices.....	103
6.3	Recommendations	103
6.4	Study critique and recommendations for further research	105
COMPLETE REFERENCE LIST.....		107

APPENDICES

APPENDIX A: LIST OF PARTICIPATING SCHOOLS	119
APPENDIX B: LETTERS REQUESTING PERMISSION & INFORMED CONSENT	120
APPENDIX C: UKZN ETHICAL CLEARANCE LETTER	128
APPENDIX D: PERMISSION FROM THE DEPARTMENT OF EDUCATION	129
APPENDIX E: TUCK SHOP SURVEY	133
APPENDIX F: LEARNER QUESTIONNAIRE.....	140
APPENDIX G: FOCUS GROUP AGENDA.....	151
APPENDIX H: PUBLISHED ARTICLE FROM CHAPTER 4.....	153

LIST OF FIGURES

Figure 2.1: An ecological model of the aetiology of childhood overweight and obesity	14
Figure 2.2: Factors influencing the development of childhood overweight and obesity to be tested in this study	28
Figure 3.1: Most popular first break items according to tuck shop managers	42
Figure 3.2: Most popular second break item according to tuck shop managers	42
Figure 4.1: Sample of male and female BMIs compared to the normal distribution curve of the study population as a whole	59
Figure 4.2: Source of tuck shop spending money for Grade 4 learners	65
Figure 6.1: Factors influencing the contribution that school tuck shops along with the purchasing practices of learners' make toward childhood overweight and obesity	102

LIST OF TABLES

Table 1.1:	Research instruments addressing the research sub problems.....	4
Table 2.1:	Studies showing the prevalence of childhood overweight and obesity in South Africa	13
Table 2.2:	Studies related to the nutritional composition and “inventory” of food and beverages available at school	21
Table 2.3:	Outcomes of the studies regarding the factors influencing the consumption of food and beverage items at school.....	25
Table 2.4:	Studies related to the nutrition knowledge of children	27
Table 3.1:	Management of the tuck shop and amount of input tuck shop managers had regarding the products that were stocked.....	39
Table 3.2:	Variety of tuck shop items available for sale.....	40
Table 3.3:	The nutritional composition of “healthy” tuck shop items based on FDA (2003) classification.....	44
Table 3.4:	The nutritional composition of “unhealthy” items based on Temple <u>et al</u> (2006) classification.....	45
Table 3.5:	The average nutritional composition of “healthy” and “unhealthy” tuck shop items according to Temple <u>et al</u> (2006) and FDA (2003) classification.....	46
Table 4.1:	Anthropometric characteristics of learners of the study population as a whole (n = 311).....	60
Table 4.2:	Classification of study population according to WHO z-score categories	60
Table 4.3:	Resources found in each learner’s household.....	61
Table 4.4:	Medical conditions of the learner and his/her family member for the study population as a whole.....	62
Table 4.5:	BMI classification of learners who made frequent and non frequent tuck shop purchases	63
Table 4.6:	Characteristics of frequent versus non frequent tuck shop purchasers	64
Table 4.7:	Items purchased by Grade 4 learners at each break period.....	66
Table 4.8:	Popular items bought at each break period	67
Table 4.9:	Reasons why learners purchase tuck shop items	68
Table 4.10:	Total scores for each section of the nutrition knowledge test.....	69

Table 4.11: Correct and incorrect answers to nutrition knowledge questions	70
Table 4.12: Learner characteristics related to BMI percentiles	72
Table 5.1: Tuck shop items allocated to healthy or unhealthy categories.....	92
Table 5.2: Important reasons why learners purchased tuck shop items	93
Table 5.3: Quantitative nutrition knowledge test scores	94

CHAPTER 1: INTRODUCTION: THE PROBLEM AND ITS SETTING

1.1 Background to the importance of the study

The World Health Organisation (WHO) considers childhood obesity to be “one of the most serious public health challenges of the 21st century” (WHO 2010). International figures from 2010 approximated that over 43 million children under the age of five were overweight. Almost 35 million of these children resided in developing countries (WHO 2011). In South Africa, the 2005 National Food Consumption Survey revealed that ten percent of South African children aged one to nine years were overweight, while four percent were obese (Labadarios 2008). Both overweight and obese children have an increased risk of developing diseases of lifestyle at a young age (WHO 2010). Preventing childhood obesity therefore is extremely important. Along with encouraging physical activity, it is recommended that children increase their dietary intake of fruits and vegetables, legumes, whole grains and nuts; and restrict their intake of sugar and fat - especially saturated fat (WHO 2010). This requires that one also address attitudes and beliefs surrounding food in young children.

A child’s attitudes and beliefs surrounding food is greatly shaped by two influences: their home and school environment (Story 2009). In the early stages of childhood, a parent has the greatest influence and responsibility in establishing these attitudes and beliefs (Lissau & Poulsen 2005, Owen, Schickler & Davies 1997). However as a child grows, this influence is soon replaced by the media, the peers surrounding him/her as well as the quality of the nutrition education received at school (Lissau & Poulsen 2005). Children spend a substantial amount of time at school. The classroom therefore, is considered to be an appropriate environment where one can influence knowledge about nutrition and thereby equip children with the skills necessary to maintain a healthy lifestyle (WHO 2010; Story 2009; Kubik, Lytle, Hannan, Perry & Story 2003). In South Africa, at the time of this study, nutrition education formed part of the Life Orientation curriculum for General Education Training (GET) learners, from grade R (pre-grade 1) to 9; and the Life Science curriculum for Further Education Training (FET) learners in grade 10 to 12. It should be acknowledged, however, that even though children could possess adequate knowledge to assist them with making healthy food choices, the variety of food at their disposal could in the long run, remain a limiting factor in exercising this choice.

Research conducted in South African schools regarding tuck shop use has been very limited. As a result there is a great shortage of current information regarding the factors contributing to childhood overweight and obesity amongst South African school children. This information is particularly lacking with respect to children attending well-resourced schools in South Africa. Several questions that have not been addressed in the South African primary school setting then arise:

- What food and beverages are available for sale at primary school tuck shops?
- Are learners who purchase from their school tuck shop within normal, overweight or obese body mass index categories?
- When faced with an alternative, are learners choosing the healthier option over the less healthy tuck shop item?
- What factors influence learner's decisions to purchase items from their tuck shop?

This study therefore provided an excellent opportunity to gain additional insight into the link between the use of the school tuck shop and the onset of childhood overweight and obesity.

1.2 Statement of the problem

To determine whether the nutritional quality of the food and beverages sold at school tuck shops, along with the purchasing practices of these products, are related to the development of childhood overweight and obesity in Grade 4 learners, attending well-resourced schools.

1.3 Sub problems

- 1.3.1 To assess the nutritional quality of the food and beverage items available for learners to purchase.
- 1.3.2 To determine whether primary schools have policies and restrictions regarding tuck shop use.
- 1.3.3 To determine the anthropometric and socio-demographic characteristics of Grade 4 learners who frequently¹ purchase food items from their school tuck shop compared to those who use the tuck shop infrequently.
- 1.3.4 To determine whether Grade 4 learners are using the tuck shop to purchase their entire lunch meal or just to purchase items to supplement what was brought from home.
- 1.3.5 To determine the items that Grade 4 learners are regularly purchasing, as well as the amount of money that learners are spending at their school's tuck shop.
- 1.3.6 To determine the factors influencing the Grade 4 learner's decision to purchase school tuck shop items.
- 1.3.7 To determine the nutrition knowledge levels of Grade 4 learners related to their tuck shop purchasing practices.

The research instruments addressing these sub problems are presented in Table 1.1:

¹ For the purpose of this research frequent tuck shop purchasers will be considered as those who visit the tuck shop at least three times per week (Finch 2010).

Table 1.1: Research instruments addressing the research sub problems

Tuck shop survey	Learner Questionnaire	Focus Groups
1.4.1 To assess the nutritional quality of the food and beverage items available for learners to purchase.	1.4.3 To determine the anthropometric and socio-demographic characteristics of Grade 4 learners who frequently purchase food items from their school tuck shop compared to those who use the tuck shop infrequently.	1.4.4 To determine whether Grade 4 learners are using the tuck shop to purchase their entire lunch meal or just to purchase items to supplement what was brought from home.
1.4.2 To determine whether primary schools have policies and restrictions regarding tuck shop use.	1.4.4 To determine whether Grade 4 learners are using the tuck shop to purchase their entire lunch meal or just to purchase items to supplement what was brought from home.	1.4.6 To determine the factors influencing the Grade 4 learner's decision to purchase school tuck shop items.
1.4.4 To determine whether Grade 4 learners are using the tuck shop to purchase their entire lunch meal or just to purchase items to supplement what was brought from home.	1.4.5 To determine the items that Grade 4 learners are regularly purchasing, as well as the amount of money that learners are spending at their school's tuck shop.	
	1.4.6 To determine the factors influencing the Grade 4 learner's decision to purchase school tuck shop items.	
	1.4.7 To determine the nutrition knowledge levels of Grade 4 learners related to their tuck shop purchasing practices.	

1.4 Type of study

This cross sectional study included Grade 4 learners and their school tuck shops, within selected Pietermaritzburg schools of mixed race to ensure that all population groups were represented (participating schools presented in Appendix A, p118). Learners from the Grade 4 were chosen

based on the fact that previous studies have found this age group (9-10 years) representative of primary school aged children (Hoelscher, Day, Lee, Frankowski, Kelder, Ward & Scheurer 2004). It has also been proposed that children from this age group are able to concentrate for at least half an hour and when presented with a question containing five possible responses, they are able to clearly interpret the question and make an appropriate response (DeVault, Kennedy, Hermann, Mwavita, Rask & Jaworsky 2009; Rebok, Riley, Forrest, Starfield, Green, Robertson & Tambor 2001).

Eleven out of thirty schools in the highest government classified quintile range in Pietermaritzburg were selected to participate in the first part of the study, a tuck shop survey. Along with being the only mixed race schools in Pietermaritzburg, these eleven, well resourced schools were chosen based on the assumption that they would have the greatest availability and variety of tuck shop items. Based on the findings from the tuck shop surveys, learners from the schools that offered healthier alternatives, in addition to unhealthy food and beverages, were selected to complete a questionnaire. These schools were selected because it was assumed that the findings would provide greater insight into the tuck purchasing practices of Grade 4 learners, when provided with both healthy and unhealthy purchasing options. A small sample of learners from one of the schools that completed the questionnaire was further interviewed as part of male and female focus groups. This school was selected because it had the greatest variety of healthy and unhealthy food and beverages available at the tuck shop.

Information was only obtained if the tuck shop managers and learners had given consent and where necessary assent (forms requesting assent and consent presented in Appendix B, p119).

1.5 Study constraints

Monetary and time limitations resulted in this study only targeting a small sample of all the schools in Pietermaritzburg. The questionnaire and focus group was also designed to be as brief as possible to prevent learner fatigue.

1.6 Study parameters

All consenting tuck shop managers and all consenting and assenting Grade 4 learners who formed part of the selected schools were included in this sample population. This study only looked at the food and beverages sold at tuck shops and excluded vendors, vending machines, school meal programs and any other form of school feeding opportunities. Race was not selected as a demographic objective because the race groups were not evenly distributed amongst the Grade 4 learners.

1.7 Assumptions

For the purpose of this study, the following was assumed to be valid:

- The schools chosen in this sample had the greatest accessibility and variety of tuck shop items for sale.
- The respondents (tuck shop managers and learners) were able to understand the questions.
- The respondents were honest with their answers.
- The questionnaires were conducted in a standardised manner where the teachers were consistent with their questioning techniques as discussed during the preliminary meetings.
- The learners selected for the focus groups were representative of the whole Grade 4 sample.

1.8 Definition of terms

Healthy tuck shop item: A food or beverage containing low amounts of fat and saturated fat, restricted amounts of sodium and cholesterol, and at least 10% of Vitamin A, C, calcium, iron, protein or fibre per serving (FDA 2003).

Learner: A child attending school in South Africa.

Nutrition knowledge:	“is the aptitude of remembering information about the nutritional content of a food” (Sapp & Jensen 1997).
Obese child/learner:	A BMI greater than 2 positive standard deviations from the z score mean (WHO 2011).
Overweight child/learner:	A body mass index (BMI) greater than 1 positive standard deviation from the WHO Z score mean (WHO 2011).
Reliability:	“The scale ability of measuring something in reproducible fashion” (Turconi, Celsa, Rezzani, Biino, Sartirana & Roggi 2003).
Selected schools:	Schools classified as Quintile 5, chosen on the basis that they were well resourced.
Tuck shop:	A designated area within the school premises that have food and beverage items available for sale to learners before, during or after school.
Unhealthy tuck shop item:	A food or beverage containing an elevated fat, added sugar and sodium content, poor nutrient density as well as low amounts of dietary fibre (Temple, Steyn, Myburgh & Nel 2006).
Validity:	“The ability of a scale to measure what it is supposed to measure” (Bowers, House & Owen 2006, p97).

1.9 Abbreviations

BMI:	Body Mass Index
DRI:	Dietary Reference Intake
FAO:	Food and Agricultural Organisation
FBDG:	Food Based Dietary Guidelines

FDA:	Food and Drug Administration
MRC:	Medical Research Council
RDA:	Recommended Dietary Allowance
WHO:	World Health Organisation

1.10 Summary

The incidence of childhood overweight and obesity is on the increase. As part of the guidelines on reducing the risk of developing diseases of lifestyle at a young age, the WHO recommends children restrict their intake of sugar and fat. The food and beverages that children purchase at their school tuck shop may contribute to the development of childhood overweight and obesity.

The focus of this study is to determine the nutritional quality of the food and beverages available for learners to purchase; items regularly purchased from the tuck shop as well as factors influencing the learner's decision to purchase these items; the anthropometric and socio-demographic characteristics of Grade 4 learners as well as their nutrition knowledge related to the tuck shop items purchased.

1.11 Thesis outline

- Chapter 1 presents the background to the problem and objectives investigated in this research.
- Chapter 2 presents the literature review surrounding the topic, looking at the theoretical framework behind the food and beverages available at school as well as purchasing habits related to these items.
- Chapter 3, 4 and 5 present results from the tuck shop survey, learner questionnaire and focus groups, respectively.
- Chapter 6 presents the conclusions and final recommendations based on this study.

1.12 Referencing style

For the purpose of this thesis, the researcher has adopted a referencing style used in the Discipline of Dietetics and Human Nutrition, University of KwaZulu-Natal.

1.13 Ethical clearance and permission to use the schools

Ethics approval for this study was obtained from the University of KwaZulu-Natal (Appendix C, p127). Permission to use the schools was obtained from the Department of Education's Superintendent General, Dr Cassius Lubisi (Appendix D, p128). Written consent and permission to be interviewed was obtained from the selected school's principal and tuck shop manager for the tuck shop survey (Appendix B, p119). Written assent and consent was obtained from the learner and their parent/guardian and only learners with both assent and consent were interviewed in this study (Appendix B, p119).

References

- Bowers D, House A, Owens D (2006). **Understanding Clinical Papers, 2nd ed.** Chichester: John Wiley & Sons.
- DeVault N, Kennedy T, Hermann J, Mwavita M, Rask P, Jaworsky A (2009). It's all about kids: Preventing overweight in elementary school children in Tulsa, OK. **Journal of American Dietetic Association** 109(5): 680 - 687.
- Finch M (2010). Program manager and public health nutritionist, University of Newcastle, Australia. E-mail communication, 2 February 2010.
- Food and Drug Administration (2003). Claims that can be made for conventional foods and dietary supplements. <http://www.fda.gov/food/labellingnutrition/labelclaims/ucm111447.htm>, (date accessed 18/01/2010).

- Hoelscher DM, Day S, Lee ES, Frankowski RF, Kelder SH, Ward JL, Scheurer ME (2004). Measuring the prevalence of overweight in Texas schoolchildren. **American Journal of Public Health** 94(6): 1002 - 1008.
- Kubik MY, Lytle LA, Hannan PJ, Perry CL, Story M (2003). The association of the school food environment with dietary behaviours of young adolescents. **American Journal of Public Health** 93: 1168-1173.
- Labadarios (2008). National Food Consumption Survey – Fortification Baseline (NCFS-FB-South Africa: Executive Summary. **South African Journal of Clinical Nutrition** 21: Suppl. 2: 247–300.
- Lissau I, Poulsen J (2005). Nutrition policy, food and drinks at school and after school care. **International Journal of Obesity** 29: S58-61.
- Owen S, Shickler P, Davies J (1997). Food choice: how to assess attitudes of pre-adolescent children. **Nutrition and Food Science** 1: 5-11.
- Rebok G, Riley A, Forrest C, Starfield B, Green B, Robertson J, Tambor E (2001). Elementary school-aged children's reports of their health: A cognitive interviewing study. **Quality of Life Research** 10: 59-70.
- Sapp SG, Jensen HH (1997). Reliability and validity of nutrition knowledge and diet-health awareness tests developed from the 1989 - 1991 diet and health knowledge Surveys. **Journal of Nutrition Education** 29(2): 63 - 72.
- Story M (2009). The third school nutrition dietary assessment study: Findings and policy implications for improving the health of US children. **Journal of the American Dietetic Association** 109 (Suppl. 1): S7-S13.
- Temple NJ, Steyn NP, Myburgh NG, Nel JH (2006). Food items consumed by students attending schools in different socioeconomic status areas in Cape Town, South Africa. **Nutrition** 22: 252-258.

Turconi G, Celsa M, Rezzani C, Biino G, Sartirana MA, Roggi C (2003). Reliability of a dietary questionnaire on food habits, eating behaviour and nutritional knowledge of adolescents. **European Journal of Clinical Nutrition** 57: 753-763.

World Health Organisation (2010) Childhood overweight and obesity. <http://www.who.int/dietphysicalactivity/childhood/en/>, (date accessed 5/01/2010).

World Health Organization (2011). Growth reference data for 5 – 19 years. http://www.who.int/growthref/growthref_who_bull/en, (date accessed 9/05/2011).

CHAPTER 2: REVIEW OF THE RELATED LITERATURE

This chapter will review studies that have been conducted regarding the factors contributing to childhood overweight and obesity at the school setting. The first section will introduce the background to childhood overweight and obesity including the prevalence in South Africa. This will be followed by the aetiology of childhood overweight and obesity, including the school setting as a contributing factor and the factors affecting the eating behaviour of children. The second section will look at the purchasing practices of the food and beverages available at school and include studies conducted on the food and beverages consumed at school, the factors influencing the purchase of these items as well as studies surrounding levels of knowledge of school children. This will be concluded by a section that summarises the review.

2.1 Background to the childhood overweight and obesity problem

2.1.1 The prevalence of childhood overweight and obesity in South Africa

The development of overweight and obesity is an enormous challenge facing children today. While the prevalence has increased more rapidly in developed countries, children living in developing countries are not immune (Wang & Lobstein 2006). In South Africa, undernutrition and overnutrition exist simultaneously (du Toit & van der Merwe 2003). It is therefore important to understand the prevalence of childhood overweight and obesity in South Africa.

Table 2.1 presents the prevalence of childhood overweight and obesity in South African children since 1999. It should be noted that the most recent studies used age specific WHO z-scores to categorise the overweight and obese subjects, whilst studies before 2010 used adult BMI cut off points. Combined, overweight and obesity range from 7.9% in one province (Kruger, Kruger & MacIntyre 2005) to 17.3% in South Africa (Armstrong, Lambert, Sharwood & Lambert 2006), with Armstrong *et al* (2006) having the largest sample population (n = 10195). Armstrong *et al* (2006) suggested their findings reflected international childhood overweight and obesity trends from ten years ago where American overweight rates ranged from 22.1% for males and 22.4 % for females, and obesity rates ranged from 7.0% for males and 8.2% for females.

Table 2.1: Studies showing the prevalence of childhood overweight and obesity in South Africa

	Sample Size (n)	Age Range (years)	Overweight (%)	Obesity (%)	Overweight & Obesity combined (%)
HealthKick Abrahams <i>et al</i> (2011) [#]	717	10-12	14.3	6.7	21.0
Oldewage-Theron & Egal (2010) [#]	142	9-13	12.0	2.8	14.8
THUSA BANA Kruger <i>et al</i> (2005) [*]	1257	10-15	6.3	1.6	7.9
NFCS[^]: 2005 Steyn <i>et al</i> (2005) [*]	2469	1-9	10	4	14
Health of the Nation: 2001-2004 Armstrong <i>et al</i> (2006) [*]	10 195	6-13	13.9	3.5	17.3
NFCS[^]: 1999 Labadarios <i>et al</i> (2005) [*]	2200	1-9	12	5	17.0

[#]WHO age specific z-scores used [^]National Food Consumption Survey (NFCS)

^{*}Adult BMI cut off points used

An increasing prevalence of childhood overweight and obesity in South Africa is of great concern. It is therefore important to understand the aetiology of this problem, in order to understand what has caused the increasing prevalence.

2.1.2 The aetiology of childhood overweight and obesity

The causes of childhood overweight and obesity are multifaceted (Harrison, Bost, McBride, Donovan, Grigsby-Toussaint, Kim, Liechty, Wiley, Teran-Garcia & Costa Jacobsohn 2011). Primarily, consuming macronutrients in excess results in weight gain (Collins, Watson & Burrows 2010, Collison, Zaidi, Subhani, Al-Rubeaan, Shoukri & Al-Mohanna 2010). However, there are many factors that influence excess macronutrient consumption. Figure 2.1 presents an ecological model of the aetiology of childhood overweight and obesity, demonstrating that a child's weight is influenced by their "behaviour", which is in turn influenced by their "parenting,

feeding and parent characteristics”, which is in turn influenced by their “community and demographic factors”(after Birch & Ventura 2009).

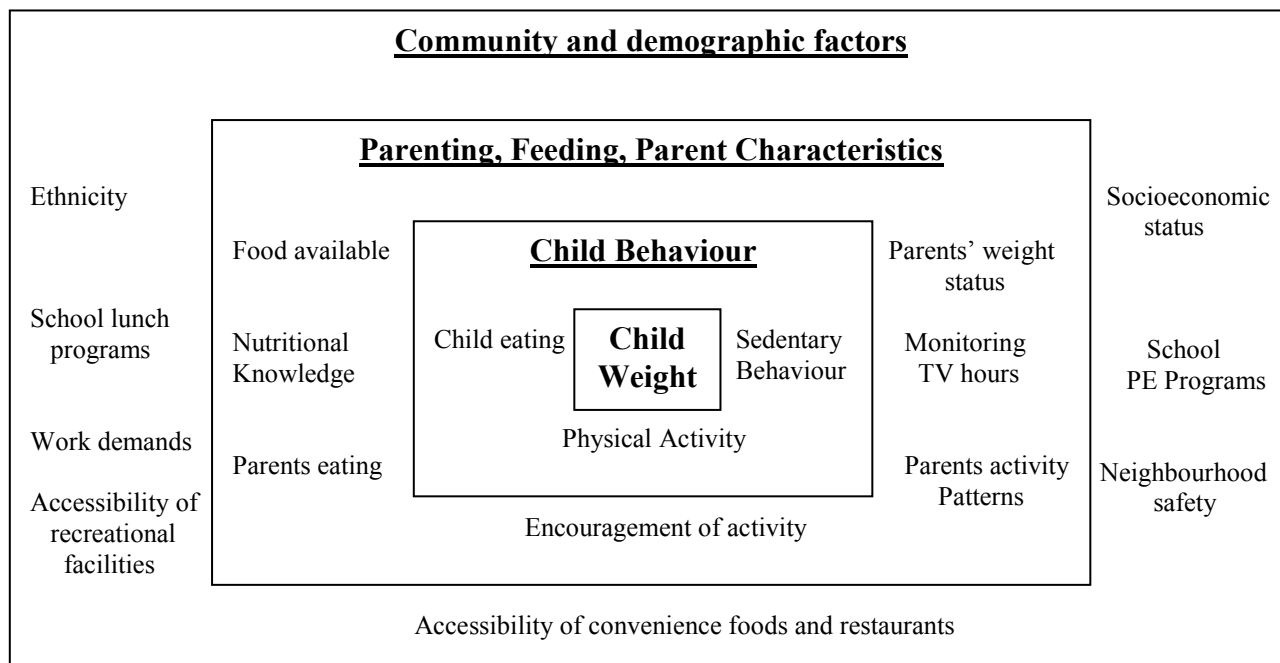


Figure 2.1: An ecological model of the aetiology of childhood overweight and obesity (after Birch & Ventura 2009)

Harrison *et al* (2011) further expands the aetiology of childhood overweight and obesity to include a “Six-C model” that comprises:

1. Cell – “the child’s genetic and biological characteristics”
2. Child – “the child’s characteristics”
3. Clan – “the familial characteristics”
4. Community – “the local community and organisational characteristics”
5. Country – “the state and national characteristics”
6. Culture – “the cultural and societal characteristics”

These levels are further incorporated into zones including: “nutrition related opportunities and resources, activity-related opportunities and resources, nutrition-related practices, activity-related

practices and personal and relational attributes”. Successful intervention studies need to take into account all of these levels.

Lloyd, Logan, Greaves and Wyatt (2011) and Davidson (2007) propose that the causes of childhood obesity may be contentious due to the complexity in measuring all the “determinants”. Lloyd *et al* (2011) further state that the poor research design and reporting of school-based intervention studies have resulted in minimal confirmation that school-based intervention programmes are successful. It is suggested that successful overweight and obesity prevention strategies should target “the child, their family as well as the school environment”.

Whilst all the factors mentioned in this section are pivotal in influencing the development of childhood overweight and obesity, this study and literature review will only be focusing on the food and beverages available at school and the factors affecting the selection of these items.

2.1.3 The classification of healthy and unhealthy food

Kibblewhite, Bowker and Jenkins (2010) state that “a healthy, balanced and nutritious diet for children and young people is essential for normal growth and development”. It is therefore important to determine what food and beverages comprise the healthy and unhealthy categories.

A South African study by Temple, Steyn, Myburgh & Nel (2006) investigating food items consumed by adolescent learners defined “unhealthy foods” as those containing an elevated fat, added sugar and sodium content, poor nutrient density as well as low amounts of dietary fibre. The United States Food and Drug Administration (FDA) have defined a “healthy” food as having:

- Low fat (3g or less per 100g, <30% total calories);
- Low saturated fat (1g or less per 100g, <10%total calories);
- Restricted sodium (\leq 480mg per serving);
- Restricted cholesterol (\leq 90 mg per serving);
- Minimum 10% of Vitamin A, C, calcium, iron, protein or fibre per serving (FDA 2003).

American researchers Lucan, Karpyn and Sherman (2010) further define healthy food as those containing fruits and vegetables and wholegrain products. Conversely, unhealthy food contains elevated total fat, sodium and refined sugar contents, such as processed foods including “salty” and sweet snacks.

In their study investigating the contents of vending machines in Wales, Kibblewhite *et al* (2010) used the following classifications to define healthy and unhealthy food and beverages:

- Healthy food: “dried or fresh fruit, sandwiches, baguettes, filled rolls, bread sticks, yoghurts, salads, pasta mixes, crackers and cheese, jacket potato”
- Unhealthy food: “chocolate bars, cereal bars, crisps, pies, pasties, pizza”
- Healthy beverages: “semi-skimmed milk, flavoured milk, pure fruit juice, fruit smoothies, plain still or sparkling water”
- Unhealthy beverages: “fizzy carbonated drinks, sweetened fruit flavoured drinks, flavoured water, sports drinks, sweetened juice-based drinks”

Consuming unhealthy food and beverages in excess may lead to the development of overweight and obesity. It is therefore important to determine the presence and availability of these items at primary school tuck shops.

2.1.4 The school setting as a contributing factor to childhood overweight and obesity

Children spend a large portion of their day at school (Story 2009, Kubick, Lytle & Story 2005, Worsley 2005), where their dietary intake is greatly impacted by the food and beverages accessible to them (Story 2009, Kubick *et al* 2005). The concern however, is not the accessibility of these items, but rather their composition – which may be of poor nutritional quality and contain a high fat and or sugar content (Naidoo, Coopoo, Lambert & Draper 2009, Kubik *et al* 2005, Weschler, Devereaux, Davis & Collins 2000).

Developed countries have a variety of school feeding options including vending machines, a la carte school meals and school stores (Kubik *et al* 2005). In South Africa, school meals are generally provided to poorly resourced schools as part of a national school-feeding program. The

schools with greater resources have tuck shops that have food and beverages available for learners to purchase. Children attending these schools are also expected to bring their own lunch to school.

School management may have an influential responsibility in preventing childhood overweight and obesity through the items that they choose to make available for sale and or consumption. This is especially important where the food and beverages sold at school are used as a fund-raising opportunity to generate profits (Dorfman & Wallack 2007). Dorfman and Wallack (2007) state that learners should not be tasked with the “responsibility” of contributing to the generation of school funds by purchasing unhealthy food and beverages.

Determining the food and beverages that are both available and consumed at school is therefore of great importance (Story 2009). The availability of unhealthy energy dense food choices may tempt learners into making unhealthy purchases. An excess energy intake of these items may then result in weight gain that could ultimately lead to childhood overweight and obesity (St-Onge, Keller & Heymsfield 2003, Birch & Fisher 1998). Understanding the factors that influence a child’s eating behaviour therefore, is imperative.

2.1.5 Factors affecting the eating behaviour of children

A child’s eating behaviour is influenced by a number of interrelated factors including physical environmental influences, macrosystem influences, social environmental influences and individual influences (Story, Kaphingst, Robinson-O’Brien & Glanz 2008, Story, Neumark-Sztainer & French 2002, Kraak & Pelletier 1998, Owen et al 1997).

2.1.5.1 Physical environmental influences

These influences include the availability and accessibility of food in school, fast food outlets, vending machines and convenience store environments (Story et al 2002). Grocery stores and supermarkets have a large influence on the food that will be eaten at home (Story et al 2008).

2.1.5.2 Macrosystem influences

These influences include the child as a consumer, along with the media and advertising related to food and eating (Story et al 2008, Birch & Fisher 1998). Television may have an important influence on a child's eating behaviour, in that repeated exposure to adverts marketing energy dense, poor nutritional quality items may result in a preference for these items (Birch & Fisher 1998).

2.1.5.3 Social environmental influences

These include the influences that the family and household have in terms of their demographic and cultural characteristics, family meals with parents and siblings as well as household food security including food availability, affordability and access (Story et al 2008, Patrick & Nicklas 2005, Birch & Fisher 1998). Friends and peers are also social environmental influences (Story et al 2002). Parents and siblings may have an important influence on the developing the eating behaviour of the child (Story et al 2008, Birch & Fisher 1998). Parenting practices and restrictions of certain foods may result in the child developing an increased preference for these items (Story et al 2008).

2.1.5.4 Individual influences

These include psychosocial influences such as food preferences, taste and sensory perception, health and nutrition, meanings of food, “self-efficacy” and nutritional knowledge; biological influences such as hunger and gender; and lifestyle influences such as time and convenience, cost, meal patterns and dieting (Story et al 2002; Birch & Fischer 1998). Opinions surrounding food choice are established during childhood and will continue to influence lifelong eating behaviour (Kraak & Pelletier 1998, Owen et al 1997). Birch and Fischer (1998) state that continual exposure to energy dense foods may predispose a child's liking of these foods through “associative conditioning”.

Children are faced with purchasing decisions from an early age (Kraak & Pelletier 1998) and are able to exercise a greater variety of choice regarding the portion size or quantity of the food and beverages that they purchase. (Gidding, Dennison, Birch, Daniels, Gilman, Lichtenstein, Rattay, Steinberger, Stettler & Van Horn 2005). Many of these purchasing and eating decisions may take place without parental supervision. It is therefore important that their ability to make a healthy purchase is well established because an inadequate ability will lead to poor purchasing decisions during adulthood that may in turn be passed on to their offspring (Kraak & Pelletier 1998).

In order to determine the influence that food and beverage purchases made at school have on the development of childhood overweight and obesity, it is important to determine the items available at school for learners to purchase, the purchasing practices of learners as well as their nutrition knowledge levels to determine if this has an impact on their food and beverage purchases.

2.2 The purchasing practices surrounding the food and beverages available at school

2.2.1 The food and beverages consumed at school

The school food environment plays an important role in “influencing” a child’s diet (Kubik *et al* 2005). This section will cover studies regarding school food policies, food items brought from home and the nutritional quality of foods available at school. Table 2.2 presents studies that have investigated these items. Some of these studies will be discussed in section 2.2.2 and 2.2.3 as their objectives overlap with those of this section.

2.2.1.1 School food policy

Having a school food policy implies that school management is taking an active role in regulating the food and beverages available for sale. Vereecken, Bobelijn and Maes (2005), Lissau and Poulsen (2005) and Carter and Swinburn (2004) conducted studies surrounding school food policies. Vereecken *et al* (2005) found that Belgium primary schools were more likely to have a policy and least likely to have vending machines (9%) and a school store (5%), compared to high schools who were least likely to have a policy and most likely to have vending

machines (80%) and school stores (27%). Lissau and Poulsen (2005) and Carter and Swinburn (2004) found very few of the schools in their sample had a food policy at all. Just over one third (37%) of Carter and Swinburn's (2004) New Zealand sample and more than half (57%) of Lissau and Poulsen's (2005) Danish sample relied on profits from their food stands which may have had an impact on the scarcity of food policies.

In an intervention study where a nutrition policy was introduced that removed tuck shop items from stock, South African researchers Naidoo *et al* (2009) found that the gradual removal of unhealthy tuck shop items, did not result in the loss of tuck shop revenue or customers and had a greater acceptance by learners, according to reports from the school management. This study only used four schools as part of a purposive sample and was an empirical pilot study. Learner's BMIs were not measured to determine the influence of the tuck shop intervention on weight status. The intervention was measured after six months and it would have been interesting to note what effect a longer intervention would have had, considering the seasonality of certain unhealthy items which may be more popular depending on the season, such as iced lollies during the summer months.

Jaime and Lock (2009) conducted an international review of 27 studies investigating the effectiveness of school food policies in reducing childhood overweight and obesity. These researchers found that while some food policies were effective in reducing the consumption of unhealthy items, there was little evidence of the long term effects on the learners' BMI. Wolff and Dansinger (2008) came to similar conclusions regarding the debate concerning the role that sugar-sweetened beverages have in the development of weight gain leading to overweight and obesity, stating that the main reason for the debate is the magnitude (too small) and length (too short) of the clinical interventions that have been previously conducted surrounding this topic.

Table 2.2: Studies related to the nutritional composition and “inventory” of food and beverages available at school

Researcher	Main Objective	Sample	Research Tool	Outcome
Abrahams <i>et al</i> (2011) South Africa	Identify and describe factors associated with tuck shop use and lunchbox behaviours	8 schools, 717 grade 4 learners aged 10-12.	Questionnaire, unquantified 24 hour recall.	Less than 70% of learners brought food from home to eat at school. Learners who brought a lunch box had significantly lower BMIs, consumed more regular meals and had a greater dietary diversity.
Bevans <i>et al</i> (2010) United States	Evaluate the contributions that school lunch programs have on eating behaviour.	12 elementary and 10 middle schools, 2039 learners in grades 5 - 8, 22 food service managers	Semi-structured interviews with food service managers, student reports on program participation and eating behaviour.	Students who frequently purchased unhealthy items had a poorer eating behaviour, whereas students who infrequently used the program purchased healthier items.
Weber & Morais (2010) Brazil	Assess the nutritional quality of prepared foods available to primary school children.	One private and one public primary school.	Chemical analyses of 4 weeks of food.	Private schools provided significantly higher amounts of energy, protein, lipid, sodium and iron contents compared to the public schools.
Condon <i>et al</i> (2009) United States	Examine the food and beverages offered in the school meal programs	School Nutrition Dietary Assessment Study. 2314 learners from grades 1–12 and Food Service Managers used.	School menu surveys, 24 hour dietary recalls.	Learners taking part in the school lunch and breakfast program received a more nutritious meal (milk, fruit, vegetables) compared to those that did not.
Naidoo <i>et al</i> (2009) South Africa	Determine the impact of a primary school based nutrition and physical intervention	4 primary schools, 4 principals, 10 teachers, 256 learners in grade 6	Learner questionnaire, fitness tests, observation of physical activity during lunch break; semi-structured interview with principals and selected teachers.	Gradual changes in improving the nutritional quality of tuck shop stock did not impact profits. The intervention improved the intake of water and healthier purchases. Learners continued to purchase tuck shop items when unhealthy stock was removed.
Gould <i>et al</i> (2006) England	Determine whether school lunch selections met nutritional standards.	74 children aged 11-12 years from three schools	Indirect weighing method of menu composition and 5 day dietary intake.	The poorer schools provided the poorest nutritional quality foods. Children from poorer areas made the poorest nutritional choices.
Temple <i>et al</i> (2006) South Africa	Investigate the food consumption patterns of adolescents attending schools in different socioeconomic levels	14 schools, 476 students from grades 7 and 10	Questionnaire	Nearly 80% of learners consumed food at school – most of this purchased from the school tuck shop. Unhealthy foods brought to school outnumbered healthy items by 2:1. Knowledge scores were unrelated to tuck shop purchases.

Table 2.2 continued....

Researcher	Main Objective	Sample	Research Tool	Outcome
Finch <i>et al</i> (2006) Australia	Identify sources of foods eaten at school, types of foods and frequencies of canteen purchases and association with socioeconomic and weight status.	16 primary schools, 5206 students from grade 1-6.	School Eating Habits and Lifestyle Survey questionnaire	Ninety six percent of children brought food from home to eat at school but 95% also used the canteen to make purchases, commonly of unhealthy foods and beverages.
Vereecken <i>et al</i> (2005) Belgium – Flanders	Assess the food items available at primary and secondary schools and determine the influence that school policy and socioeconomic status had on purchases	197 schools, 16560 learners and 247 school principals	School questionnaire, survey, questionnaire for principals.	Primary schools were more likely to have rules regarding school shop and vending machine use, then secondary schools. Fresh fruit was not widely available. Learners from lower socioeconomic schools purchased higher amounts of carbonated beverages, sweets and crisps.
Lissau & Poulsen (2005) Denmark	Describe the food and drinks available at food stands during school and after school care institutions	70 schools and 66 aftercare institutions	Self-administered postal questionnaire	Only 3% of schools and 4% of aftercare institutions had food policies. Most schools ran the food stand for profit; however stock of carbonated beverages and sweets was rare.
Sanigorski <i>et al</i> (2005) Australia	Identify the main food and beverages consumed at school including the canteen and food brought from home.	1681 children aged 5–12 years	School food checklist and scales to weigh and measure food and beverage items.	Most food and beverages consumed at school were of low nutritional value and high in sugar, fat and salt. Lunch boxes contained “excessive” amounts of energy dense items cakes, sweet spreads and dessert items.
Cleland <i>et al</i> (2004) Australia	Describe the foods purchased from canteens and perceptions regarding these canteens.	12 primary schools, 384 children aged 9-12, 404 parents and 41 teachers	Self-completed questionnaires	School canteens were used regularly with unhealthy items (hot chips, pies and pastries) most commonly purchased. Knowledge of healthy items did not result in healthy purchases. Teachers placed greater emphasis on the role that canteen purchases had on eating behaviour
Carter & Swinburn (2004) New Zealand	Identify and measure the obesogenic elements of the school food environment and canteen sales of energy dense food and beverage items.	200 primary and 26 secondary schools,	School Environment Questionnaire	Foods Half of the sample relied on profits from the canteen. Less than one fifth of the schools had a policy regarding food. Pies, juice and sausage rolls were most popular.

2.2.1.2 Food brought from home

Studies surrounding food brought from home to eat at school were conducted in South Africa by Abrahams, de Villiers, Steyn, Fourie, Dalais, Hill, Draper and Lambert (2011) and Temple et al (2006), and in Australia by Finch, Sutherland, Harrison and Collins (2006) and Sanigorski, Bell, Kremer and Swinburn (2005). Results showed that most children brought food from home yet also purchased food and beverage items at school (Finch et al 2006, Temple et al 2006). Temple et al (2006) and Sanigorski et al (2005) found that the children in their sample predominantly brought unhealthy, energy dense, micronutrient poor items to school including sweets and snacks. Finch et al (2006) who had the greatest number of children in their sample, found that food and beverages brought from home were the greatest source of dietary intake at school. While 96% of their subjects brought food from home, only 5% of their subjects reported never using the canteen. This indicated that most children supplemented their food brought from home with canteen purchases.

While Temple et al's (2006) study provided insight into South African tuck shops, their study focused on adolescent learners attending high school. Abrahams et al (2011) on the other hand provided insight into the primary school setting using a large sample size, however only considered those children from poorly resourced schools.

2.2.1.3 Nutritional quality of food and beverages available at school

Bevans, Sanchez, Tenerall & Forrest (2010), Temple et al (2006), Finch et al (2006), Gould, Russell and Barker (2006) and Sanigorski et al (2005) all found food and beverages of poor nutritional quality available at their schools. Just under half the sample in Temple et al's (2006) South African study bought potato crisps (46.3%) and sweets (46.0%) from their tuck shop. Healthy items including fruit and fruit juice were purchased by a very small portion of the sample (11.8% and 10.7% respectively). In terms of energy consumed at school, Sanigorski et al (2005) found that their Australian sample consumed around 3000kJ at school with their male subjects consuming slightly more than the female subjects (3154.1kJ and 3021kJ respectively) indicating that the male subjects were purchasing more energy dense food items. While Finch et

al (2006) had the greatest sample size (n =5206), Gould et al (2006) had the smallest sample size (n = 74).

2.2.2 Factors influencing the purchase of food and beverages at school

This section will cover the perceptions and preferences for purchasing unhealthy versus healthy foods, as well as the influence that socioeconomic status has on food and beverages purchased and consumed at school. Table 2.3 presents the factors influencing the purchase and consumption of food and beverage items at school.

2.2.2.1 Perceptions and preferences for purchasing unhealthy versus healthy food

Children generally purchase unhealthy items at school with pies and pastries being most popular and commonly purchased (Finch et al 2006, Temple et al 2006, Carter & Swinburn 2004, Cleland, Worsley & Crawford 2004). In Carter and Swinburn's (2004) sample, for every sale of a healthy item, two unhealthy items were sold. Temple et al (2006) found that 70% of their subjects had no healthy items amongst their tuck shop purchases. Bevans et al (2010) reported that the children in their American sample, who frequently purchased unhealthy items, had a poorer eating behaviour compared to those who infrequently purchased food and beverages from school. This suggests that learners who purchase from the tuck shop more often are likely to buy unhealthy items.

Most children are able to distinguish between a healthy and unhealthy food item. Yet despite knowing the consequences of unhealthy dietary behaviour, children generally prefer to purchase and consume unhealthy items (Warren, Parry, Lynch & Murphy 2008, Temple et al 2006, Hesketh, Waters, Green, Salmon & Williams 2005, Cleland et al 2004, Noble, Corney, Eves, Kipps & Lumbers 2000). Sensory characteristics including flavour, aroma and visual appeal were the most influential factors affecting a school food purchase in Wales (Dammann & Smith 2010). The perceived taste of healthy items appears to be a huge negative influence on the purchase of these items as found in Northern Ireland (McKinley, Lowis, Robson, Wallace, Morrissey, Moran & Livingstone 2005). Both Damman and Smith (2010) and McKinley et al (2005) however, only made use of a small sample size of less than 100 children.

Table 2.3: Outcomes of the studies regarding the factors influencing the consumption of food and beverage items at school

Researcher	Main Objective	Sample	Research Tool	Outcome
Damman <i>et al</i> (2010) United States	Explore the food-related attitudes and beliefs of low income children	92 children aged 9-13 years	Focus groups	Over half the sample was overweight or obese. Children preferred school feeding opportunities that allowed “unlimited quantities of their favourite food item”.
Warren <i>et al</i> (2008) Wales	Examine children’s perceptions of food and food-related behaviour	96 children from grade 3 (7-8 years) and grade 5 (10-11 years)	Focus groups	All children preferred unhealthy items despite knowing the negative health effects of consuming these items.
Hesketh <i>et al</i> (2005) Australia	Determine parent and child views regarding social and environmental barriers to healthy eating and physical activity and obesity prevention programs	119 children from grade 2 (7-8 years) and grade 5 (10-11 years), 17 parents	Semi-structured focus groups	Despite being aware of healthy food and food-related behaviour, actual food related behaviour was inversely related to this awareness.
McKinley <i>et al</i> (2005) Northern Ireland	Gain insight into children’s views regarding food and nutrition	106 children aged 11-12 years	Focus groups	Healthy eating was associated with salads, fruit and vegetables. Children were able to identify healthier cooking methods and behaviour. The perceived taste of healthier food was the greatest barrier to its consumption. “The barriers to healthy eating outweighed the benefits or motivation”.
Noble <i>et al</i> (2000) England	Determine primary schoolchildren’s perceptions of the healthiness of foods and the nutritional implication of food choices	14 schools, 123 children aged 9-11 years	Food photographs	Children had a clear “perception” of the healthy foods. A strong inverse relationship existed between the healthiness of a food and the child’s preference for this item.

2.2.2.2 Socioeconomic status

Studies that included socioeconomic status, found that where food was provided by the school, the socioeconomic status of the school directly influenced the nutritional quality of the items sold (Gould *et al* 2006, Vereecken *et al* 2005), with the poorer schools providing the poorer quality food and beverage items (Gould *et al* 2006). Sanigorski *et al* (2005) found the children from lower socioeconomic levels in their Australian study consumed more energy dense foods and carbonated beverages and less fruit, compared to children from higher socioeconomic levels. Interestingly Australian researchers Finch *et al* (2006) found that a higher socioeconomic status significantly affected having ever used the school canteen in their study. Children from the lower socioeconomic levels were more likely to purchase items for lunch compared to other breaks. This could be explained by the fact that children from higher socioeconomic levels are more likely to bring food from home to eat at school, as found in South Africa by Temple *et al* (2006). One should however consider that the socioeconomic levels measured in Australia and South Africa would have been different considering that Australia is a developed country while South Africa has characteristics of both a developed and developing country.

2.2.3 Levels of nutrition knowledge of learners

The studies investigating nutrition knowledge on its own are presented in Table 2.4. However other researchers investigated this as part of their objectives (Abrahams *et al* 2011, Warren *et al* 2008, Temple *et al* 2006, Hesketh *et al* 2005, Cleland *et al* 2004, Noble *et al* 2000), as presented in Table 2.2 and Table 2.3.

The studies of Abrahams *et al* (2011) and Oldewage-Theron & Egal (2010) are among the few that looked at nutrition knowledge levels of school children in South Africa. The advantage of both of these studies is that they assessed knowledge of the South African Food Based Dietary Guidelines (FBDG). Oldewage-Theron & Egal (2010) found average knowledge levels. Abrahams *et al* (2011) used multiple correspondence analyses on the knowledge scores together with nutritional self-efficacy and standard of living measures. Results showed that learner's who brought food from home, had a significantly higher standard of living as well as a higher nutrition knowledge score. Self efficacy was positively associated with better nutritional quality lunch boxes, however the self efficacy score was not validated indicating that this association should be interpreted with caution.

Knowledge levels of children from younger grades in Pirouzina's (2001) American sample had no correlation with the food choices that were made. Interestingly whilst levels of knowledge deteriorated amongst older grades, the nutritional quality of food choices improved. These findings however contradict those of German researchers Reinehr, Kersting, Chahda and Andler (2003) who found that increasing age correlated significantly with greater nutrition knowledge levels.

Table 2.4: Studies related to the nutrition knowledge of children

Researcher	Main Objective	Sample	Research Tool	Outcome
Oldewage-Theron & Egal (2010)	Determine the nutritional status of primary school children	142 children aged 9-13 years	Questionnaire	Average nutrition knowledge levels were revealed, indicating that improved nutrition education programmes are required.
Reinehr et al (2003) Germany	Determine the nutritional knowledge of obese compared to non obese children.	274 children aged 8-15 years	Questionnaire	BMI and gender had no significant correlation to knowledge; however age and type of school correlated significantly with nutritional knowledge.
Pirouzina (2001) United States	Determine the association between nutrition knowledge and eating behaviour	532 adolescents aged 11-13 years	Questionnaire	No correlation between nutrition knowledge and food choices in youngest children, however this improved in older grades.

2.3 Summary

The review of the literature in this chapter has focused on the background to childhood overweight and obesity, the determinants of eating behaviour, the food and beverages available at the school setting and the factors influencing the purchase of these items, as contributing factors to the development of childhood overweight and obesity. While the causes of childhood overweight and obesity are multifactorial, the food and beverages available at school, along with the child's purchasing practices may contribute to its development.

The food and beverages purchased and consumed at school are influenced by a number of determinants including the physical environment influences, macrosystem influences, social environment influences as well as individual influences. In light of the above findings, there is

currently a lack of knowledge regarding the school feeding setting of well resourced schools in South Africa.

Based on the theory regarding the factors influencing eating behaviour from section 2.1.5, and the review of the literature in section 2.2, this study used the model in Figure 2.2 to test the contribution that school tuck shops, along with the purchasing practices of learners, made towards childhood overweight and obesity in Grade 4 learners attending selected primary schools in Pietermaritzburg.

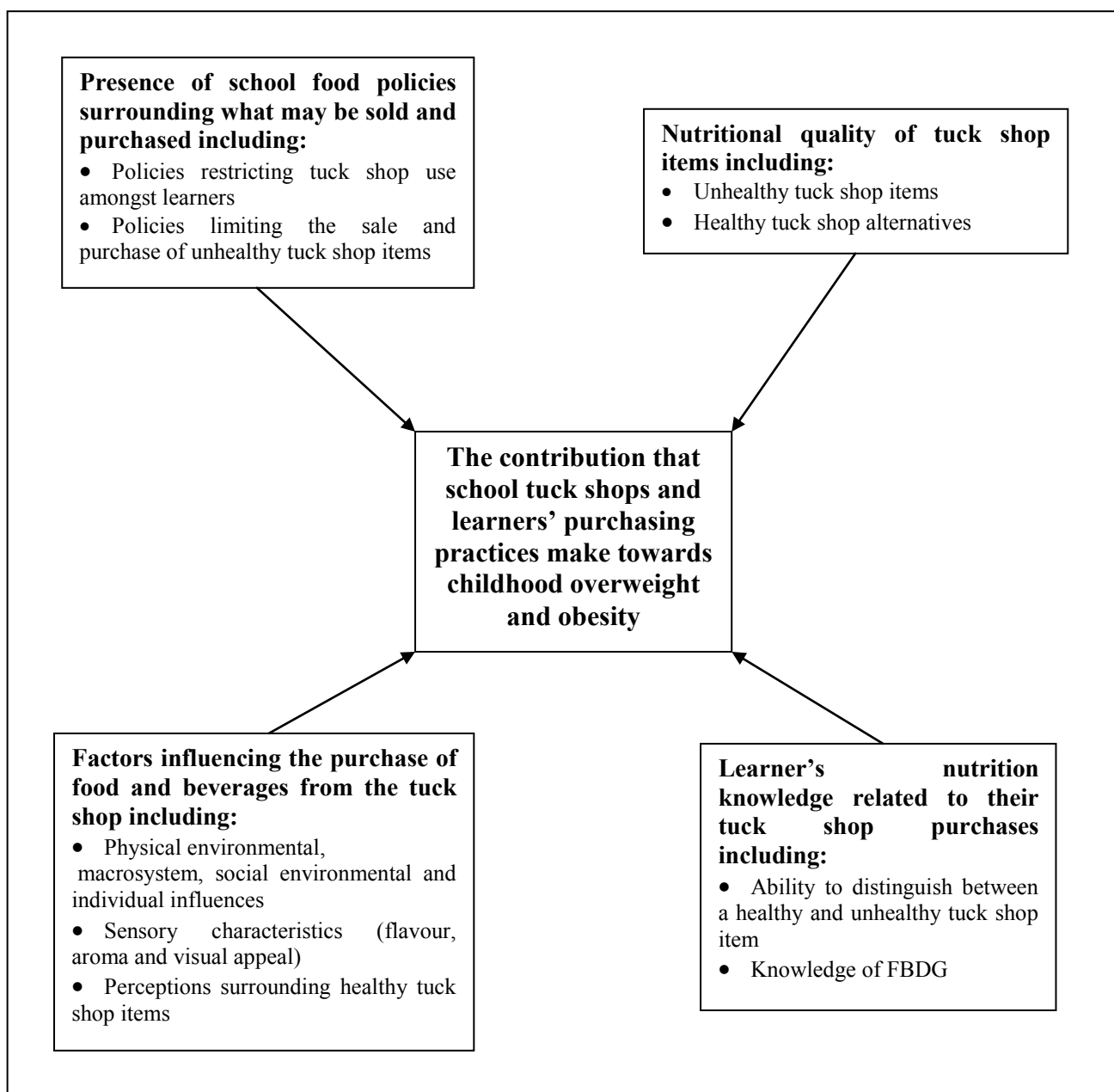


Figure 2.2: Factors influencing the development of childhood overweight and obesity to be tested in this study

This chapter has provided the basis for the next in which the nutritional quality of the food and beverages sold to learners is determined.

References

- Abrahams Z, de Villiers A, Steyn NP, Fourie J, Dalais L, Hill J, Draper CE, Lambert EV (2011). What's in the lunchbox? Dietary behaviour of learners from disadvantaged schools in the Western Cape, South Africa. **Public Health Nutrition** doi:10.1017/S1368980011001108.
- Armstrong MEG, Lambert MI, Sharwood KA, Lambert EV (2006). Obesity and overweight in South African primary school children – the Health of the Nation Study. **South African Medical Journal** 96(5): 439-444.
- Bevans KB, Sanchez B, Tenerall R, Forrest CB (2010). Children's eating behaviour: the importance of nutrition standards for foods in schools. **Journal of School Health** 81: 424-429.
- Birch LL, Fisher JO (1998). Development of eating behaviours among children and adolescents. **Pediatrics** 101: 539-549.
- Birch LL, Ventura AK (2009). Preventing childhood obesity: what works? **International Journal of Obesity** 33: S74-S81.
- Carter MA, Swinburn B (2004). Measuring the 'obesogenic' food environment in New Zealand primary schools. **Health Promotion International** 19(1): 15-20.
- Cleland V, Worsley A, Crawford D (2004). What are grade 5 and 6 children buying from school canteens and what do parents and teachers think about it? **Nutrition & Dietetics** 61: 145-150.
- Collins CE, Watson J, Burrows (2010). Measuring dietary intake in children and adolescents in the context of overweight and obesity. **International Journal of Obesity** 34: 1103-1115.

- Collison KS, Zaidi MZ, Subhani SN, Al-Rubeaan K, Shoukri M, Al-Mohanna FA (2010). Sugar-sweetened carbonated beverage consumption correlates with BMI, waist circumference, and poor dietary choices in school children. **Biomed Central Public Health** 10:234 available at <http://www.biomedcentral.com/1471-2458/10/234>.
- Condon EM, Crepinsek MK, Fox M (2009). School meals: types of foods offered to and consumed by children at lunch and breakfast. **Journal of the American Dietetic Association** 109: S67-S78.
- Dammann K, Smith C (2010). Food-related attitudes and behaviours at home, school and restaurants: perspectives from racially diverse, urban low-income 9- to 13-year old children in Minnesota. **Journal of Nutrition Education and Behaviour** 42: 389-397.
- Davidson F (2007). Childhood obesity prevention and physical activity in schools. **Health Education** 107(4):377-395.
- Dorfman L, Wallack L (2007). Moving nutrition upstream: the case for reframing obesity. **Journal of Nutrition Education and Behaviour** 39: S45-S50.
- Du Toit G, van der Merwe MT (2003). The epidemic of childhood obesity. **South African Medical Journal** 93(1): 49-50.
- Finch M, Sutherland R, Harrison M, Collins C (2006). Canteen purchasing practices of year 1-6 primary school children and association with SES and weight status. **Australian and New Zealand Journal of Public Health** 30(3): 247-251.
- Food and Drug Administration (2003). Claims that can be made for conventional foods and dietary supplements. <http://www.fda.gov/food/labellingnutrition/labelclaims/ucm111447.htm>, (date accessed 18/01/2010).
- Gidding SS, Dennison BA, Birch LL, Daniels SR, Gilman MW, Lichtenstein AH, Rattay KT, Steinberger J, Stettler N, Van Horn L (2005). Dietary recommendations for children and adolescents: a guide for practitioners: a consensus statement from the American Heart Association. **Circulation** 112: 2061-2075.

- Gould E, Russell J, Barker ME (2006). School lunch menus and 11 to 12 year old children's food choice in three secondary schools in England – are the nutritional standards being met? **Appetite** 46: 86-92.
- Harrison K, Bost KK, McBride BA, Donovan SM, Grigsby-Toussaint DS, Kim J, Liechty JM, Wiley A, Teran-Garcia M, Costa Jacobsohn G (2011). Toward a developmental conceptualisation of contributors to overweight and obesity in childhood: the Six-Cs model. **Child Development Perspectives** 5(1): 50-58.
- Hesketh K, Waters E, Green J, Salmon L, Williams J (2005). Healthy eating, activity and obesity prevention: a qualitative study of parent and child perceptions in Australia. **Health Promotion International** 20(1): 19-26.
- Jaime PC, Lock K (2009). Do school based food and nutrition policies improve diet and reduce obesity? **Preventive Medicine** 48: 45-53.
- Kibblewhite S, Bowker S, Jenkins HR (2010). Vending machines in hospitals – are they healthy? **Nutrition & Food Science** 40(1): 26-28.
- Kraak V, Pelletier D (1998). The influence of commercialism on the food purchasing behaviour of children and teenage youth. **Family Economics and Nutrition Review** 11(3): 15-24.
- Kruger R, Kruger HS, MacIntyre UE (2005). The determinants of overweight and obesity among 10- to 15- year-old schoolchildren in the North West Province, South Africa – the THUSA BANA (Transition and Health during Urbanisation of South Africans; BANA, children) study. **Public Health Nutrition** 9(3): 351 – 358.
- Kubick MY, Lytle LA, Story M (2005). Soft drinks, candy and fast food: what parents and teachers think about the middle school food environment. **Journal of the American Dietetic Association** 105(2): 233-239.
- Labadarios D, Steyn NP, Maunder E, MacIntyre U, Gericke G, Swart R, Huskisson J, Dannhauser A, Vorster HH, Nesmvuni AE, Nel JH. The National Food Consumption Survey (NFCS): South Africa, 1999 (2005). **Public Health Nutrition** 8(5): 533-543.

- Lissau I, Poulsen J (2005). Nutrition policy, food and drinks at school and after school care. **International Journal of Obesity** 29: S58-S61.
- Lloyd JL, Logan S, Graeves CJ, Wyatt KM (2011). Evidence, theory and context – using intervention mapping to develop a school-based intervention to prevent obesity. **International Journal of Behavioural Nutrition and Physical Activity** <http://www.ijbnpa.org/content/8/1/73/>, (date accessed 11/11/2011).
- Lucan SC, Karpyn A, Sherman S (2010). Storing empty calories and chronic disease risk: snack-food products, nutritive content, and manufacturers in Philadelphia corner stores. **Journal of Urban Health: Bulletin of the New York Academy of Medicine** 87(3): 394-409.
- McKinley MC, Lowis C, Robson PJ, Wallace JMW, Morrissey M, Moran A, Livingstone MBE (2005). It's good to talk: children's views on food and nutrition. **European Journal of Clinical Nutrition** 59: 542-551.
- Naidoo R, Coopoo Y, Lambert EV, Draper C (2009). Impact of a primary school-based nutrition and physical activity intervention on learners in KwaZulu-Natal, South Africa: a pilot study. **South African Journal of Sports Medicine** 21(1): 7-12.
- Noble C, Corney M, Eves A, Kipps M, Lumbers M (2000). Food choice and school meals: primary schoolchildren's perceptions of the healthiness of foods and the nutritional implications of food choices. **Hospitality Management** 19: 413-432.
- Oldewage-Theron WH, Egal AA (2010). Nutrition knowledge and nutritional status of primary school children in QwaQwa. **South African Journal of Clinical Nutrition** 23(3): 149-154.
- Owen S, Schickler P, Davies J (1997). Food choice: how to assess attitudes of pre-adolescent children. **Nutrition & Food Science** 1: 5-11.
- Patrick H, Nicklas TA (2005). A review of family and social determinants of children's eating patterns and diet quality. **Journal of the American College of Nutrition** 24(2): 83-92.

- Pirouzina M (2001). The association between nutrition knowledge and eating behaviour in male in female adolescents in the US. **International Journal of Food Sciences and Nutrition** 52: 127-132.
- Reinehr T, Kersting M, Chahda C, Andler W (2003). Nutritional knowledge of obese compared to non obese children. **Nutrition Research** 23: 645-649.
- Sanigorski AM, Bell AC, Kremer PJ, Swinburn BA (2005). Lunchbox contents of Australian school children: room for improvement. **European Journal of Clinical Nutrition** 59: 1310-1316.
- St-Onge MP, Keller KL, Heymsfield SB (2003). Changes in childhood food consumption patterns: a cause for concern in light of increasing body weights. **American Journal of Clinical Nutrition** 78: 1068-1073.
- Steyn NP, Labadarios D, Maunder E, Nel J, Lombard C (2005). Secondary anthropometric data analysis of the national food consumption survey in South Africa: The double burden. **Nutrition** 21:4-13.
- Story M, Neumark-Sztainer D, French S (2002). Individual and environmental influences on adolescent eating behaviours. **Journal of the American Dietetic Association** 102(3): S40-S51.
- Story M, Kaphingst KM, Robinson-O'Brien R, Glanz K (2008). Creating healthy food and eating environments: policy and environmental approaches. **Annual Reviews Public Health** 29: 253-272.
- Story M (2009). The third School Nutrition Dietary Assessment study: findings and policy implications for improving the health of US children. **Journal of the American Dietetic Association** Suppl1 109(2): S7-S13.
- Temple NJ, Steyn NP, Myburgh NG, Nel JH (2006). Food items consumed by students attending schools in different socioeconomic status areas in Cape Town, South Africa. **Nutrition** 22: 252-258.

- Vereecken CA, Bobelijn K, Maes L (2005). School food policy at primary and secondary schools in Belgium-Flanders: does it influence young people's food habits? **European Journal of Clinical Nutrition** 59: 271-277.
- Wang Y, Lobstein T (2006). Worldwide trends in childhood overweight and obesity. **International Journal of Pediatric Obesity** 1: 11-25.
- Warren E, Parry O, Lynch R, Murphy S (2008). 'If I don't like it then I can choose what I want': Welsh school children's accounts of preference for and control over food choice. **Health Promotion International** 23(2): 144-151
- Weber ML, Morais TB (2010). Nutritional composition, assessed by chemical analyses, of prepared foods available for primary-school children: a comparison of public and private schools. **Public Health Nutrition** doi:10.1017/S1368980010000534.
- Weschler H, Devereaux RS, Davis M, Collins J (2000). Using the school environment to promote physical activity and healthy eating. **Preventive Medicine** 31: S121-S137.
- Wolff E, Dansinger ML (2008). Soft drinks and weight gain: how strong is the link? **Medscape Journal of Medicine** 10(8):189-197.
- Worsley A (2005). Children's healthful eating: from research to practice. **Food and Nutrition Bulletin** 26(2)Suppl2: S135-S143.

CHAPTER 3: The variety, popularity and nutritional quality of the food and beverages sold to Grade 4 learners ²

3.1 Introduction

Resource rich schools have a designated tuck shop where learners are likely to purchase either a “complete” lunch option or food and beverage items to supplement what was brought from home. Some schools provide learners daily with two opportunities – during their first and second break, respectively – to purchase food and beverages. While some tuck shops are used as a fundraising opportunity, others may be outsourced to “for-profit” private individuals. A poor food choice of one meal during the day may not necessarily lead towards childhood obesity. Yet, it is important to acknowledge that most children buy from tuck shops almost daily. It is therefore, important to identify the food that these children purchase, as well as the nutritional quality of the food and beverages at their disposal (Story 2009).

Understanding the food choices that learner’s make is important because it is one of the few opportunities where the learner is able to exercise his/her own choice of food and beverages, assuming they are not preparing their own food at home. Those learners who are frequent customers – with at least three visits to the tuck shop per week (Finch 2010), that make poor food and beverage choices, may be at risk of becoming overweight. There is currently great concern amongst health professionals, public health advocates, educators and politicians regarding the food and beverages obtainable in schools (Kubik *et al* 2003). Along with providing adequate nutrition education, the WHO recommends that schools serve food that meets specified nutrient standards and sells healthy choices including water, milk, juice, fruit and vegetables, sandwiches and low fat snacks (WHO 2010).

South Africa currently makes use of the Dietary Reference Intakes (DRI) to estimate recommended nutrient intakes. Within the DRI, the acceptable macronutrient distribution ranges for children aged 4 -18 years include:

- Carbohydrate intake of 45 to 65 percent of the total energy intake
- Protein intake of 10 to 30 percent of the total energy intake
- Total fat intake between 25 and 35 percent of the total energy intake

² This chapter was published as Wiles NL, Green JM, Feldman FJ (2011). The variety, popularity and nutritional quality of tuck shop items available for sale to primary school learners in Pietermaritzburg, South Africa. *S Af J Clin Nutr* 24(3):129-135. Appendix H, p152.

- Total fibre intake of 26 grams per day for females and 31 grams per day for males aged 9 to 13 years (International Expert Meeting, 2009)

Poor quality fats in the diet may increase the risk of both coronary heart disease and coronary heart events (International Expert Meeting 2009). Both saturated fat and trans fatty acids, may not only increase the risk of coronary heart disease but may also increase the risk of diabetes. Improving the quality of dietary fat intake, by substituting saturated fat intake with both monounsaturated and polyunsaturated fats, has been found to decrease the risk of coronary heart disease. It is therefore further recommended that from age two onwards, within the dietary fat intake, saturated fat should be limited to less than 10% of the total energy, while polyunsaturated fats should contribute to between 6 and 10% of the total intake, with monounsaturated fats making up the remainder. Trans fats should comprise less than 1% of the total energy intake (International Expert Meeting 2009).

The purpose of this chapter was to determine the following:

- Do primary schools provide learners and/ or tuck shop owners with any recommendations or guidelines pertaining to the quality of food sold and bought at the shop?
- What food and beverage items are available for purchase at primary school tuck shops and are popular amongst learners?
- Do the tuck shops offer learners a healthy alternative for their lunch meal?

3.2. Research design

This study employed a cross-sectional research design, where a survey questionnaire was used in a structured interview to interview eleven tuck shop managers on site (Appendix E, p132). A structured interview makes use of a set number of questions and predetermined responses (Cohen, Manion & Morrison 2005, p271; Britten 1995). This method facilitates data analysis and allows comparison between responses. However, a limitation of this method is that the categories may restrict and dilute a greater range of the respondent's opinions (Cohen, et al 2005, p271).

Administering a structured questionnaire during a face-to-face interview has the advantage of the interviewer being able to establish a relationship with the respondent (Leedy & Ormrod

2001, p196). The interviewer may also explain any questions that the respondent may be unsure about. The disadvantage of this method is the fact that greater amounts of time are required; making it impractical when surveying large numbers of respondents (Leedy & Ormrod 2001, p196). It is also important that the interviewer does not influence the interviewee's response through the tone in which the question is asked or wording in which the question is phrased (Goddard & Mellville 2001, p49).

3.3 Methodology

3.3.1 Sample selection

From the 303 government schools in the Umgungundlovu District, 11 primary school tuck shops in Pietermaritzburg, KwaZulu-Natal were chosen on the basis that they had learners from all race groups (Black, Coloured, Indian and White) and were classified as Quintile 5 – meaning the bulk of the school's funding was generated from school fees as opposed to a Quintile 1 school who received all of their funding from the government. The researcher chose Quintile 5 schools expecting that these schools had greater access to resources and as a result their tuck shops would accommodate a greater variety of stock, including “healthy” and “unhealthy” food items³. It was also expected that the learners at these schools would have more money to spend.

3.3.2 Research instruments

The first part of the questionnaire addressed the tuck shop manager's awareness regarding official school recommendations on tuck shop use, the second part obtained information regarding the variety of food and beverages available for sale, while the third part addressed the popularity of these items. Measuring cups and spoons were used to quantify the measurement of ingredients used for items made on site.

The same researcher completed all eleven interviews to ensure consistent recording of portion sizes and food and beverage items. The questionnaire was standardised using one of the participating schools.

³ For the purpose of this study, “healthy” and “unhealthy” food and beverages will follow the definitions in Chapter 1, p6.

3.3.3. Data analysis

All items available at tuck shops were classified into beverages, snack items, sweets and chocolates or lunch categories. It should be noted that while “lunch” was intended to refer to what the learner would have chosen as a main meal option, many of the items listed in the lunch category were available for learners to purchase during both school breaks. The nutritional analyses of tuck shop items were conducted using the MRC Foodfinder 3 program and where specific items such as beverages were not found, the nutrition information on the food label of the product was used. Descriptive analyses were conducted using the Statistical Package SPSS (version 15.0, SPSS Inc, Chicago IL, USA).

3.4 Results

Out of the 33 Quintile 5 primary schools in Pietermaritzburg, only eleven had learners of all race groups. All eleven of these schools participated in this study. The schools were located in various suburban areas of Pietermaritzburg. The most common period that the tuck shop was open was the first and second break only (45.5%, n = 5), followed by both breaks and after school (18.2%, n = 2). Ten out of the eleven schools (90.9%) ran their tuck shops from Monday to Friday. The remaining tuck shop was only open once a week, on a Friday and for one break only because the school closed early. This particular tuck shop was managed by school staff and only stocked sweets, crisps and carbonated beverages. Overall, the most popular day of the week for tuck shop purchases was Friday (54.5%, n = 6) followed by the parents payday (27.3%, n = 3) and then Monday (18.2%, n = 2).

3.4.1 School recommendations regarding tuck shop stock and use by learners

The person/s managing the tuck shop as well as the amount of input the tuck shop manager had regarding the type of products that were stocked, is presented in Table 3.1. Nine of the eleven tuck shops (81.8%) were privately managed. One of the schools that had no input regarding what was stocked had been restricted to selling “sweets and treats” only on Friday mornings. One tuck shop manager had to have all of her food and beverage choices approved by the school’s Occupational Therapist. This tuck shop manager had also been instructed to cut down on the amount of loose sweets, and limit crisps to lightly salted varieties. Another was permitted to stock any item provided it came with a label that included the product’s nutrition information.

Table 3.1: Management of the tuck shop and amount of input tuck shop managers had regarding the products that were stocked

	Tuck Shop Management							
	Management		Manager's input regarding products that were stocked					
	n	%	Full		Partial		School input only	
n			%	n	%	N	%	
Privately Managed School	9	81.8	5	45.5	1	9.1	3	27.3
Managed	2	18.2	0	0.0	0	0.0	2	18.2

Two of the eleven schools (18.2%) had recommendations regarding the maximum amount of money that learners were allowed to spend during each visit to the tuck shop. One of the schools had a R10 limit, while the second school restricted their junior primary learners to spending a maximum of R5 on their “sweets and treats” day. Six (54.5%) of the schools restricted the breaks within which specific grades of learners could purchase tuck shop items. Most of the break restrictions pertained to junior primary members and included either limiting their tuck shop purchasing to once a week (18.2%, n = 2), or prohibiting them from purchasing any sweets, chips and fizzy drinks (18.2%, n = 2). This implies that most senior primary learners, including those from Grade 4, had full access to the tuck shop and no restrictions on what they were allowed to purchase.

3.4.2 Variety of tuck shop items available for sale

The variety of tuck shop items, along with the average number of units sold per day, price range and average price per item, are presented in Table 3.2. This information was based on each tuck shop manager's estimation. Only those items that were stocked by at least two schools (n = 18.2%) are shown in this table. It can be seen that frozen popsicles were sold at almost every school, were the cheapest beverage with an average cost of R1.55⁴ and sold the most number of units (40.7 units per day) when compared to all other available beverages. Flavoured milks at an average cost of R6.50, sold the least number of units per day (1.5). Amongst the snack items, the small packets of corn crisps were the cheapest at an average cost of R1.19 and sold the most number of units per day (68.8 units per day). Although reasonably priced compared to other snack items (R1.75), bananas were only stocked by two schools (18.2%) and sold the least number of units per day (2.5). Savoury pies had the most

⁴ At the time of submission R1 was equivalent to US\$0.13, £0.08 and €0.09 (X-rates.com 2011)

number of units (43) sold per day by eight of the schools (72.7%), while salads were the most expensive lunch item at an average cost of R10.75 per day and selling an average of three units a day by only two schools (18.2%).

Table 3.2: Variety of tuck shop items available for sale

Tuck shop categories		Serving Size	Number of tuck shops that stocked these items	Percent	Average number of units sold per day*	Price range of item (range)	Average price per item
Beverages	Frozen popsicles	70g	10	90.9	40.7	R1.00-R2.50	R1.55
	Assorted cans	330ml	10	90.9	15.7	R6.00-R8.00	R6.45
	Powerade	500ml	9	81.8	4.8	R7.00-R9.00	R8.00
	Still water	500ml	8	72.7	4.4	R4.00-R6.00	R5.07
	Flavoured water	500ml	8	72.7	11.4	R6.00-R7.00	R6.36
	Sugar free cans	330ml	8	72.7	4.3	R5.50-R8.00	R6.50
	Fruit juice canned	330ml	6	54.5	3.5	R6.00-R7.00	R6.50
	Mixed fruit blend	250ml	4	36.4	12.7	R2.50-R7.50	R4.83
	Flavoured milk	275ml	2	18.2	1.5	R6.00-R7.00	R6.50
Snack items	Potato crisps	30g	10	90.9	18.8	R2.50-R4.00	R3.30
	Popcorn	500ml	9	81.8	30.2	R2.00-R7.00	R3.50
	Small corn crisps	20g	8	72.7	68.8	R0.50-R2.50	R1.19
	Samoosas	75g	4	36.4	46.5	R2.00-R3.00	R2.75
	Peanuts & raisins	32g	5	45.5	4.3	R2.00-R3.00	R2.50
	Samoosas	75g	4	36.4	46.5	R2.00-R3.00	R2.75
	Doughnut	45g	3	27.3	38.7	R3.00-R4.00	R3.33
	Corn crisps	30g	3	27.3	12.7	R2.00-R4.00	R3.00
	Peanuts	32g	3	27.3	5.0	R2.00	R2.00
	Chocolate muffin	48g	2	18.2	22.0	R2.00-R4.50	R3.25
	Packet of biscuits	33g	2	18.2	11.0	R2.50-R4.50	R3.50
	Dried fruit stick	25g	2	18.2	8.0	R2.50	R2.50
	Crunchies (homemade)	25g	2	18.2	4.0	R4.00	R4.00
	Health muffins	48g	2	18.2	18.0	R3.00-R4.00	R3.50
	Pretzels	25g	2	18.2	12.5	R1.00-R1.50	R1.25
	Bananas	75g	2	18.2	2.5	R1.50-R2.00	R1.75
	Fruit salad	375ml	2	18.2	3.5	R5.00-R6.00	R5.75
	Jelly & custard	250ml	2	18.2	12.5	R4.00-R6.00	R5.00
	Yoghurt	100g	2	18.2	3.5	R2.50	R2.50
	Sweets & Chocolates	Packet of sweets	75g	9	81.8	23.8	R1.50-R4.50
Chocolate (mini size)		23g	7	63.6	27.2	R2.50-R3.50	R3.07
Chocolate (normal size)		48g	7	63.6	7.0	R3.50-R7.00	R6.00
Suckers		13g	6	54.5	15.0	R0.50-R1.50	R1.00
Muesli energy bar		45g	6	54.0	6.0	R4.00-R6.00	R5.33
Lunch items	Pies	170g	8	72.7	43.0	R7.00-R10.00	R8.06
	Hot dogs	1 each	7	63.6	22.4	R5.00-R8.00	R5.71
	Assorted	1 each	5	45.5	11.0	R6.00-R10.00	R9.00
	Salad rolls						
	Toasted sandwich	1 each	5	45.5	17.4	R6.00-R11.00	R7.90
	Pizza	80g	5	45.5	6.3	R7.50-R8.00	R7.83
	Beef burger	1 each	4	36.4	15.4	R7.00-R12.00	R9.40
	Hot chips	250g	4	36.4	22.5	R4.00	R4.00
	Sausage rolls	165g	3	27.3	26.0	R4.50-R9.00	R7.17
	Salads	1 each	2	18.2	3.0	R6.50-R15.00	R10.75

*Only the schools that stocked these items were included in the calculation to determine the average units sold per day

3.4.3 Popularity of learners as tuck shop customers and tuck shop items available for sale

All tuck shop managers confirmed that the bulk of their customers purchased tuck shop items frequently - that is they made purchases at least three times a week. Tuck shop managers were asked whether these learners were purchasing single items or meal combinations - for example a beverage and something to eat. Seven (63.6%) tuck shop managers thought that their learners were purchasing meal combinations followed by three (27.3%) who thought the learners purchased single items, and one (9.1%) who felt that half the learners purchased single items and half purchased meal combinations. Grade 7 learners were the most popular customers for five (45.5%) tuck shop managers, followed by senior primary school learners (grade 4 to 7) being the most popular customers for two tuck shop managers (18.2%).

The modal amount of money spent at both first and second break was R5.00 (30%, n = 3) for first break and (50%, n = 3) for second break. The mean amount of money spent at first break was R7.09, while at second break it was R9.14. A t-test for equality of means showed that there was no significant difference between the amount spent at first and second break ($p = 0.444$).

The most popular items sold at first and second break are presented in Figure 3.2 and 3.3, respectively. Both figures show that savoury pies were the most popular amongst all learners for both first and second break (45%, n = 5 and 27.3%, n = 3). During first break pies were ranked the first and third most popular item. This can be explained by the fact that the learners who chose pies as their third most popular item would have selected a variety of other items as more popular. The most popular beverage amongst learners was Coca Cola (45.5%, n = 5), followed by assorted cans (54.5%, n = 6) and then Fanta (27.3%, n = 3).

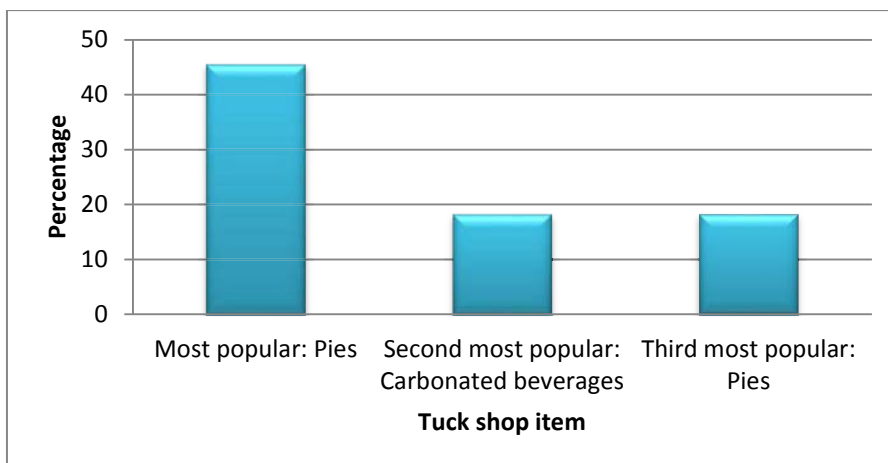


Figure 3.1: Most popular first break items according to tuck shop managers

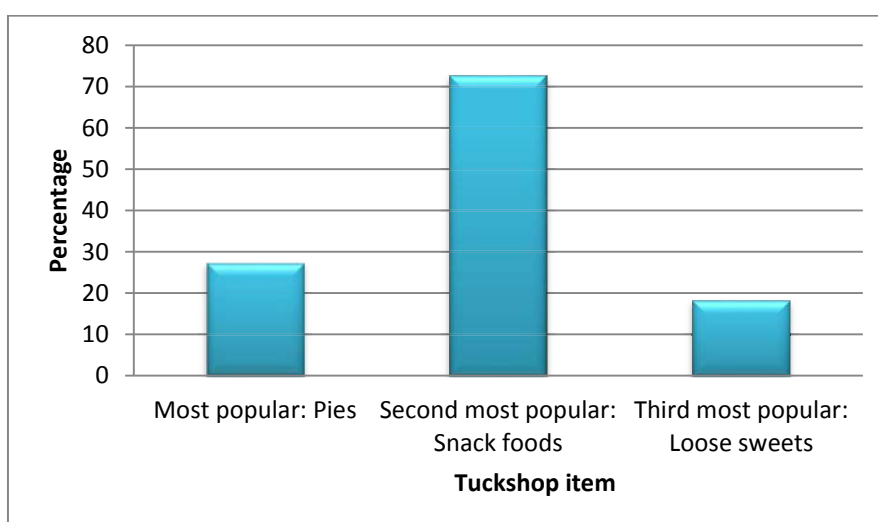


Figure 3.2: Most popular second break items according to tuck shop managers

3.4.4 Nutritional quality of tuck shop items

All items in Table 3.2 were further categorised based on what the FDA had classified as healthy (FDA 2003) (Table 3.3) and Temple *et al.* (2006) as unhealthy (Table 3.4). These categories which focus on the total and saturated fat contents of a food item are also in line with the South African recommended dietary goals for fat (International Expert Meeting 2009).

It should be noted that although there is not enough nutrition information to categorise them, both still and flavoured water have been included in the “healthy” table because they do not fit into the “unhealthy” category based on their nutritional composition. When comparing the

ratio of “healthy” to “unhealthy” items in this study, for every “healthy” beverage (n = 3) there are two “unhealthy” beverages (n = 6); while for every “healthy” snack (n = 5), there are 3.4 “unhealthy” snacks (17). This latter ratio was calculated including the sweets and chocolates offered at the school tuck shops.

If one were to compare likely meal combinations from the tuck shop stock - a “healthy” combination consisting of a health muffin, yoghurt, fruit and canned fruit beverage would provide 2073kJ of energy, 5.7g of total fat and 8.3g of added sugar. An “unhealthy” combination on the other hand of a savoury pie and canned beverage would provide 2715kJ of energy, 31.5g of total fat and 34g of added sugar. The two items from the “unhealthy” option would cost R14.51, while the four items from the “healthy” option cost R14.25.

Table 3.3: The nutritional composition of “healthy” tuck shop items based on FDA (2003) classification

Tuck shop categories	Serving Size	Average kilojoules per serving	Protein (g)	Total Fat (g)	Saturated Fat (g)	Dietary Fibre (g)	Cholesterol (mg)	Added Sugar (g)	Sodium (mg)
Beverages									
Fruit juice, can	330ml	769	1.00	0.3	0.00	0.3	0	0.0	7.0
Still water	500ml	0	*	*	*	*	*	*	*
Flavoured water	500ml	280	0.03	0.0	*	0.0	*	*	15.0
Snack items									
Dried fruit stick	25g	382	0.60	0.2	0.03	3.0	0	3.9	2.0
Health muffins	48g	642	3.70	3.7	0.00	4.1	28	8.3	370
Bananas	75g	287	1.00	0.2	0.09	1.3	0	0.0	1.0
Fruit salad	375ml	641	1.60	0.3	0.11	6.6	0	0.0	10.5
Yoghurt	100g	375	3.80	1.5	0.94	0.0	7	0.0	74.0

*Not specified on product label

Table 3.4: The nutritional composition of “unhealthy” items based on Temple et al (2006) classification

Tuck shop categories	Serving Size	Average kilojoules per serving	Protein (g)	Total Fat (g)	Saturated Fat (g)	Dietary Fibre (g)	Cholesterol (mg)	Added Sugar (g)	Sodium (mg)
Beverages									
Assorted cans	330ml	577.0	0.0	0.0	0.0	0.0	0.0	34.0	23
Sugar free cans	330ml	3.5	0.0	0.0	*	0.0	0.0	0.0	39
Frozen popsicle	70g	83.0	0.0	0.0	0.0	0.0	0.0	4.5	4
Flavoured milk	275ml	827.0	8.8	4.7	2.9	0.0	22.0	13.2	195
Mixed fruit blend	250ml	550.0	2.0	0.3	0.1	5.0	0.0	24.0	10
Powerade	500ml	645.0	0.0	0.0	*	0.0	*	*	120
Snack items									
Small corn crisps	20g	411.0	0.8	4.5	0.0	0.3	0.0	0.0	200
Corn crisps	30g	698.0	1.9	10.4	3.9	0.5	0.0	0.0	320
Potato crisps	30g	695.0	2.0	10.8	2.8	1.2	0.0	0.0	300
Doughnut	45g	780.5	2.5	8.9	1.4	1.3	9.5	7.9	91
Chocolate muffin	48g	710.0	2.5	5.9	1.4	0.5	28.0	15.3	116
Packet of biscuits	33g	672.0	1.6	6.2	3.5	0.4	17.0	13.7	74
Samoosas	75g	1694	3.1	36.8	4.8	1.6	9.0	0.6	87.5
Popcorn	500ml	633.0	3.1	7.0	1.1	3.8	0.0	0.0	621
Peanuts	32g	830.0	8.5	15.8	2.2	2.8	0.0	0.0	139
Peanuts & raisins	32g	635.0	4.7	8.0	1.1	2.1	0.0	0.0	72
Crunchies homemade	25g	519.0	1.1	6.5	4.0	1.0	12.0	8.1	48
Pretzels	25g	416.0	2.7	3.9	1.1	2.4	*	*	*
Jelly & custard	500ml	1786	14.5	8.3	3.6	0.0	200	62.7	150
Sweets & Chocolates									
Packet of sweets	75g	1202	0.0	0.6	0.5	0.0	0.0	69.1	17
Suckers	13g	512.0	0.0	0.3	0.2	0.0	0.0	29.4	7
Chocolate (normal size)	48g	1006	3.0	12.1	7.7	0.0	11.0	26.8	73
Chocolate (mini size)	23g	513.0	1.7	6.5	3.9	0.0	6.0	12.8	31
Lunch items									
Muesli energy bar	45g	912.0	3.0	11.6	*	1.8	*	*	112
Pies	170g	2138	15.1	31.5	13.1	2.5	60.0	0.0	757
Sausage rolls	165g	2739	16.2	48.3	17.9	2.3	96.0	0.0	1205
Toasted cheese	1 each	1808	19.1	25.4	11.7	2.9	65.0	0.0	671
Toasted cheese & tomato	1 each	1476	14.0	18.6	7.9	3.5	41.0	0.0	565
Toasted ham & cheese	1 each	1083	12.1	8.9	3.7	3.6	25.0	0.0	608
Toasted chicken mayo	1 each	1516	24.4	14.6	2.4	2.6	40.7	1.2	468
Hot dogs	1 each	805.0	7.9	8.8	0.4	0.9	0.0	0.0	756
Hot chips	250g	3193	10.8	37.0	4.7	8.8	0.0	0.0	495
Beef burger	1 each	1917	26.9	21.4	7.9	2.5	83.0	0.5	517
Pizza	80g	1226	13.8	15.5	*	0.1	*	66.8	*
Salad roll – chicken	1 each	2339	18.5	43.3	2.8	3.8	41.0	2.1	456
Salad roll – cheese	1 each	986.0	9.4	13.6	5.7	2.7	28.0	0.0	341
salad roll – ham	1 each	1264	12.1	15.6	4.4	3.3	26.0	0.6	775
Salads	245g	679.0	5.5	10.8	3.4	3.4	12.0	0.1	286

Table 3.5: The average nutritional composition of “healthy” and “unhealthy tuck shop items according to Temple *et al* (2006) and FDA (2003) classification

Tuck shop categories	Average kilojoules per serving	Protein (g)	Total Fat (g)	Saturated Fat (g)	Dietary Fibre (g)	Cholesterol (mg)	Added Sugar (g)	Sodium (mg)	Vit A RE (mcg)	Vit C (mg)	Iron (mg)	Calcium (mg)
“Healthy”												
Beverages	350	0.3	0.1	0.0	0.1	0.0	0.0	7.3	0.0	36.0	0.5	6.0
Snack items	465	2.1	1.2	0.2	3.0	7.0	2.4	91.5	59.2	48.0	0.8	52.1
“Unhealthy”												
Beverages	448	1.8	0.8	0.5	0.8	3.7	12.6	65.2	23.2	61.0	0.3	64.0
Snack items	806	3.8	10.2	2.4	1.4	21.2	8.3	170	15.1	1.7	0.6	35.3
Sweets & Chocolates	808	1.2	4.9	3.1	0.0	4.3	34.5	32	1.3	0.0	0.5	34.3
Lunch items	1605	14.0	20.6	5.7	3.0	34.5	4.8	534	113.0	7.3	1.3	128.0

Items in Tables 3.3 and 3.4 were further analysed to calculate the average nutritional composition of each category within the healthy and unhealthy options (Table 3.5). It can be seen that the average healthy snack contained just under half the kilojoules of its unhealthy counterpart (465kJ vs 806kJ), had only 1.2g of total fat compared to 10.2g and just over double the dietary fibre content (3g vs 1.4g). While the average healthy beverage is lower in kilojoules (350kJ vs 448kJ), it did not contain any added sugar or cholesterol and contained only 7.3mg of sodium, compared to the average unhealthy beverage that contained an average 12.6g of added sugar, 3.7g of cholesterol and 65.2mg of sodium.

The homemade salad rolls and salads had a nutritional composition that prevented them from being categorised as healthy items. On average, the salad roll's saturated fat content just exceeded the recommended limit of 10% (containing 11%); however the combined average total fat for all three rolls provided 60% of the total product's energy content. This is quite alarming considering that an average pie, which is an "unhealthy" choice, has a total fat content of 56%. The home made salads which contained either feta cheese or pecan nuts also contained a total fat content of 60%. Flavoured milk, while low in total fat content (22% of total energy), had a saturated fat content that just exceeded the recommended limit of 10% (13%).

3.5 Discussion

The purpose of this study was to investigate the variety, popularity and nutritional quality of the food and beverages available for sale to primary school learners, as well as school recommendations regarding tuck shop use and management thereof.

Fridays were most likely to be popular for learners to purchase tuck shop items. Two of the schools chose to limit their selling of "sweets and treats" to Fridays only. During preliminary interviews, the principals from both of these schools felt their learners were likely to have become overexcited and "hyped up" from the increased sugar intake. Interestingly, although sugar intake has long been perceived to influence hyperactivity, some researchers have not found enough evidence to support this relationship (Kim & Chang 2011; Wiles, Northstone, Emmet & Lewis 2009).

Learners from grade 7, being the most senior learners, were the most popular customers at the school tuck shop. Learners of this age group are likely to receive a larger amount of pocket money compared to the younger children and therefore are able to spend more often. School management should focus more attention on these learners to ensure they are purchasing food and beverages of a good nutrition quality.

3.5.1 School recommendations regarding tuck shops

Over 80% of the schools did not impose monetary restrictions at the tuck shop. It is therefore interesting to note that learners spent on average R5.00 at each break, because the implications of a lack of restriction could have resulted in the learners with large amounts of money having free reign on multiple unhealthy choices. Schools could implement restrictions with regards to the total amount of money a learner spends during a single visit to the tuck shop. Otherwise, tuck shops should be encouraged to restrict the amount of unhealthy items available for sale.

It was also interesting to note that over half of the schools imposed restrictions regarding when their Junior Primary members (Grade 3 and below) could visit the tuck shop. Along with a perceived influence of sugar on hyperactivity, potential reasons could include the principals of these young learners feeling that they did not have enough self control to restrict their purchases of unhealthy tuck shop items. Belgian researchers found that compared to secondary schools, the principals of primary schools were more likely to acknowledge the need for restricting the amounts of sweets and high-fat snacks sold/available to learners (Vereecken *et al* 2005).

3.5.2 Variety and popularity of food and beverages available for sale

This survey took place between April and May 2010 where the average maximum temperature in Pietermaritzburg was still fairly high (34°C and 32°C) (The Botanical Society of South Africa 2010). As a result the iced popsicles were extremely popular amongst the learners and because they were cheap, they sold the most number of units each day. On the other hand, flavoured milks containing a greater nutrient value sold the least number of units. Many of the tuck shop managers who chose not to stock flavoured milk justified their decision on the basis that when they had stocked these items, they had not been popular amongst the learners and had expired before being purchased. It should be noted that

Amalgamated Beverage Industries (ABI) distribute Coca Cola products and loan a special display fridge to each school on condition that only these products are displayed. Tuck shop managers confirmed that routine spot checks are carried out by ABI to ensure these conditions are being met. Coca Cola do not sell flavoured milks and so the two schools that stocked these items had a second fridge at the back of the tuck shop. This lack of visibility may have an important influence on the poor sales of these items. Tuck shop managers should be provided an opportunity to improve the display and promotion of other food and beverage items, especially when these are healthier.

Tuck shop managers felt that Coke was the most popular canned beverage amongst learners. Two schools stocked not only the 330ml can, but also a 500ml and even a 1 litre option. These larger volume items are of extreme concern because learners could consume the entire product and not have the knowledge or “discipline” to limit their consumption to a normal portion size. Many tuck shop managers claimed that because the small packets of corn crisps were so cheap, learners would buy more than one packet of these each break. This is in line with the fact that these items had the highest average number of units sold per day. Learners should be encouraged to limit the quantities of unhealthy items that they purchase to ensure that they are not consuming items in excess nor consuming multiple units of items purely because they are cheaper.

The cheapest “healthy” snack in this study was a banana, which was not popular amongst learners at all. Some of the tuck shop managers of the schools who chose not to stock fruit explained that when they had stocked fruit it had sat on the shelf and gone bad. It was also mentioned that many learners were already bringing fruit to school and therefore not likely to purchase it from the tuck shop. Other researchers have found that fruit sells poorly in schools for similar reasons (Vereecken *et al* 2005, Neumark-Sztainer, Story, Perry & Casey 1999). Neumark-Sztainer *et al* (1999) found that learners were least likely to choose fruit compared to “unhealthy” items on the basis that it was less practical to eat and deemed unpopular by peers.

3.5.3 Nutritional quality of tuck shop food and beverages

The apparently “healthier” food items – salad rolls and salads, were high in both total and saturated fat. These items were also more expensive and if learners would rather prioritize

value for money over health benefits they are unlikely to purchase these items. One would need to examine the contents; portion sizes and nutritional quality of the ingredients used in the salads and salad rolls and educate the tuck shop managers regarding healthier modifications: for example, the manager could reduce the portion size of pecan nuts and use a lower fat version of cheese. Furthermore, it was also disappointing that only two schools had salads for sale, regardless of the fact that it was summer. Some tuck shop managers chose not to make homemade items and rather purchased readymade items such as pies and pizzas from outsourced bakeries. For these tuck shop managers, making salads would have required time and a greater variety of ingredient purchases. These tuck shop managers would require extra motivation from the school principal to explain the necessity of preparing and stocking healthier products for sale to the learners.

Considering that only small amounts of these items were purchased each day, to make the home made “healthy” items worthwhile for the tuck shop managers, it is also important that the learners are encouraged to choose the lower fat options over the high fat food. In the United States, French, Story, Fulkerson and Hannan (2004) found that increasing the availability of low fat items in combination with learner based promotions, resulted in increased sales of these items. This could provide extra motivation for the tuck shop managers relying on the profits as their income.

The American researcher Story (2009) estimates that a child’s lunch meal should comprise 33% of their total energy intake, with breakfast and supper comprising 25% and 33%, respectively. The remaining 9% is what the author termed “discretionary calories” to be used throughout the day. The last School Nutrition and Dietary Assessment Study (SNDA-III) conducted in the United States between 2004 and 2005 revealed that students participating in the National School Lunch Program consumed more than 35% of their total daily intake from items consumed at school.

In the United Kingdom, a School Food Trust was established in 2008 with 14 nutrient-based standards derived from UK Dietary reference values, for which all food sold at schools was to be based (School Food Trust 2010). Minimum requirements were established for energy, protein, carbohydrates, iron, zinc, calcium, folate, vitamin A and C, and fibre. Maximum levels were set for total fat, saturated fat, non-milk extrinsic sugars (added sugar) as well as

sodium. Compared to the United States, the British are slightly more conservative with their energy estimates and stipulate that an average primary school lunch should provide 30% of the total daily energy requirement. This is on average around 2215kJ for primary school aged children. The School Food Trust further stipulates that not more than:

- 11% (15.5g) of the total energy should come from added sugars,
- 35% (20.6g) from total fat and
- 11% from saturated fat (6.5g).

The Food Based Dietary Guidelines and dietary goals in South Africa do not specify “meal values”, so if one were to compare this study’s meal combinations to the energy stipulated from both the UK and US, the unhealthy meal example of a pie and canned beverage combination exceeded all amounts, while the healthy meal example of the muffin, yoghurt, fruit and canned juice is lower in all categories.

3.5.4 Barriers to stocking “healthy” items

The tuck shop manager who was only allowed to sell “sweets and treats” on Friday’s was fairly despondent regarding her profits and felt that she was not receiving a lot of business on the basis that learners were already bringing “healthy” food from home during the week. Several tuck shop managers reiterated this sentiment when explaining their reasons for not stocking items such as fruit and yoghurt. Many felt that learners saw the tuck shop as an opportunity to buy treats to supplement the “healthy” lunch box items they were already bringing from home. If this is true, it is encouraging to know parents are playing an active role in promoting a healthy lifestyle for their children. However, based on the fact that many children are purchasing meal combinations, one could assume there are many children who don’t come to school with ready-made healthy snacks and lunches. These children, if fortunate enough, will receive money to buy all food and beverages for their school day from the tuck shop.

Many tuck shop managers perceive that it is more costly to sell healthier items. Just over half the schools were stocking canned fruit beverages with the remaining tuck shop managers complaining that purchasing canned fruit beverages was more costly than purchasing regular carbonated cans. Interestingly, one tuck shop manager refused to stock bottled water on the basis that learners could obtain water for free from the school tap. Tuck shop facilities may

play an additional important role regarding what is available for sale to the learners. In the case of beverages, because of the ABI restriction, it is necessary for schools to invest in alternative refrigeration units to ensure that a variety of healthier beverages can be made available to learners.

3.6 Conclusion

The present study indicates that school tuck shops in Pietermaritzburg sell products to children that encourage an unhealthy lifestyle and may therefore be playing a role in promoting an early onset of obesity. Based on these findings, successful preventative strategies should focus on the following:

- 1) Restricting the amount of unhealthy items available for purchase;
- 2) Increasing the promotion of a healthy lifestyle amongst school children thereby emphasizing the importance of purchasing healthier tuck shop items;
- 3) Educating tuck shop managers regarding the appropriate quality and quantity of ingredients used in the preparation of homemade tuck shop items;
- 4) Overcoming any negative attitudes and barriers that prevent tuck shop managers from making and selling healthy items, especially in the case of those who have full control over what is sold.

References

- Britten N (1995). Qualitative interviews in medical research. **British Medical Journal** 311: 251-253.
- Cohen L, Manion L, Morrison K (2005). **Research Methods in Education, 5th ed.** RoutledgeFalmer: London.
- Food and Drug Administration (2003). Claims that can be made for conventional foods and dietary supplements. <http://www.fda.gov/food/labellingnutrition/labelclaims/ucm111447.htm>, (date accessed 18/01/2010).
- French SA, Story M, Fulkerson JA, Hannan P (2004). An environmental intervention to promote lower-fat food choices in secondary schools: Outcomes of the TACOS study. **American Journal of Public Health** 94(9): 1507-1512.

- Goddard W, Melville S (2001). **Research Methodology: An Introduction, 2nd ed.** Landsowne: Juta.
- International Expert Meeting (2009). Adapted summary statement of the International Expert Meeting: Health Significance of Fat Quality of the Diet. International Union of Nutritional Sciences and World Heart Federation, Cape Town, South Africa.
- Kim Y, Chang H (2011). Correlation between attention deficit hyperactivity diagnosis and sugar consumption, quality of diet, and diet behaviour in school children. **Nutrition Research and Practice** 5(3): 236-245.
- Kubik MY, Lytle LA, Hannan PJ, Perry CL, Story M (2003). The association of the school food environment with dietary behaviours of young adolescents. **American Journal of Public Health** 93:1168-1173.
- Leedy PD, Ormrod JE (2001). **Practical Research: Planning and Design, 7th ed.** New Jersey: Prentice Hall.
- Neumark-Sztainer D, Story M, Perry C, Casey MA (1999). Factors influencing food choices of adolescents: findings from focus-group discussions with adolescents. **Journal of the American Dietetic Association** 99: 929-937.
- School Food Trust (2010). School Food Trust: Eat Better Do Better. <http://www.schoolfoodtrust.gov.uk>, (date accessed 11/07/2011).
- Story M (2009). The third school nutrition dietary assessment study: Findings and policy implications for improving the health of US children. **Journal of the American Dietetic Association** 109: Suppl. 1, S7-S13.
- Temple NJ, Steyn NP, Myburgh NG, Nel JH (2006). Food items consumed by students attending schools in different socioeconomic areas in Cape Town, South Africa. **Nutrition** 2: 252-258.
- The Botanical Society of South Africa (2010). KwaZulu-Natal Inland branch Newsletter July 2010, 3:2010.

Vereecken CA, Bobelijn, Maes L (2005). School food policy at primary and secondary schools in Belgium-Flanders: Does it influence young people's food habits? **European Journal of Clinical Nutrition** 59: 271-277.

Wiles NJ, Northstone K, Emmet P, Lewis G (2009). "Junk food" diet and childhood behavioural problems: Results from the ALSPAC cohort. **European Journal of Clinical Nutrition** 63(4): 491-498.

World Health Organisation (2010). Childhood overweight and obesity. <http://www.who.int/dietphysicalactivity/childhood/en/>, (date accessed 05/01/2010).

X-rates.com. Currency Calculator. <http://www.x-rates.com/calculator.html>, (date accessed 10/10/2011).

CHAPTER 4: The anthropometric and socio-demographic characteristics, and levels of nutrition knowledge of Grade 4 learners related to tuck shop purchasing practices.

4.1 Introduction

South Africa currently has a population of about 50 million people, 10% of whom are under the age of 14 years (Stats SA 2011). These children, who come from households across the Living Standards Measure (LSM) segments, may be at risk of becoming either underweight or overweight and obese (Abrahams et al 2011; Cassim 2010; du Toit & van der Merwe 2003).

The International Association for the Study of Obesity (IASO) estimates that more than 200 million children attending school are overweight (IASO 2011). The consequences of the current childhood obesity “epidemic” will continue through to adulthood, requiring lifelong medical treatment (Lobstein, Baur & Uauy 2004). The IASO (2011) further reports that “This generation of obese children will have a shorter lifespan than their parents”. This may be further exacerbated in developing countries that may not be able to afford the extensive health care expense, resulting in an even further reduction in life span (Lobstein et al 2004).

Du Toit and van der Merwe (2003) state that “A passive approach towards the obesity epidemic can no longer be tolerated”. There are several health consequences of childhood overweight and obesity, including cardiovascular disease, hyperinsulinaemia, poor glucose tolerance and increased risk of Type 2 diabetes (Lobstein et al 2004). Along with the physical and metabolic effects of childhood obesity, there are extensive psychosocial effects that must be considered including depression and stigmatization, which may affect their “quality of life” (Cassim 2010; Sanigorski et al 2005; Lobstein et al 2004; du Toit & van der Merwe 2003).

Schools may play an effective role in decreasing a child’s exposure to an “obesogenic environment” (Sanigorski et al 2005), because it is here that children are expected to learn and be taught (Steyn, Lambert, Parker, Mchiza & de Villiers 2009). Knowledge of healthy eating habits should be established from an early age and sustained through to adulthood (Abrahams et al 2011; Oosthuizen, Oldewage-Theron & Napier 2011; Steyn et al 2009). Recent studies show that education interventions are more effective when targeted earlier on in a child’s development. In

addition, learners who are healthy also perform better at school (Florence, Asbridge & Veugelers 2008).

Schools may, however, also contribute significantly towards the development of childhood obesity. Although the causes of childhood obesity are of a multifactorial nature, some schools may make available food and beverage items for learners to purchase that promote its development (Lobstein *et al* 2004). There is currently a paucity of studies that have investigated anthropometric characteristics, tuck shop purchasing habits and nutritional knowledge of learners attending well resourced schools in South Africa.

The purpose of the current study was to investigate Grade 4 learners with respect to the following:

- The anthropometric and socio-demographic characteristics of those who frequently purchase food items from their school tuck shop compared to those who use the tuck shop infrequently;
- Items purchased by Grade 4 learners who regularly frequent their school tuck shop as well as the amount of money they spend each day;
- Factors that influence their decision to purchase school tuck shop items;
- The levels of nutrition knowledge amongst the learners;
- Whether the Grade 4 learners who frequently purchase from the tuck shop apply their knowledge gained from the school curriculum to influence their purchases?

4.2 Research design

This study employed a cross-sectional research design, using a questionnaire administered to Grade 4 learners (Appendix F, p139).

4.3 Methodology

4.3.1 Sample selection

Four of the 11 schools surveyed in Chapter 3 were selected to participate in this study. These schools were chosen because their tuck shops stocked a “healthier” alternative in addition to the

unhealthy foods and beverages that the remaining seven schools stocked. It was thought that this would allow a greater insight into the purchasing practices of Grade 4 learners, attending well resourced schools in Pietermaritzburg, who were provided with the opportunity to make both healthy and/or unhealthy purchases.

Informed consent to interview the learners was first obtained from their parents/guardians and only those learners that had assented and received consent from their parents/guardians completed the questionnaire used for this part of the study. Requests for informed consent and assent were given to 403 learners and their parents/guardians and from that sample, 311 learners agreed to participate in the study.

A pilot study was conducted on 58 consenting and assenting Grade 4 learners using a school that did not participate in the main study. The purpose of this pilot study was to ensure that the questionnaire was easy to understand and also administer. If necessary, the questions would have been rectified before commencing the actual study. No changes were made to the final questionnaire.

Four students in the final year of their BSc Human Nutrition degree were trained as fieldworkers for this study. Prior to data collection, these fieldworkers were shown the correct techniques for taking weight and height measurements. During the pilot study and throughout the data collection process, the researcher supervised the fieldworkers for quality control purposes. In addition, the mean of three weight and height measurements was used to determine the final measurement. Learner's heights were measured without shoes and socks, to the nearest 0.5cm using a portable, free standing Leicester Height Measure. Weights were measured with learners wearing light school clothing, without shoes and socks, to the nearest 0.1 kg using portable SECA scales.

4.3.2 Research instrument

A four-part questionnaire was administered to the Grade 4 learners. The first part obtained anthropometric data (weight and height) measurements, the second part socio-demographic information, the third part information regarding tuck shop purchasing practices, while the fourth part tested the learner's nutrition knowledge.

All questions pertaining to nutrition knowledge were obtained from the HealthKick⁵ questionnaire that is currently in use in an intervention study for Grade 4 learners from historically disadvantaged, low-income rural and urban communities in the Western Cape, South Africa. Questions regarding FBDG, sugar, fat and dietary fibre as well as recommended fruit and vegetable servings, were selected from the original HealthKick questionnaire for this study. The anthropometric measurements (weight and height) were measured by trained fieldworkers, while the remainder of the questionnaire was administered by the Grade 4 teachers during the school day.

Prior to administration of the questionnaire, the researcher met with the Grade 4 teachers at each school to explain the questionnaire. Any queries were addressed and areas that required special attention, such as the question containing a Likert scale, were emphasised and explained by the researcher. Learner codes were used throughout the data collection process to ensure subject anonymity.

4.3.3 Data analysis

Results were analysed using PASW Statistics 18, an updated version of SPSS 15 (SPSS Inc, Chicago, IL, USA). Pearson correlation analysis, and Chi-square tests and multi-variate analysis were performed with significance measured at the 0.05 level (2-tailed).

4.4 Results

4.4.1 Anthropometric data

Fifty six percent of the sample as a whole comprised female learners (n =173), while 44% of the sample comprised male learners (n = 138). The anthropometric characteristics of the subject group as a whole are presented in Table 4.1. The mean age of the learners was 9.85 (\pm SD) years with the mean BMI for females being 20.4 \pm kg/m² and 19.0 \pm kg/m² for males. An analysis of the BMI results revealed that neither gender was distributed normally (Figure 4.1). The BMI results have been further categorised (Table 4.2) to represent the distribution of male and female learners

⁵ Acknowledgement is given to Estelle V Lambert and Catherine E Draper from the UCT/MRC Research Unit for Exercise and Sports Medicine, Sports Science Institute of South Africa; Nelia P Steyn, Lucinda Dalais and Zulfa Abrahams from the Human Sciences Research Council and Anniza de Villiers, Jean Fourie and Jillian Hill from the Chronic Diseases of Lifestyle Unit, Medical Research Council.

based on the WHO z-score normal, overweight and obese classifications. No learners were identified with BMI in the thin ($< -2SD$) or severely thin categories ($< -3SD$) (WHO 2011). Yet, what is significant is that male subjects were predominantly overweight (BMI greater than 1 positive SD from the mean), whereas female subjects were more prone to obesity (BMI greater than 2 positive SD from the mean).

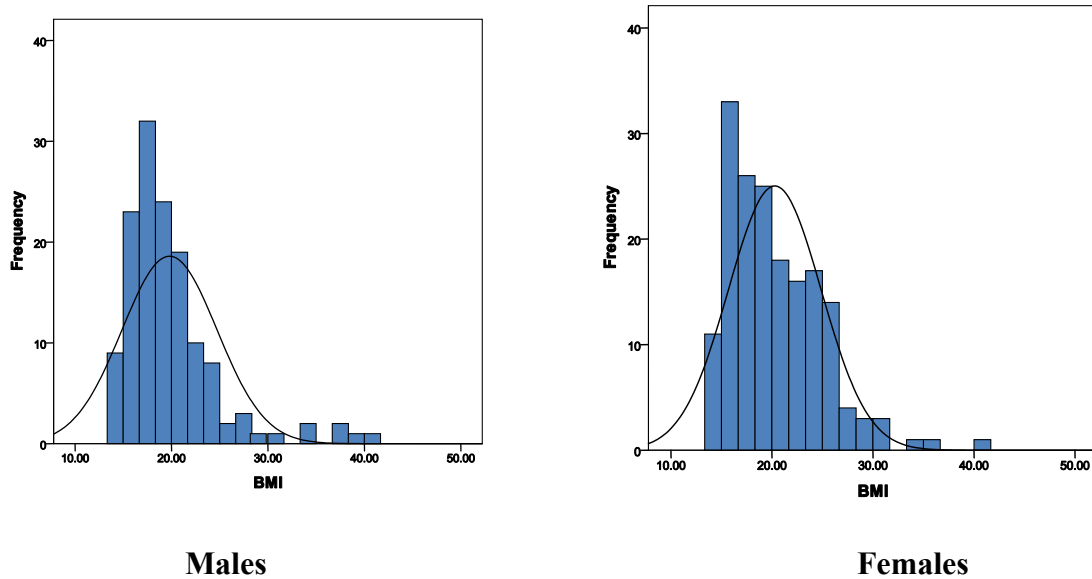


Figure 4.1: Sample of male and female BMIs compared to the normal distribution curve of the study population ($n = 311$) as a whole

Table 4.1: Anthropometric characteristics of the study population as a whole (n = 311)

	Mean	Median	WHO z-score median	1 SD	Minimum	Maximum	Std Deviation
Age (years):							
Combined	9.9	10.0			9	11	0.54
Females (n = 173)	9.8*	10.0			9	11	0.54
Males (n = 138)	9.9 [#]	10.0			9	11	0.54
Weight(kg):							
Combined	39.9	37.1			21.9	90.0	11.4
Females	40.6	38.2	31.2	37.4	21.9	86.1	11.5
Males	39.3	36.6	30.9	36.7	23.7	90.0	11.3
Height (m):							
Combined	1.41	1.40			1.20	1.64	6.7
Females	1.41	1.40	1.38	1.44	1.26	1.64	6.9
Males	1.40	1.40	1.37	1.44	1.20	1.59	6.3
BMI (kg/m²):							
Combined	20.1	19.0			13.5	40.3	4.7
Females	20.3	19.4	16.5	18.9	13.7	40.3	4.6
Males	19.8	18.5	16.4	18.4	13.5	40.1	4.9

* 9 years 10 months, [#] 9 years 11 months (differed significantly between males and females, Independent samples t-test, p < 0.045; two tailed)

Table 4.2: Classification of study population according to WHO z-score categories

	Female (n = 173)		Male (n = 138)		Total (n = 311)	
	n	%	n	%	N	%
Normal	79	45.7	64	46.4	143	46.0
Overweight > +1 SD	43	24.9	40	29.0	83	26.7
Obese > + 2 SD	51	29.5	34	24.6	85	27.3

Additional analyses showed that the BMI of the learners who reported never buying from the tuck shop, had a tendency to be lower when compared to the BMI of the learners who bought from the tuck shop ($19.5 \pm 3.5 \text{ kg/m}^2$ and $20.2 \pm 4.9 \text{ kg/m}^2$, respectively). This tendency should not be discarded based on the fact that it is of no statistical significance, as it could at a later age develop into more significant differences and requires further investigation. Further analyses showed that the BMI of the learners who reported purchasing from the tuck shop frequently, also

had a tendency to be higher when compared to the BMI of the learners who purchased from the tuck shop less frequently ($20.0 \pm 4.8 \text{ kg/m}^2$ and $20.5 \pm 5.3 \text{ kg/m}^2$, respectively).

4.4.2 Socio-demographic background

The mean number of people living with each learner was 4.25 ± 1.9 (minimum 1, maximum 6). Of these 2.13 ± 1.0 were employed (minimum 0, maximum 7). The associated socioeconomic characteristics of the learners' household are presented in Table 4.3. More than 30% of the learners reported to come from a household without access to a landline telephone connection, weekly or monthly magazine and internet access.

Table 4.3: Resources found in each learner's household

	Yes		No	
	n	%	n	%
Cold water	311	100	0	0.0
Stove	311	100	0	0.0
Electricity	309	99.4	2	0.6
TV	309	99.4	2	0.6
Flushing toilet	306	98.4	5	1.6
Video/DVD player	303	97.4	8	2.6
Hot water	303	97.4	8	2.6
Car	298	95.8	13	4.2
Fridge	298	95.8	13	4.2
Radio	292	93.9	19	6.1
Brick house	291	93.6	20	6.4
Computer	275	88.4	36	11.6
Newspaper	249	80.1	62	19.9
Magazine	225	72.3	86	27.7
Landline	223	71.7	88	28.3
Internet	195	62.7	116	37.3

Learners were asked to indicate whether they or a close relative had been diagnosed with diabetes, high blood pressure, high cholesterol, heart disease and or overweight/obesity. Results are presented in Table 4.4. The most common medical condition experienced by both the learners and their family members was high blood pressure ($n = 13$, 4.2% and $n = 67$, 21.5% respectively). Learners who had been diagnosed with diabetes were significantly more likely to indicate that they had been diagnosed with either high blood pressure ($r = 0.204$; $p = 0.000$) or heart disease ($r = 0.225$; $p = 0.000$). Similarly, learners who indicated that they had been

diagnosed with high cholesterol were also more likely to have been diagnosed with high blood pressure ($r = 0.229$; $p = 0.000$).

Table 4.4: Medical conditions of the learner and his/her family, for the study population as a whole.

	Learner		Family Member	
	n	%	n	%
Diabetes	6	1.9	65	20.9
High blood pressure	13	4.2	67	21.5
High cholesterol	5	1.6	25	8.0
Heart disease	3	1.0	21	6.8
Overweight/obesity	15	4.8	38	12.2

4.4.3 Food consumed at home and brought from home to eat at school

Almost 92% of learners indicated that they ate breakfast every morning ($n = 285$), while 8.4% did not ($n = 26$). Eighty one percent of learners claimed to bring food from home ($n = 252$), while 8.4% ($n = 26$) never brought food. Sixty two percent of the children who never bought food ($n=17$) claimed to purchase items from their school tuck shops. In most instances, the food brought to eat at school was prepared by a family member/guardian (57.9%, $n = 180$), followed by the learner (15.1%, $n = 47$), and domestic worker (9.6%, $n = 30$). Eating breakfast and bringing a packed lunch did not seem to influence the learner's decision to go to the tuck shop. However, eating breakfast seemed to correlate with bringing a packed lunch to school ($r = 0.303$; $p = 0.000$).

Two of the schools in this study served either breakfast or lunch as part of a feeding scheme for learners who were from a poor socio-economic background. This feeding scheme was administered by the tuck shop manager and was independent of the Government initiated National School Lunch Programme. Unexpectedly, of the study population that participated in this study, 10% ($n=32$) reported to receive a school-sponsored meal. It is interesting to note that all 32 learners also indicated that they regularly purchased items from their school tuck shop.

4.4.4 Tuck shop purchasing practices

4.4.4.1 When learners purchase

Eighty six percent of learners (n = 266) claimed to buy from their school tuck shop. Only the learners that indicated they made use of the tuck shop completed the third part of the questionnaire, which included their tuck shop purchasing practices. More than half of the learners who used the tuck shop claimed to visit it at least once a week (54.5%, n = 145). The second most popular frequency was twice a week (13.9%, n = 37), followed by everyday as the third choice (12%, n = 32). For the purpose of this study “frequent” purchasers have been classified as those who visited the tuck shop at least three times a week (Finch 2010). Twenty two percent of the learners (n = 58) in this study reported to be frequent tuck shop purchasers. The BMI classification of the frequent versus non frequent purchasers is presented in Table 4.5. Just over 40% of the female learners who purchased from the tuck shop frequently were in the normal weight category, while similar results were found amongst the male learners with 38.5% of the male learners purchasing frequently being in the normal weight category. This indicates that around 60% of male and female learners purchasing frequently from the tuck shop were at least overweight. Learners who frequented the tuck shop had a significantly higher BMI than those who did not (p = 0.020). Yet, within the group of learners who frequented the tuck shops, no association existed between the BMI and how often they purchased from the tuck shop.

Table 4.5: BMI classification of learners who made frequent and non-frequent tuck shop purchases

		Normal		Overweight > +1SD		Obesity > + 2SD		Total	
		n	%	n	%	n	%	n	%*
Females	Non frequent	47	44.8	26	24.8	32	30.5	105	39.5
	Frequent	13	40.6	7	21.9	12	37.5	32	12.0
	Non users	10	47.6	4	19.0	7	33.3	21	46.7
Males	Non frequent	32	42.1	23	30.3	21	27.6	76	28.6
	Frequent	10	38.5	11	42.3	5	19.2	26	9.8
	Non users	13	54.2	5	20.8	6	25.0	24	53.3
Total	Users	102	42.7	67	28.0	70	29.3	239	84.2
	Non Users	23	51.1	9	20.0	13	28.9	45	15.8

*calculated from the total number of learners in each category who responded to the frequency question

All school tuck shops in this sample were open during the first and second break. The most popular period to make tuck shop purchases was the second break (64.3%, $n = 171$), followed by both breaks (22.6%, $n = 60$) and then the first break (12.4%, $n = 33$). The characteristics of a frequent versus non frequent tuck shop purchasers are presented in Table 4.6. Learners who purchased from the tuck shop frequently were more likely to purchase items at both breaks, obtain their spending money from their parents, bring a packed lunch from home and consume breakfast before school. It is interesting to note that a correlation analysis highlighted a significant association between being diagnosed with high cholesterol and purchasing multiple items during the first break ($r = 0.196$; $p = 0.001$).

Table 4.6: Characteristics of frequent versus non frequent tuck shop purchasers

		Frequent		Non frequent	
		n	%	n	%
When are items purchased:	First break	7	21.2	23	69.7
	Second break	21	12.3	131	76.7
	Both breaks	30	50.0	27	45.0
Where does spending money come from:	Parents guardians	32	25.4	86	68.3
	Learners own money	2	11.1	14	77.8
	Borrowed from a friend	0	0.0	1	100.0
	Parents and own	17	16.8	70	69.3
	Parents, learners, borrowed	2	50.0	1	25.0
	Parents and borrowed	3	27.3	8	72.7
Is packed lunch brought from home:	Yes	48	19.0	174	69.0
	No	10	58.8	7	41.2
Is breakfast consumed before school:	Yes	50	17.5	166	58.2
	No	8	30.8	15	57.7

Learners who purchased from the tuck shop spent on average R8.38 per day with a minimum of R1 and a maximum of R40 (standard deviation 5.39). Learners, who purchased from the tuck shop frequently, spent the same amount of money per day as those who purchased infrequently.

No correlation was found between BMI, frequency of purchases and how much was spent per day, nor whether items were bought at first or second break. There was also no correlation between bringing lunch and what was spent each day and what break items were bought.

The most common source of tuck shop spending money, presented in Figure 4.1, was the parents and guardians (47.4%, n = 126), followed by parents and learner's own pocket money combined (37.9%, n = 101) and lastly, the learners own money (6.8%, n = 18).

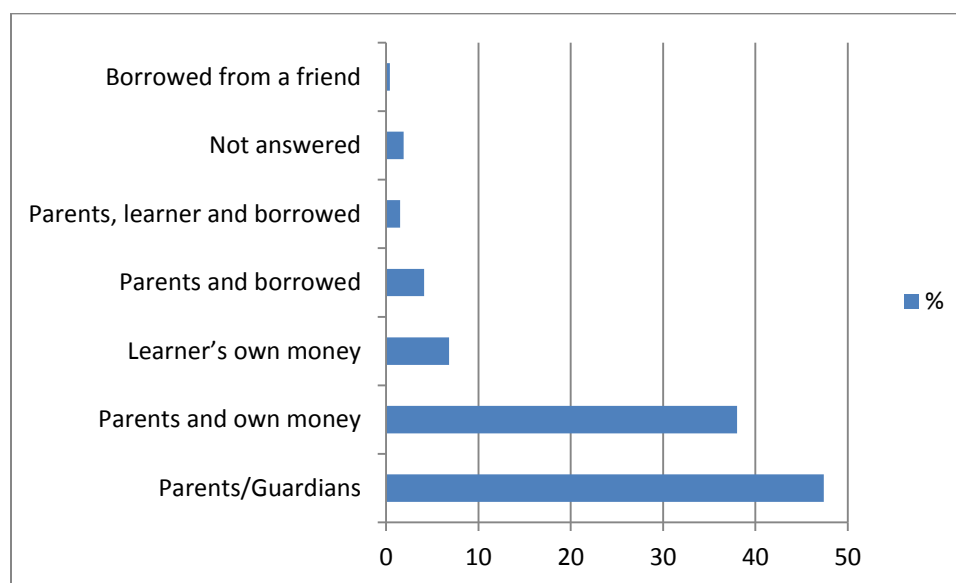


Figure 4.2: Source of tuck shop spending money for Grade 4 learners

4.4.4.2 What learners purchase

Learners were most likely to purchase multiple items during the second break (56.8%, n = 151), whereas multiple items at first break was limited (22.9%, n = 61). The results confirm that more learners purchased multiple items during their second break, in general. A breakdown of the items purchased during each break is provided in Table 4.7. With the exception of fruit, most items were more commonly purchased during the second break.

Table 4.7: Items purchased by Grade 4 learners at each break period

	First Break		Second Break	
	n	%	n	%
Beverages	53	19.9	103	38.7
Lunch items	43	16.2	52	19.5
Sweets	49	18.4	120	45.1
Snack	63	23.7	161	60.5
Fruit	12	4.5	9	3.4

Learners were asked to indicate what beverages, sweets and chocolates, and snack/lunch items they purchased during first or second break. The most popular items for each category are presented in Table 4.8. It should be noted that not all schools had the same stock and therefore the popularity of these items is “diluted”.

Pearson Correlation analysis showed that the BMI of learners correlated significantly positive with peanuts ($p = 0.033$, $r = 0.131$) and cereal bars ($p = 0.048$, $r = 0.122$) purchased during the second break.

Table 4.8: Popular items bought at each break period

	First Break		Second Break	
	n	%	n	%
Beverages				
Carbonated	31	11.7	75	28.2
Fruitblend	41	15.4	39	14.7
Frozen popsicle	55	20.7	108	40.6
Sweets & Chocolates				
Loose sweets	46	17.3	84	31.6
Packet of sweets	38	14.3	95	35.7
Chocolate	29	10.9	41	15.4
Snack/Lunch item				
<u>“Unhealthy”</u>				
Cheap chips	40	15.0	67	25.2
Corn chips	42	15.8	68	25.6
Potato chips	40	15.0	75	28.2
Popcorn*	56	21.1	127	47.7
Pies	41	15.4	46	17.3
Hot dog	46	17.3	44	16.5
Hot chips	58	21.8	65	24.4
<u>“Healthy”</u>				
Banana	14	5.3	7	2.6
Fruit Salad	14	5.3	8	3.0
Yoghurt	15	5.6	11	4.1
Salad rolls	16	6.0	17	6.4
Salads	7	2.6	19	7.1

Items in bold represent the most popular food/beverage item for each category.

*Prepared using oil.

4.4.4.3 Why learners make purchases from their tuck shop

Learners were asked to rank the statements in Table 4.9 according to whether this statement motivated their decision to purchase items from their school tuck shop. In the original question learners were presented with a five point Likert scale including the options, strongly agree, agree, neutral, disagree and strongly disagree. During the questionnaire training with the Grade 4 teachers, the researcher emphasised that the teachers should clarify what these options meant so that the learner could distinguish between a “strong” opinion, a “normal” opinion and a neutral opinion. Despite this training these questions were not well answered. For the purpose of these

results all positive opinions have been conflated into “agree” and negative opinions into “disagree” with neutral opinions remaining as they are. The results show that the most popular statements that the learners agreed with were “*this is my favourite thing to eat or drink*” (66.5%, n = 177) and “*I only have enough money to buy this*” (47.0%, n = 125). Learners felt most strongly against the statements “*I don’t like what I brought from home*” (66.9%, n = 178) and “*I am not allowed to have this at home*”.

Table 4.9: Reasons why learners purchase specific tuck shop items

	Agree		Disagree		Neutral		Not answered	
	n	%	n	%	n	%	n	%
This item is my favourite thing to eat or drink	177	66.5	36	13.5	27	10.2	26	9.8
I only have enough money to buy this item / these items	125	47.0	71	26.7	44	16.5	26	9.8
The person looking after me has told me that I am only allowed to buy this item / these items	70	26.3	122	45.9	54	20.3	20	7.5
My friends buy this item	64	24.1	146	54.9	35	13.2	21	7.9
I think this item will help keep my body healthy	66	24.8	122	45.9	49	18.4	29	10.9
I don’t like what I brought for lunch from home	30	11.3	178	66.9	30	11.3	28	10.5
I am not allowed to eat or drink this item at home	53	19.9	173	65.0	16	6.0	24	9.0

When asked to rank the top three “statements” influencing tuck shop purchases, “*this is my favourite thing to eat or drink*” was rated the most influential (24.1%, n = 75), followed by a tie with the options “*this is my favourite thing to eat and drink*” and “*I only have enough money to buy this item*” (9.6%, n = 30). “*My friends buy this item*” was rated as the third most important reason to purchase from the tuck shop (11.6%, n = 36).

4.4.5 Nutrition knowledge levels

All learners completing the questionnaire were asked to participate in this part of the study. The mean score for each section is presented in Table 4.10, while the number of correct and incorrect answers for each question is presented in Table 4.11. The overall mean score for knowledge was

12.7 out of 26 (48.8%). Analysis of Variance (ANOVA) revealed no significant difference between knowledge scores of male and female learners.

Table 4.10: Total scores for each section of the nutrition knowledge test

	Number of Questions	n	Minimum Score	Maximum Score	Mean	Std Deviation
Total score for knowledge	26	310	3	21	12.70	3.788
Food Groups score	6	310	0	5	1.99	1.061
Fruit & Veg servings per day	1	310	0	1	0.33	0.471
Healthy fats	8	310	0	8	4.56	1.909
Fat True or False	3	310	0	3	1.63	1.062
Fat functions	3	310	0	3	1.03	0.741
Fibre functions	2	310	0	2	0.92	0.682
Sugar True or False	3	310	0	3	2.28	0.966

Additional analyses showed that the total knowledge scores of those learners that reported never buying from the tuck shop had a tendency to be higher when compared to the total knowledge scores of those learners who bought from the tuck shop (12.6 ± 3.8 and 13.0 ± 3.72 , respectively). Linear regression analysis also revealed that the total knowledge scores contributed significantly towards the BMI of the group as a whole (significance < 0.000). Further analyses also showed that the total knowledge scores of those learners that reported purchasing from the tuck shop frequently, was significantly ($p < 0.05$) lower when compared to the total knowledge scores of those learners who bought from the tuck shop less frequently (13.0 ± 3.9 and 11.6 ± 3.1 , respectively). Logistic regression analysis confirmed that the total knowledge of a learner can be used to predict whether he or she is more likely to purchase items from their school tuck shop (significance = 0.017), in that higher levels of knowledge result in decreased frequency of tuck shop purchases.

Table 4.11: Correct and incorrect answers to nutrition knowledge questions

	Correct		Incorrect		Obese Correct	
	n	%	n	%	n	%
Food Groups (Multiple Choice)						
Food group that you should eat the most	36	11.6	275	88.4	12	14.1
Food group that you should eat the least	257	82.6	54	17.4	68	80.0
Food group that contains foods with lots of fibre	60	19.3	251	80.7	13	15.3
Food group that provides the best energy	46	14.8	265	85.2	14	16.5
Food group that your body uses to build muscles	57	18.3	254	81.7	10	11.8
Food group that protects the body against illness	163	52.4	148	47.6	38	44.7
Average for food group questions	103	33.2	208	66.8	26	30.6
Fruit and Vegetables (Multiple Choice)						
Number of recommended fruit and veg portions	102	32.8	209	67.2	25	29.4
Fats (True or false)						
Fats give energy and keep you warm (true)	62	19.9	249	80.1	24	28.2
Fats help with absorption of nutrients (true)	75	24.1	236	75.9	14	16.5
Fats help your body to build muscle (false)	180	57.9	131	42.1	53	62.4
Too much fat causes overweight (true)	234	75.2	77	24.8	73	85.9
Too much fat causes high blood pressure (true)	138	44.4	173	55.6	39	45.9
Too much fat can cause a heart attack (true)	132	42.4	179	57.6	34	40.0
Average for fats	137	44.0	174	56.0	40	47.1
Healthy Fats (True or False)						
Healthy fats in red meat and chicken	100	32.2	211	67.8	28	32.9
Healthy fats in chips and crisps	244	78.5	67	21.5	66	77.6
Healthy fats in nuts	220	70.7	91	29.3	58	68.2
Healthy fats in soft margarine	95	30.5	216	69.5	24	28.2
Healthy fats in avocado	241	77.5	70	22.5	69	81.2
Healthy fats in vetkoek and doughnuts	232	74.6	79	25.4	69	81.2
Healthy fats in pilchards and sardines	193	62.1	118	37.9	54	63.5
Healthy fats in polony	88	28.3	223	71.7	25	29.4
Average for healthy fats	177	56.8	134	43.2	49	57.6
Sugar (True or False)						
Eating a lot of sugar and sweet food is good for health	237	76.2	74	23.8	65	76.5
Eating a lot of sugar and sweet food can make you fat	209	67.2	102	32.8	63	74.1
Eating a lot of sugar and sweet food is bad for your teeth	257	82.6	54	17.4	68	80.0
Average score for sugar	234	75.3	77	24.7	65	76.5
Fibre (True or False)						
Fibre helps you go to the toilet regularly	139	44.7	172	55.3	44	51.8
Fibre helps protect against heart disease	145	46.6	166	53.4	34	40.0
Average for fibre	142	45.7	169	54.3	39	45.9
Average Total score for knowledge	152	48.8	159	51.2	41	48.2

When looking at the average for the food group questions as well as the recommended number of fruit and vegetable servings per day question, just under two thirds of the sample (n=208, 66.8%) had incorrect results. This also included the obese learners where on average only one third of these learners answered these questions correctly. The questions surrounding sugar were the most well answered on average with 75.3% of learners answering correctly. Interestingly, obese learners performed similarly on the sugar questions when compared to the whole sample (76.5% answering correctly).

A combination of all the factors in relation to the BMI percentiles is presented in Table 4.12. Learners in the highest quartile range were most likely to visit their tuck shop and purchase frequently, including every day. Learners in the lowest BMI quartile spent more money, but were most likely to purchase non-frequently and once a week. Learners who achieved the highest knowledge scores were in the normal BMI categories.

Table 4.12: Learner characteristics in relation to BMI percentiles

BMI Percentiles	<25 (n -)	50 percent band	>25
Money spent per day	R8.86	R8.47	R7.73
Knowledge score (out of 26):	12.30	12.99	12.53
Fat (out of 6)	1.38	1.71	1.73
Sugar (out of 3)	2.29	2.24	2.34
Fibre (out of 2)	0.96	0.91	0.88
Healthy Fats (out of 8)	4.29	4.78	4.43
Do they purchase from the tuck shop?			
Yes	86.3	84.4	87.0
No	13.8	15.6	13.0
Non-frequent purchasers	66.3	66.2	64.9
Frequent purchasers	18.8	16.9	22.1
Tuck shop visits per week:			
Once	48.8	48.7	39.0
Twice	5.0	10.4	22.1
Three times	6.3	3.9	3.9
Four times	5.0	9.1	2.6
Every day	7.5	15.6	15.6
Don't go to the tuck shop	13.8	10.0	13.0
Presence of medical condition:			
Diabetes	1.3	1.9	2.6
Blood Pressure	2.5	5.8	2.6
Cholesterol	0.0	2.6	1.3
Heart disease	2.5	0.0	1.3
Obesity	0.0	2.6	14.1
Consumption of breakfast	90.0	92.9	90.9
Resources:			
Newspaper	78.8	80.5	80.5
Magazine	76.3	70.1	72.7
Radio	91.3	94.2	96.1
TV	97.5	100	100
Computer	86.3	89.0	89.6
Stove	100	100	100
Internet	65.0	61.0	63.6
DVD	97.5	98.7	94.8
Fridge	96.3	96.8	93.5
Electricity	100	99.4	98.7
Flushing Toilet	97.5	98.7	98.7
Landline	67.5	72.0	75.3

4.5 Discussion

The following objectives were addressed in this chapter:

- The anthropometric and socio-demographic characteristics of Grade 4 learners who frequently purchase food items from their school tuck shop compared to those who use the tuck shop infrequently;
- The items Grade 4 learners regularly purchase from the school tuck shop and how much money they spend per day;
- Factors that influence the Grade 4 learner's decision to purchase school tuck shop items;
- The levels of nutrition knowledge amongst Grade 4 learners;
- Whether Grade 4 learners who frequently purchase from the tuck shop use their knowledge gained from the school curriculum to influence their purchases.

4.5.1 Anthropometric data

More than half the learners in this sample were overweight or obese (54.0%), with just more than a quarter of the sample classified as obese (27.3%). Of those learners that bought from the tuck shop frequently, around 60% of both male and female learners had BMIs above what is considered to be healthy. These findings suggest that frequent purchases from a school tuck may contribute to overweight and obesity in Grade 4 learners at well-resourced schools in Pietermaritzburg, KwaZulu-Natal, South Africa.

In comparison to other non-related South African studies amongst learners, Oldewage-Theron and Egal (2010) reported that at least 17% of their sample of rural children (aged 9-13 years) was overweight, with 4% obese. The HealthKick survey amongst disadvantaged Grade 4 learners revealed that 14% of the learners were overweight and 7% obese (Abrahams *et al* 2011).

It is difficult to compare these studies on children from low-socioeconomic population groups with the study population used in this study. Few South African researchers have previously investigated the anthropometrics of learners from well-resourced schools. However in the Health of the Nation Study between 2001 and 2004, Armstrong *et al* (2006) investigated 10 195 learners aged 6-13 years from mixed socio-economic levels and expressed concern at the levels of

overweight and obesity that were found. These rates (10.9% overweight and 2.4% obesity amongst males and 17.5% overweight and 4.8% obesity amongst females) were much lower compared to those reported in this study. While Armstrong *et al* (2006) levels are most likely lower due to the range of socio-economic levels investigated, the high levels of overweight and obesity found in this sample raise concern.

International comparisons with developed countries reveal an inversely associated trend compared to those experienced in South Africa and in this study, in that children from lower socio-economic status schools internationally, are more likely to be overweight and obese. Moschonis, Tanagra, Vandorou, Kyriakou, Dede, Siatitsa, Koumpitski, Androutsos, Grammatikaki, Kantilafti, Naoumi, Farmaki, Siopi, Papadopoulou, Voutsadaki, Chlouveraki, Maragkopoulou, Argyri, Giannopoulou & Manios (2010) found a prevalence of 29.6% overweight and 11.1% obesity amongst Greek schoolchildren aged 9-13 years and found lower family income was significantly associated with overweight and obesity. Swedish researchers Sjoberg, Moraeus, Yngve, Poortvliet, Al-Ansari and Lissner (2011) found children from lower socioeconomic levels more likely to be overweight and obese (16.6% overweight and 3% obesity). O'Dea, Nguyen Hoang and Dibley (2011) found an 18.4% incidence of overweight and 12.2% incidence of obesity amongst Australian children aged 9 to 10 years with both being more prevalent amongst schools of lower socioeconomic levels. Perhaps South Africa's various cultural influences have a role to play here, where some cultures perceive both wealth and overweight as a sign of prosperity.

4.5.2 Socio-demographic backgrounds

The majority of learners in this study lived in well-resourced homes with access to facilities that are suspected to promote a sedentary lifestyle. Almost all learners had a television and video machine / dvd player. Although time spent viewing television was not investigated in this study, current research suggests that increased time spent on sedentary activities such as television viewing, is contributing toward childhood overweight and obesity (Lobstein *et al* 2004). This is further exacerbated by the fact that children have access to an increasing number of television channels that are now continuously available (Lobstein *et al* 2004), even via the internet.

Children are not only inactive whilst watching television, but also exposed to food advertising marketing in the form of advertisements. An American study looking at the television viewing habits of children found that children aged 8 – 12 years were the most exposed group of children and subjected to an average of 21 food-related advertisements per day (Gantz, Schwartz, Angelini & Rideout 2007). Many international countries have become extremely strict about the marketing of food to children (Cassim 2010). In South Africa, The Advertising Standards Authority (ASA) currently prohibits any advertising directed specifically toward children aged 12 and under (ASA 2011).

Parents should be encouraged to restrict the amount of time their child spends viewing television and encourage their children to substitute this with physical activity. This may not always be practical. There may be a number of non-obvious reasons why children are allowed to watch unrestricted amounts of television, including their safety. Parents may choose to have their children indoors as opposed to them being in the neighbourhood unsupervised where they could be exposed to the illicit behaviour of other unsupervised children and crime.

The results confirm that learners who indicated the presence of health problems were likely to have had multiple health problems diagnosed. The health problems that were listed are linked to chronic diseases of lifestyle and concern should be raised that children as young as those in this sample already have a formally diagnosed metabolic abnormality. The high incidence of overweight and obesity found amongst the whole sample of learners further reinforces the severity of the problem that learners are suffering serious health conditions related to childhood obesity even before they have entered adolescence. These conditions may seriously affect the child's quality of life and ultimately their lifespan.

Despite the fact that half the sample was classified as overweight, only a small percentage of learners indicated that they had been diagnosed as such. This emphasises the extent to which learners are unable to differentiate between a healthy and unhealthy weight for age. Poor nutrition education on both the learner and their parent's behalf may explain this shortcoming. He and Evans (2007) reported that parents in their Canadian study significantly underestimated their child's weight and were more concerned about their children being underweight rather than

overweight/obese. Whilst it is important not to place too much emphasis on weight, for fear of creating an unhealthy obsession at a young age, it is important that parents are at least made aware of healthy weight ranges for their children and encouraged to promote physical activity and a healthy dietary intake with their children. This will ensure that any health problems related to being overweight are recognised and treated quickly to prevent complications later on in the child's life.

4.5.3 Food consumed at home and brought from home to eat at school

It is encouraging to know that most learners consumed breakfast at home and were likely to bring food to consume at school. Abrahams *et al* (2011) found similar results in their South African study where more than 90% of their sample regularly consumed breakfast. However, considering the high rates of overweight and obesity in this sample, it is important that parents receive education and encouragement to ensure their child's breakfast and lunch box is of the utmost nutritional quality, especially if their child is supplementing their lunch box with tuck shop purchases.

4.5.4 Items bought from the tuck shop

More than 80% of the learners brought food from home to eat at school. Yet, most of these learners were also making use of the tuck shop, indicating that learners were not using the tuck shop for their main meal but rather to supplement what was brought from home. Learners were most likely to purchase items during the second break, perhaps once they had consumed all items brought from home during their first break. Frequent shoppers indicated they used both breaks whereas non-frequent shoppers preferred the second break. Lobstein *et al* (2004) suggests that "increasing the frequency of purchasing opportunities" may contribute to childhood overweight and obesity.

Finch *et al* (2006) found much lower levels of tuck shop purchasing in their Australian study of primary school children, with only 13.1% of the children purchasing at least three times per week. Compared to their study, more learners from this sample purchased from the tuck shop every day -12% from this sample versus 1.7% from Finch *et al* (2006).

Learners who visited the tuck shop had higher BMIs than those who did not, confirming that school tuck shops may be contributing to childhood overweight and obesity. This can either be through the poor nutritional quality of the items that the learners were consistently purchasing, most likely in excessive amounts, or through the learners themselves who were not choosing the healthiest possible option when making a tuck shop purchase. Within the learners who used the tuck shop, no association existed between the learner's BMI and how often they purchased items. This could possibly be because lower frequency tuck shop users may have purchased more energy dense items compared to the frequent users. Significant correlations were found linking learners who purchased high fat options to having a higher BMI. Schools should be encouraged to play an active role in reducing the number of energy dense, unhealthy items that they have available for sale at their tuck shop and increase the number of healthy choices. Learners also need to be educated on the importance of not consuming more kilojoules than necessary, especially when they have brought food from home.

Parents were the most likely source of spending money, either on their own or as a supplement to the learner's own money. This confirms that they are playing an active role in supporting their child's tuck shop purchasing habits. Considering that most learners were already bringing food to school, schools should encourage monetary restrictions to ensure that learners are restricted in terms of what they are able to purchase to supplement food brought from home, especially when the amount of food brought from home is adequate to meet the learner's nutritional needs.

The popularity of certain items amongst learners was consistent with the tuck shop survey results. These items included the frozen popsicles, carbonated beverages, packets of sweets and popcorn. Interestingly salads and salad rolls as well as hot chips appeared to be more popular amongst the learners than what the tuck shop managers reported in the tuck shop survey.

4.5.5 Motivating reasons for purchasing items

Learners indicated that they were purchasing from the tuck shop because they liked the items on sale and could afford them. They were happy with what they had been given for lunch and were not "defying" instructions from their caregiver as the item had not been "banned" from home. This indicates that Grade 4 learners are exercising personal choices that are not fuelled by their

parent's advice or the nutrition education that they have received at school. This places great emphasis on encouraging children to broaden their preferences and find ways of making healthier food more appealing to tuck shop purchasers. On the other hand, the simpler option would be to limit the availability of unhealthy food items, thus leaving the learner with no other choice but to purchase healthy tuck shop items. There are, however, multiple implications of this strategy including the learner seeking alternative, perhaps illicit vending options to obtain their favourite tuck shop item. However, considering learners are funded by their parents, they are most likely to make tuck shop purchases regardless of what is available. If all unhealthy items were removed and provided there were no other sources of the illicit tuck shop items, learners would probably continue to make tuck shop purchases. This was reflected in the findings of the intervention study conducted by Naidoo *et al* (2009) in which the gradual removal of unhealthy tuck shop items had no negative influence on tuck shop sales and purchases.

Only a small amount of learners indicated that they purchased tuck shop items because there was limited access to these items at home. It is however necessary that these learners receive appropriate nutrition education on the importance of moderation when purchasing "illicit" items. There could possibly be negative consequences later in the learner's life, when they have free access to these items and could possibly purchase these items in excess to compensate for childhood restrictions. As adults, this could also negatively impact the learner's own children, where they may choose not to restrict items at all because of their negative associations surrounding their childhood food restrictions.

Peers had a less likely influence but were however voted as their third option for influencing tuck shop purchases. These findings are somewhat similar to those of Finnerty, Reeves, Dabinett, Jeanes and Vogeles (2009) who found that English pre-adolescent peers were more likely to influence physical activity as opposed to dietary intake.

4.5.6 Nutrition knowledge levels

The results indicate that the learners in this sample had a poor nutritional knowledge. This suggests that both the nutrition education curriculum and/or the nutritional knowledge of the teachers is lacking.

At the time of this study, nutrition education formed part of the Health Promotion learning outcome, where learners were expected to “make informed decisions regarding personal, community and environmental health” (South African Department of Education 2002). According to the assessment standards, by the time learners completed grade 4 they would need to have understood “the link between a healthy environment and personal health” as well as “investigate menus from various cultures and suggest plans for healthy meals” (South African Department of Education 2002). Learners receive one and a half hours of “personal and social well being” lessons including nutrition education, per week. The national curriculum provides the learning outcomes and assessment standards, but it is up to the teachers to develop the lessons to ensure that these assessment standards are met. Auditing the subject matter is school specific.

The average score for the food groups was only 33% indicating that learners are not familiar with the Food Based Dietary Guidelines (FBDG). Oldewage-Theron & Egal (2010) also found their learners aged 9-13 years, had poor knowledge surrounding the South African food based dietary guidelines. Possible reasons for learners having poor knowledge levels could include the reference material used to develop the lessons being out of date and not appropriate to South Africa. Perhaps the teachers, who may even come from an older generation pre-FBDG, are not familiar with the food groups themselves and therefore not likely to teach the children appropriately. In an intervention training programme conducted amongst South African primary school teachers, Oldewage-Theron (2011) found a poor level of nutrition knowledge in certain areas of the curriculum. Learners are extremely disadvantaged if their teachers are not up to date and/or knowledgeable about nutrition. Therefore emphasis should be placed on training the teachers effectively.

Most learners answered correctly for the food group that should be eaten the least. This is very interesting considering the high rate of overweight and obese learners in the sample, the frequency of tuck shop purchases and the fact that items from this food group were purchased regularly. Despite knowing this, learners are still making unwise dietary choices. This reinforces the fact that knowledge does not necessarily guide eating behaviour.

More than two thirds of the sample was unaware of the fact that they should be eating five fruit and vegetables a day. This could potentially explain why fruit was such a poor seller in the tuck shop survey. If learners are not aware of the benefits of fruit and vegetables nor the number of servings they should have each day, encouraging them to eat more of these items may be futile. Tuuri, Zanovec, Silverman, Geaghan, Solmon, Holston, Guarino, Roy & Murphy (2009) found that a 12 week school based wellness intervention program, promoting the consumption of fruit and vegetables, improved their subject's nutrition knowledge surrounding fruit and vegetables. Wardle, Parmenter & Waller (2000) found that adult subjects with good nutrition knowledge consumed higher amounts of fruit and vegetables and reduced amounts of fat intake.

Learners who purchased frequently from their tuck shop had significantly lower levels of knowledge compared to those who brought items less frequently. Knowledge levels were also an important predictor of whether the learner was likely to make tuck shop purchases, with higher levels of knowledge in learners who did not make frequent tuck shop purchases. These findings are important in that it shows that nutrition education may play an important role in preventing unhealthy tuck shop purchases. Nutrition education intervention involving an improved curriculum combined with improving the nutrition knowledge of the teachers could play a significant role in improving the purchasing practices of learners.

4.6 Conclusion

The present study indicates a potentially alarming prevalence of overweight and obesity amongst Grade 4 learners compared to previous South African findings. Learners who are overweight and obese are making frequent purchases from their school tuck shop. Learners are purchasing items at the tuck shop based on preference and not on their health containing properties; therefore school tuck shops may be contributing to childhood overweight and obesity. The current levels of nutrition knowledge of FBDG amongst Grade 4 learners are low however general nutrition knowledge was significantly associated with the frequency of tuck shop purchasing. Based on these findings, successful preventative strategies should focus on the following:

1. Restricting the number of unhealthy items available for purchase at the tuck shop and the amount of money learners may spend per day.

2. Educating parents regarding the promotion of a healthy lifestyle at home; as well as encouraging parents to restrict the amount of money provided to learners to make tuck shop purchases, especially when the food brought from home to eat at school is adequate.
3. Improving the quality of the nutrition education that learners receive making it more in line with the South African Food Based Dietary Guidelines.

References

- Abrahams Z, de Villiers A, Steyn NP, Fourie J, Dalais L, Hill J, Draper CE, Lambert EV (2011). What's in the lunchbox? Dietary behaviour of learners from disadvantaged schools in Western Cape, South Africa. **Public Health Nutrition** Available on CJO, DOI: 10.1017/S1368980011001108
- Advertising Standards Authority of South Africa, ASA (2011). Appendix A – Marketing of health products. http://www.asasa.org.za/Default.aspx?mnu_id=44 (date accessed 4/09/2011).
- Armstrong MEG, Lambert MI, Sharwood KA, Lambert EV (2006). Obesity and overweight in South African primary school children – the Health of the Nation Study. **South African Medical Journal** 96(5): 439-444.
- Cassim SB (2010). Food and beverage marketing to children in South Africa: Mapping the terrain. **South African Journal of Clinical Nutrition** 23(4): 181-185.
- Du Toit G, van der Merwe M-T (2003). Editorial: The epidemic of childhood obesity. **South African Medical Journal** 93(1): 49-50.
- Finch M, Sutherland R, Harrison M, Collins C (2006). Canteen purchasing practices of year 1-6 primary school children and association with SES and weight status. **Australian and New Zealand Journal of Public Health** 30(3): 247-251.

- Finnerty T, Reeves S, Dabinett J, Jeanes YM, Vogele C (2009). Effects of peer influence on dietary intake and physical activity in school children. **Public Health Nutrition** 13(3): 376-383.
- Florence MD, Asbridge M, Veugelers PJ (2008). Diet quality and academic performance. **Journal of School Health** 78(4): 209-215.
- Gantz W, Schwartz N, Angelini JR, Rideout V (2007). Food for thought television food advertising to children in the United States. **The Kaiser Family Foundation** Report No: 7618.
- He M, Evans A (2007). Are parents aware that their children are overweight or obese? **Canadian Family Physician** 53:1493-1499.
- International Association for the Study of Obesity (2011). <http://www.iaso.org/>, date accessed 1/09/11.
- Lobstein T, Baur L, Uauy R (2004). Obesity in children and young people: a crisis in public health. **Obesity Reviews** 5(Suppl 1): 4-85.
- Moschonis G, Tanagra S, Vandorou A, Kyriakou AE, Dede V, Siatitsa PE, Koumpitski A, Androutsos O, Grammatikaki E, Kantilafti M, Naoumi A, Farmaki AE, Siopi A, Papadopoulou EZ, Voutsadaki E, Chlouveraki F, Maragkopoulou K, Argyri E, Giannopoulou A, Manios Y (2010). Social, economic and demographic correlates of overweight and obesity in primary-school children: preliminary data from the Healthy Growth Study. **Public Health Nutrition** 13(10A): 1693-1700.
- Naidoo R, Coopoo Y, Lambert EV, Draper C (2009). Impact of a primary school-based nutrition and physical activity intervention on learners in KwaZulu-Natal, South Africa: a pilot study. **South African Journal of Sports Medicine** 21(1): 7-12.
- O'Dea J, Nguyen Hoang TDG, Dibley MJ (2011). Plateau in obesity and overweight in a cross sectional study of low, middle and high socioeconomic status schoolchildren between 2004 and 2009. **International Journal of Public Health** Available on DOI 10.1007/s00038-011-0280-6.

- Oldewage-Theron WH, Egal AA (2010). Nutrition knowledge and nutritional status of primary school children in QwaQwa. **South African Journal of Clinical Nutrition** 23(3): 149-154.
- Oldewage-Theron W, Egal A (2011). Influence of nutrition education on nutrition knowledge of life skill education in public schools in South Africa, oral abstract. **Journal of Nutrition Education and Behaviour** 43(4S1):S11.
- Oosthuizen D, Oldewage-Theron WH, Napier C (2011). The impact of a nutrition programme on the dietary intake patterns of primary school children. **South African Journal of Clinical Nutrition** 24(2):75-81.
- Department of Education (2002). **Revised National Curriculum Statement Grades R-9 (Schools): Life Orientation**. Pretoria
- Sanigorski AM, Bell AC, Kremer PJ, Swinburn BA (2005). Lunchbox contents of Australian school children: room for improvement. **European Journal of Clinical Nutrition** 59: 1310-1316.
- Sjoberg A, Moraesus L, Yngve A, Poortvliet E, Al-Ansari U, Lissner L (2011). Overweight and obesity in a representative sample of schoolchildren – exploring the urban-rural gradient in Sweden. **Obesity Reviews** 12: 305-314.
- Statistics South Africa (2011). Midyear population estimates 2011. <http://www.statssa.gov/publications/P0302/P03022011.pdf>, (date accessed 1/09/2011).
- Steyn NP, Lambert EV, Parker W, Mchiza Z, de Villiers A (2009). A review of school nutrition interventions globally as an evidence base for the development of the HealthKick programme in the Western Cape, South Africa. **South African Journal of Clinical Nutrition** 22(3):145-152.

Tuuri G, Zanovec M, Silverman L, Geaghan J, Solmon M, Holston D, Guarino A, Roy H, Murphy E (2009). “Smart Bodies” school wellness program increased children’s knowledge of healthy nutrition practices and self-efficacy to consume fruit and vegetables. **Appetite** 52: 445-451.

Wardle J, Parmenter K, Waller J (2000). Nutrition knowledge and food intake. **Appetite** 34:269-275.

World Health Organization (2011). Growth reference data for 5 – 19 years. <http://www.who.int/growthref/en/>, (date accessed 2/06/2011).

CHAPTER 5: Determination of factors influencing the tuck shop purchasing practices of Grade 4 learners through focus group discussions

5.1 Introduction

Primary school aged children have progressively been given greater influence over their dietary intake. Unfortunately, this influence may be contributing toward poorer dietary choices (Noble *et al* 2000), which may in turn result in the higher incidences of childhood overweight and obesity that are currently being experienced. Nutrition education may play an important role in reducing the current overweight and obesity epidemic, however, in order to be successful it should be based on an understanding of what children perceive as “healthy” (Noble *et al* 2000).

According to Dammann and Smith (2010), research on the factors influencing dietary intake amongst preadolescent children is currently lacking, with more focus having been given to those in the preschool or adolescent age groups. Children aged 7 to 11 years are classified as being in the “concrete operational stage” according to the cognitive developmental model developed by Jean Piaget, who suggests that children “think, decide and perceive” differently about food, depending on their age group (Dammann & Smith 2010). It is therefore important to obtain information regarding the factors influencing the dietary intake of preadolescent children, generally Grade 4 learners, in South Africa.

The focus group discussion is a well recognized research technique used to obtain qualitative data (Kahlor, Mackert, Junker & Tyler 2011). This qualitative data include opinions, thoughts and “experiences” and according to Porcellato, Dughill and Springett (2002) and Krueger (1994, p6) is obtained through “active participant interaction in a permissive, non-threatening environment”. Participant interaction forms the basis of a focus group discussion where researchers make use of open ended questions to allow information to be obtained in the respondent’s own words. Unplanned thoughts and ideas surrounding the topic are supported and encouraged, prompting further discussion amongst group members that in turn allows a variety of opinions to be generated (Halcomb, Gholizadeh, DiGiacomo, Philips & Davidson 2007, Wood Charlesworth & Rodwell 1997).

A comprehensive interview guide, competent moderator, accurate and reliable research questions and capable subjects who actively participate are important aspects of a successful focus group discussion (Chioncel, Van der Veen, Wildemeersch 2011).

Focus group discussions have numerous strengths including the development of a group perspective (Halcomb *et al* 2007). They also allow access to a broad range of participants who are both “culturally and linguistically” diverse (Halcomb *et al* 2007). This may also include a variety of opinions and preferences related to eating behaviour. The flexible nature of the focus group discussion facilitates a greater variety of responses compared to a more structured survey technique (Krueger 1994, p34-35). Weaknesses of focus groups possibly include the group’s interaction influencing the amount of information willingly shared by individual participants, as well as difficulty in managing disagreements amongst a “conflicting” group. The facilitator must also take note of both verbal and non-verbal reactions to the questions, which may prove difficult (Halcomb *et al* 2007, Horowitz, Vessey, Carlson, Bradley, Montoya & McCullough 2003).

The school environment in particular, provides an advantageous environment to conduct focus group discussions because of the great number of children available (Kahlor *et al* 2011). Homogeneity within the group is advantageous because it makes the best use of the interaction amongst the group members, averting the dynamics of both reserved and outgoing members (Kitzinger 1995, Khan & Manderson 1992). Using subjects that regularly interact with each other provides an added bonus where group members may dispute any comments made by focus group members that do not accurately reflect actual behaviour (Kitzinger 1995).

Focus group discussions with children may require a different approach to the methods used with adults (Kahlor *et al* 2011). Although children may find it easier to express themselves verbally rather than through written answers, obtaining a child’s opinion may be challenging due to their intellectual capacity and limited ability to pay attention (Porcellato *et al* 2002). The influence of peer pressure on a focus group should also be considered (Kahlor *et al* 2011, Horner 2000).

The purpose of this focus group discussion was to determine perceptions regarding the items stocked at the school tuck shop along with the motivating factors influencing tuck shop

purchases. It was anticipated that these results would provide a small amount of qualitative insight into the quantitative findings obtained in Chapter 4.

5.2 Research design

A cross-sectional research design was employed using two single-sex focus groups from one school. This school was chosen from the sample of four schools that were used to complete the questionnaire in Chapter 4. The researcher selected this school on the basis that from all eleven schools originally surveyed in Chapter 3 this school had the greatest variety and availability of both healthy and unhealthy tuck shop items. It was believed that the opinions obtained from these focus groups would be representative of all Grade 4 learners given the opportunity to purchase a wide variety of both healthy and unhealthy tuck shop items. Single sex groups were used to allow a comparison of the purchasing habits amongst the genders. This was also expected to facilitate a small qualitative comparison of the quantitative findings obtained in Chapter 4 and provide greater insight into the learners' tuck shop purchasing behaviour.

5.3 Methodology

5.3.1 Sample selection and data collection

Both focus group discussions were held at a quintile 5 (well-resourced) school where learners had completed the questionnaire discussed in Chapter 4. Each focus group consisted of five Grade 4 girls or boys randomly selected from the same class. Krueger (1994, pix) suggests a smaller group of between 5 and 7 participants is optimal, not only from a practical perspective but also because this allows more time for individual participants to express their opinions.

These focus group discussions took place during the school day, therefore to ensure there was minimal disruption to the entire Grade; the researcher used learners from the same class. Although the sample size was small, it was anticipated that a random (as opposed to purposive) selection would ensure the sample was representative of all Grade 4 learners. Prior to the administration of the questionnaire in Chapter 4, each teacher had been given a register of anonymous codes to assign to each learner. The purpose of this register was to facilitate the process of ensuring both the informed consent and assent forms had been returned. Five male and

five female learners were randomly selected from this register of anonymous codes. This allowed the qualitative and quantitative findings to be compared.

The focus group discussions took place one month after the learner questionnaire had been administered. A digital voice recorder was used to record each session and an undergraduate student was employed to take minutes for each focus group discussion. The same student transcribed the discussions for data analysis. The researcher compared the minutes with the recorded sessions to ensure there were no discrepancies. Chioncel, Van der Veen and Wildemeersch (2011) state that within a focus group “validity requires that the participants are competent, while reliability requires that the participants give a variety of answers”. An independent trained researcher should be able to come to the same conclusions when analysing the transcripts (Mays & Pope 1995). This can be ensured through thorough record keeping and documentation of the analysis “process”. Audio recordings are extremely advantageous to facilitate this process (Mays & Pope 1995).

Krueger (1994, p32) states that focus group discussions have high face validity because of the credibility of the participants’ responses. To improve validity, the researcher pilot tested the questions on a group of Grade 4 learners who did not participate in any part of the study. This process was intended to allow any ambiguous questions to be clarified before they were used in the study.

5.3.2 Research instrument

The interview guide used for each discussion can be found in Appendix G (p150). Topics in each discussion included determining the learners’ opinions regarding healthy food and its importance, the learners’ tuck shop purchasing practices, as well as opinions about the food and beverages sold at their school tuck shop. Each session began with a discussion starter describing the purpose of the focus group discussion where learners were encouraged to speak freely and honestly. The discussion starter was then followed by a warm up activity or “ice breaker” during which learners were asked to introduce themselves, state how old they were and describe their favourite food. Once the warm up activity had concluded, the discussion began and learners were asked a variety of questions related to their tuck shop purchasing activities, food and beverage items brought

from home as well as perceptions of healthy and unhealthy food and beverages. The discussion concluded with a summary where the researcher thanked the learners for participating. At the end of the session the learners were given a small cereal snack bar and fruit juice as a token of appreciation. The female focus group discussion lasted 40 minutes while the male session lasted 25 minutes.

5.3.3 Data analysis

According to Massey (2011), the data generated from focus groups can be categorised into three levels, namely articulated data, attributional data and emergent data. Articulated data represents the information generated when specific questions are asked from the discussion guide, as well as any discussions that are generated in response to these questions. Attributional data represents the responses obtained regarding the researcher's "p priori theories, operating hypothesis or research questions" while emergent data is the impromptu responses that are used for "new insights and hypothesis formulation" (Massey 2011). The information generated from this study was classified as articulated data as it was analysed according to the direct individual and group responses to the questions asked by the researcher and no side issues arose from the discussions.

5.4 Results

The questionnaire sample size ($n = 10$) is too small for quantitative analysis and statistical tests, so for the purpose of this chapter, the researcher will describe the results and then compare them to the qualitative findings from the focus group discussion.

5.4.1 Characteristics of the focus group learners

The average age of both the male ($n = 5$) and female ($n = 5$) learners was 10 years old.

5.4.2. Anthropometric results

According to the WHO z-score classifications, three of the five boys were overweight, while one girl was overweight and one girl was obese, indicating that half the sample had BMI's in the normal category while the other half of the sample was at least overweight. These figures are only slightly different from the general sample findings in Chapter 4, where 46% of the sample was in the normal BMI category and 54% of the sample was at least overweight.

5.4.3 Socio-demographic factors

All learners had most of the resources with the exception of the internet, weekly magazine and daily newspaper, indicating they came from a higher socio-economic background. Only one learner indicated the presence of a medical condition – diabetes, whilst five learners indicated that a family member had been diagnosed with either diabetes or high cholesterol.

5.4.4 Food brought from home

All learners brought food from home to eat at school every day, as confirmed in the focus group discussion. Most learners brought sandwiches and juice, while other items brought from home included cereal bars, fruit, biscuits, cheese wedges, peanuts and raisins. All learners responded positively when asked if they liked the food that they brought from home and all claimed to consume everything that was brought.

5.4.5 Perception of healthy and unhealthy foods

In the focus group discussion both male and female learners identified fruit and vegetables as healthy foods because they “contained vitamins and minerals”. The learners identified sweets, crisps, junk food, carbonated beverages, ice cream, chocolates, pizza and deep fried items as unhealthy foods. Reasons for classifying these items as unhealthy included “they are bad for your teeth” (male response) and “it can make you feel sick and fat” (female response).

When asked to explain why they thought it was important to eat healthy food, learner’s responses included:

- “healthy food allows your body to grow stronger” (male response)
- “builds muscles” (male response)
- “gives me energy to do sport” (female response)
- “prevents disease”(female response)

In contrast, learners were asked to explain why they thought it was important not to eat unhealthy food. Responses included:

- “puts bad chemicals in your body” (male response)

- “prevents digestion of food” (female response)
- “causes diarrhoea” (female response)
- “increases the risk of cancer and diabetes” (female response)

The learners were presented with a list of items that their tuck shop sold and asked to categorise each item as either healthy or unhealthy (Table 6.1). There were only two items that were allocated to both categories, namely popcorn and two minute noodles. The main reason that the girls classified two minute noodles as unhealthy was due to the presence of “flavourants and chemicals”. When asked whether they were satisfied with their choice of placements, one of the male learners then also requested that the two minute noodles were moved to the unhealthy category for the same reason described by the girls. However, when put to the group vote, this learner was the only one who felt this item should be moved and therefore the noodles remained in the healthy column. There was some indecision amongst the girls regarding where popcorn should be allocated, however the final group consensus was that it was a healthy food, provided it was air popped. Both items could fall in either category depending on their method of preparation. Popcorn could be classified as healthy if it was air popped and unhealthy if it was cooked in oil and served with a butter seasoning. Two-minute noodles could be classified as healthy if it was prepared without the accompanying seasoning and unhealthy if it was prepared using the seasoning that contains added salt and chemical flavourants.

The two groups were asked if they would still visit their tuck shop if unhealthy items were no longer sold. All male learners responded that they would still buy items from the tuck shop, however, three of the five learners stated they would visit the tuck shop less frequently. The remaining two learners claimed that they were not purchasing the items that had been removed so this would not affect them at all. All five of the female learners stated they would continue visiting the tuck shop if the unhealthy options were unavailable. One female learner made the comment that “I think less people would go because the unhealthy things are nicer to eat and.....people won’t really want to go anymore”.

Table 5.1: Tuck shop items allocated to healthy or unhealthy categories

Healthy		Unhealthy	
Girls	Boys	Girls	Boys
Fruit Salad	Fruit Salad	Sweets & Chocolates	Sweets & Chocolates
Fruit	Fruit	Chips	Chips
Dried Fruit Sticks	Dried Fruit Sticks	Jelly & Custard	Jelly & Custard
Fruit Juice	Fruit Juice	Flapjack & Ice-cream	Flapjack & Ice-cream
Milo	Milo	Cold drinks	Cold drinks
Yoghurt	Yoghurt	Burgers	Burgers
Cereal bars	Cereal bars	Splashes	Splashes
Sandwiches	Sandwiches	Wors & Hotdog rolls	Wors & Hotdog rolls
Toasted sandwiches	Toasted sandwiches	Pizza	Pizza
Salad	Salad	Vetkoek	Vetkoek
Salad rolls	Salad Rolls	Hot chips	Hot chips
		Sausage roll	Sausage roll
		Powerade	Powerade
	Two-minute noodles*	Two-minute noodles*	
Popcorn*			Popcorn*

*For these variables, allocations differed between male and female learners

5.4.6 Tuck shop purchasing practices

The questionnaire results showed that all learners indicated that they purchased items from their tuck shop. Three learners did not indicate how often they purchased, while six learners indicated that they purchased at least once a week. The remaining learner indicated that she purchased from the tuck shop twice a week. The most common period for visiting the tuck shop according to the questionnaire was the 2nd break (n = 9) with one learner indicating he purchased items at both breaks. Six learners used both their personal money together with money obtained from their parents, to purchase tuck shop items. Four out of the five male learners spent R10.00 at each tuck

shop visit, with the remaining learner spending R1. The amount of money spent by the female learners ranged from R3.00 to R7.50.

In the focus group discussion, the frequency of tuck shop visits for all learners ranged from once or twice a week; to once, twice or even only three times a month. None of the learners visited the tuck shop more than three times a week. Common items purchased by the learners included frozen popsicles, popcorn, flavoured water, two minute noodles and loose sweets. These results were similar to the questionnaire findings where six learners indicated that they purchased both a snack and drink at the tuck shop, while two learners only purchased snacks and the remaining one only purchased sweets from their tuck shop.

Before presenting the learners with options from Table 5.1, they were asked to discuss why they had purchased these items from the tuck shop. Answers included “they taste nice”, “my friends buy these items”, “I like to have something after sport”, “I don’t get these items at home”. Learners were then presented with seven possible motivating factors (Appendix G, p150) and asked to choose the three main reasons that most suited why they bought items from the tuck shop. The three main items chosen by each group are presented in Table 5.2. These choices agree with the results reported from the questionnaire as described in Chapter 4.

Table 5.2: Important reasons why learners purchased tuck shop items

	Girls	Boys
Most important reason	<i>This is my favourite thing to eat or drink.</i>	<i>This is my favourite thing to eat or drink.</i>
Second most important reason	<i>I only have enough money to buy this item.</i>	<i>I only have enough money to buy this item.</i>
Third most important reason	<i>My friends buy these items.</i>	<i>The person looking after me tells me I am only allowed to buy these items.</i>

5.4.7 Nutrition knowledge scores

The nutrition knowledge scores of each learner are presented in Table 5.3. Total knowledge levels in the male subjects ranged from 6 out of 26 (23.1%) to 15 out of 26 (57.7%); while in the female subjects it ranged from 11 out of 26 (42.3%) to 21 out of 26 (80.8%). Apart from the questions regarding the food based dietary guidelines (FBDG), the female learners performed better than the male learners on the nutrition knowledge questions.

Table 5.3: Quantitative nutrition knowledge test scores

	Total Knowledge		FBDG		Fats and sugars		Fibre		Recommended fruit servings per day	
	out of 26	%	out of 6	%	out of 17	%	out of 2	%	out of 1	%
Average Male	12.0	46.2	2.2	36.7	8.6	50.6	0.8	40.0	0.4	40.0
Average Female	14.6	56.2	2.2	36.7	10.4	61.2	1.2	60.0	0.6	60.0
Average Total	13.3	51.2	2.2	36.7	9.5	55.9	1.0	50.0	0.5	50.0

5.5 Discussion

Learners were asked to participate in focus groups in order to determine their perceptions regarding the items stocked at the school tuck shop along with the motivating factors influencing tuck shop purchases. The purpose of this was to provide a small amount of qualitative insight into the quantitative findings of the questionnaire in Chapter 4. Both the qualitative and quantitative findings will be discussed in this section.

Learners confirmed that they consumed all the food that was brought from home. This reinforces the results reported in Chapter 4 that learners are coming from households with adequate access to food, and that they only use the tuck shop to supplement their lunchbox. Although this sample did not fall into the frequent purchasers category (making tuck shop visits at least three times per week), the prevalence of overweight and obesity within these learners was still fairly high. Just over half the learners had indicated on the questionnaire that they were purchasing multiple items from the tuck shop.

This should motivate school management to restrict the number of unhealthy energy dense tuck shop items available for sale. It is suspected that the consumption of these items in addition to a normal dietary intake may be contributing to the development of childhood overweight and obesity as seen by the high prevalence of overweight and obesity not only amongst these learners but amongst the whole sample in Chapter 4. This is particularly relevant when taking into consideration that based on the findings of the questionnaire these learners come from a relatively wealthy socio-economic community and attend a school with considerable resources. This is a recipe for disaster. An inverse relationship has been found to exist between socioeconomic status and obesity in developed countries, where lower socioeconomic areas experienced higher incidences of obesity. However, in developed countries this relationship is directly related (Ball & Crawford 2005). These learners therefore stand a high risk of developing obesity, and as a result, have an increased risk of developing those diseases generally associated with obesity, or in more general terms, diseases of lifestyle. This was already seen by the fact that one of the female learners, who was classified in the obese BMI category had indicated she had been diagnosed with diabetes.

This finding highlights the necessity for proper intervention programmes that target learners from an early age. Education, however is not necessarily the most appropriate solution to change the eating behaviour of these school children, This is supported by the study findings, which indicate that learners were accurate in distinguishing between a healthy and unhealthy item that was available for sale at their school tuck shop, which is only apparently encouraging. Having a family member diagnosed with a medical condition, as indicated in the quantitative results, could have resulted in additional nutrition knowledge awareness through the potential dietary counselling that the family member would have received as well as any dietary modifications that would have had to take place within the learner's household.

Yet despite knowing the difference between healthy and unhealthy food and beverages, and acknowledging the general health problems associated with the intake of unhealthy food, some learners were still purchasing unhealthy items from the tuck shop. Zeinstra, Koelen, Kok and de Graaf (2007) reported that children in this age group were able to explain the benefits of healthy foods to the body, but were unable to explain the mechanisms through which healthy food

promotes good health. Noble et al (2000) confirmed this relationship in their focus group study of English primary school children, which is also supported by the additional findings of Hesketh et al (2005), in their focus groups, were conducted using Australian primary school children.

Other studies show that children may be more reluctant to choose a healthier option based on the belief that it is inconvenient and unappealing (McKinley et al 2005). This emphasises the need to find a practical solution to change their attitudes towards exercising a healthier choice. Noble et al (2000) further suggest that further education strategies should also involve parents as well. Parents contribute significantly towards their child's nutritional knowledge. Moreover, children may also mimic their parent's attitudes and practices surrounding food (Brown & Ogden 2004). This may prove difficult to achieve, but children with parents who follow an unhealthy dietary intake would require additional motivation from the school curriculum with an emphasis on making healthier dietary choices.

It was encouraging to note that most of the learners would continue to shop at the tuck shop if all unhealthy items were removed. These learners, however, claimed to already be purchasing "healthy" items from their tuck shop, therefore believe they would not be making too much of a sacrifice. The male learners however, were more hesitant to visit the tuck shop if unhealthy items were removed because in most instances these items were also their favourite items. McKinley et al (2005) reported that the male volunteers in their focus group rejected healthy food on the basis that they became hungry more quickly when compared to eating unhealthy foods. This hesitance could also be explained by the fact that in general the male learners performed worse on the nutrition knowledge questions than the female learners. These learners would require additional nutrition education and motivation to understand why it is important to choose healthy food options.

Further studies are required to establish whether implementing a "ban" on unhealthy items results in decreased sales. Yet, recent studies in the United States show that by banning the sale of unhealthy items, or by removing them from the stock list, that learners would compensate for banned items by making use of alternative vendors/ suppliers in close vicinity to the school (Jaime & Lock 2009). On the other hand Naidoo et al (2009) found favourable results during

their pilot study intervention where a gradual ban on tuck shop items appeared to have no effect on sales. Introducing a school food policy in combination with nutrition education of both the learners and their parents could be a suitable strategy to ensure success.

In their study that looked at improving the fruit and vegetable intake of primary school age children, French and Stables (2003) suggested that a “multi-component” campaign be used incorporating the nutrition education received at school, parental influence as well as the food provided at school. Ensuring children are both regularly and increasingly exposed to healthier food through education as well as their home and school environment will improve their tolerance and acceptability of these items.

It is important to acknowledge that none of the learners that participated in the focus groups visited the tuck shop frequently (more than three times per week). This may in part, explain their responses to the removal of unhealthy items from the tuck shop, because purchasing from the tuck shop does not appear to be a high priority or frequent behaviour for these learners. It is encouraging though to note that this focus group sample included learners who claimed to purchase healthy items. However, it is also important that one should conduct focus group discussions amongst the frequent purchasers to determine whether they shared the same sentiment. Yet learners from the focus group chose similar motivating factors for purchasing tuck shop items compared to those from the overall questionnaire sample population, supporting the quantitative findings that learners are purchasing from their school tuck shop because they like the item and they can afford it, not because it contains apparent health promoting properties.

5.6 Conclusion

The results of the focus group reveal that despite having the necessary knowledge to distinguish between a healthy and unhealthy tuck shop item, learners do not necessarily apply this knowledge when visiting the school tuck shop. The value of additional education programmes targeting only the learner’s knowledge of healthy food choices is therefore questionable. Much motivation is required to encourage learners to apply their knowledge to purchase healthier tuck shop items. The problem is exacerbated by recent research findings that suggest that limiting tuck shop stock to healthy items does not prevent learners from eating unhealthy food items, which they will go

out and find elsewhere. This is discouraging and complicates the nature of the problem, since it requires additional innovative means to change the eating habits of school children. Successful strategies to improve the eating behaviour of school children therefore, should incorporate both nutrition education as well as limiting access to unhealthy food and beverages, at both the school and home environment.

References

- Ball K, Crawford D (2005). Socioeconomic status and weight change in adults: a review. **Social Science & Medicine** 60: 1987-2010.
- Brown R, Ogden J (2004). Children's eating attitudes and behaviour: a study of the modelling and control theories of parental influence. **Health Education Research** 19(3): 261-271.
- Chioncel NE, Van der Veen RGW, Wildemeersch D, Jarvis P (2011). The validity and reliability of focus groups as a research method in adult education. **International Journal of Lifelong Education** 22(5): 495-517.
- Dammann K, Smith C (2010). Food-related attitudes and behaviours at home, school, and restaurants: perspectives from racially diverse, urban, low-income 9-13 year old children in Minnesota. **Journal of Nutrition Education and Behaviour** 42: 389-397.
- French SA, Stables G (2003). Environmental interventions to promote vegetable and fruit consumption among youth in school settings. **Preventive Medicine** 37:593-610.
- Halcomb E, Ghodlizada L, DiGiacomo M, Phillips J, Davidson PM (2007). Literature review: Considerations in undertaking focus group research with culturally and linguistically diverse groups. **Journal of Clinical Nursing** 16(6): 1000-1011.
- Hesketh K, Waters E, Green J, Salmon L, Williams J (2005). Healthy eating, activity and obesity prevention: a qualitative study of parent and child perceptions in Australia. **Health Promotion International** 20(1):19-26.

- Horowitz JA, Vessey JA, Carlson KL, Bradley JF, Montoya C, McCullough B (2003). Conducting school-based focus groups: Lessons learned from the CATS project. **Journal of Pediatric Nursing** 18(5): 321-331.
- Horner SD (2000). Focus on research methods: Using focus group methods with middle school children. **Research in Nursing & Health** 23: 510-517.
- Jaime PC, Lock K (2009). Do school based food and nutrition policies improve diet and reduce obesity? **Preventive Medicine** 48: 45-53.
- Kahlor L, Mackert M, Junker D, Tyler D (2011). Ensuring children eat a healthy diet: A theory-driven focus group study to inform communication aimed at parents. **Journal of Pediatric Nursing** 26(1): 13-24.
- Khan ME, Manderson L (1992). Focus groups in tropical diseases research. **Health Policy and Planning** 7(1): 56-66.
- Kitzinger J (1995). Introducing focus groups. **British Medical Journal** 311: 299-302.
- Krueger RA (1994). **Focus Groups: A practical guide for applied research, 2nd ed.** Thousand Oaks: Prentice Hall.
- Massey OT (2011). A proposed model for the analysis and interpretation of focus groups in evaluation research. **Evaluation and Program Planning** 34: 21-28.
- Mays N, Pope C (1995). Rigour and qualitative research. **British Medical Journal** 311: 109-112.
- McKinley MC, Lowis C, Robson PJ, Wallace JMW, Morrissey M, Moran A, Livingstone MBE (2005). It's good to talk: children's views on food and nutrition. **European Journal of Clinical Nutrition** 59: 542-551.
- Naidoo R, Coopoo Y, Lambert EV, Draper C (2009). Impact of a primary school-based nutrition and physical activity intervention on learners in KwaZulu-Natal, South Africa: a pilot study. **South African Journal of Sports Medicine** 21(1): 7-12.

Noble C, Corney M, Eves A, Kipps M, Lumbers M (2000). Food choice and school meals: primary schoolchildren's perceptions of the healthiness of foods and the nutritional implications of food choices. **Hospitality Management** 19: 413-432.

Porcellato L, Dughill L, Springett J (2002). Using focus groups to explore children's perceptions of smoking: reflections on practice. **Health Education** 102(6): 310-320.

Wood Charlesworth L, Rodwell, M (1997). Focus groups with children: A resource for sexual abuse prevention program evaluation. **Child Abuse & Neglect** 12: 1205-1216.

Zeinstra GG, Koelen MA, Kok FJ, de Graaf C (2007). Cognitive development and children's perceptions of fruit and vegetables; a qualitative study. **International Journal of Behavioral Nutrition and Physical Activity** 4:30.

CHAPTER 6: FINAL CONCLUSIONS AND RECOMMENDATIONS

6.1 Summary of the research approach

Childhood overweight and obesity is currently a serious public health concern (WHO 2010). This investigation was important to determine whether the food and beverages available at primary schools were contributing to the development of childhood overweight or obesity - specifically through what was available to purchase and through the choices that learners were making when faced with an opportunity to purchase both healthy and unhealthy items.

Firstly, a tuck shop survey was conducted to assess the nutritional quality of the food and beverage items available for learners to purchase, along with school policies and restrictions that were available regarding tuck shop use. Secondly, a questionnaire was used to determine the anthropometric and socio-demographic characteristics of Grade 4 learners, their tuck shop purchasing practices and factors influencing tuck shop purchases, as well as their nutritional knowledge. Thirdly, a focus group discussion was conducted amongst a small sample of male and female Grade 4 learners to obtain qualitative data regarding both their tuck shop purchasing practices and factors influencing these purchases.

The following objectives were investigated in this study:

- To assess the nutritional quality of the food and beverage items available for learners to purchase.
- To determine whether primary schools had policies and restrictions on tuck shop use.
- To determine the anthropometric and socio-demographic characteristics of Grade 4 learners who frequently purchased food items from their school tuck shop compared to those who used the tuck shop infrequently.
- To determine whether Grade 4 learners were using the tuck shop to purchase their entire lunch meal or to supplement food and beverages brought from home.
- To determine the items that Grade 4 learners were regularly purchasing, as well as the amount of money that learners were spending at their school's tuck shop.
- To determine the factors influencing the Grade 4 learner's decision to purchase school tuck shop items.

- To determine the nutrition knowledge levels of Grade 4 learners related to their tuck shop purchasing practices.

6.2 Findings and conclusions

The following model (extracted from Chapter 2, Figure 2.2) was tested in this study, Figure 6.1.

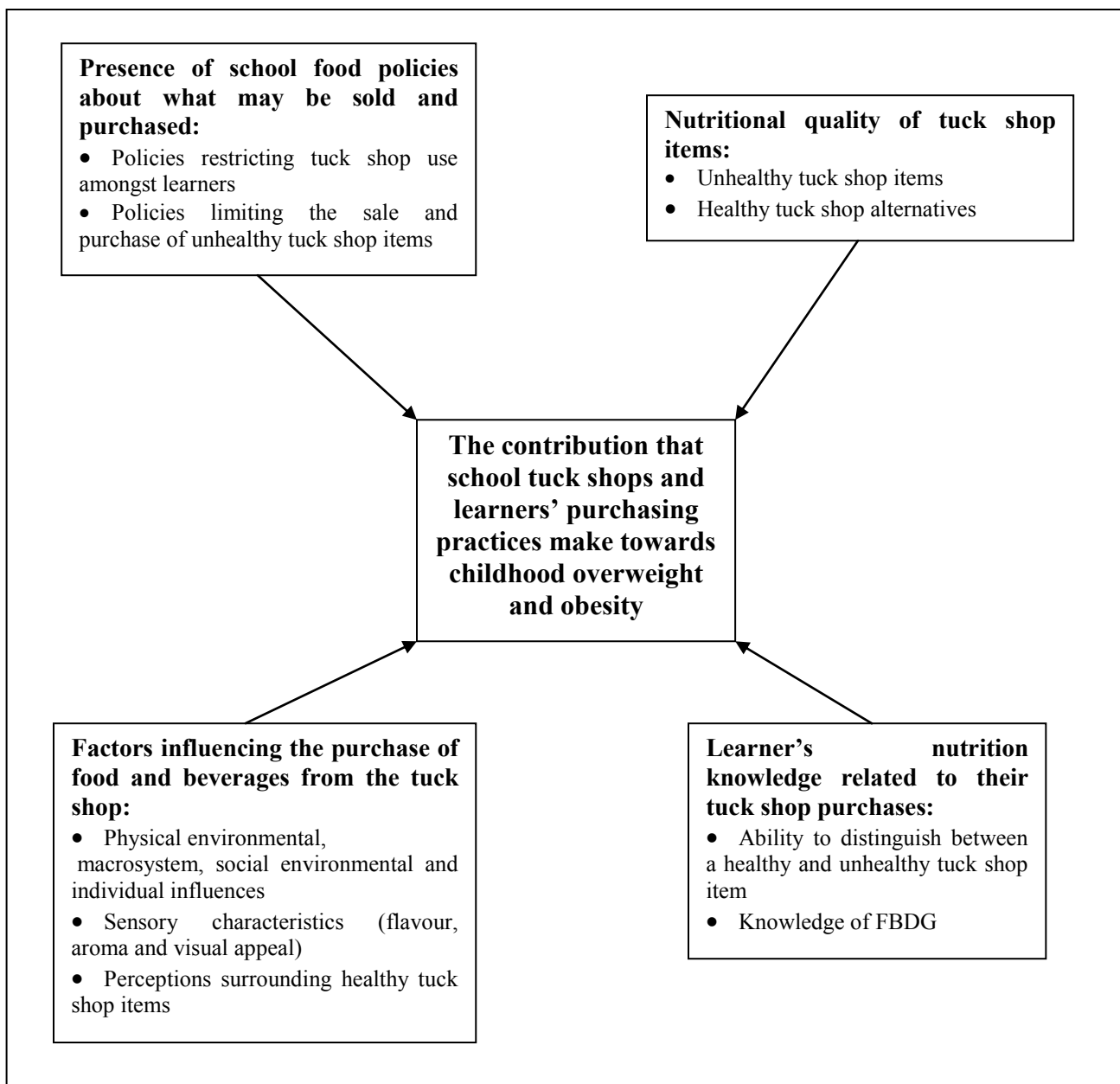


Figure 6.1: Factors influencing the contribution that school tucks shops along with the purchasing practices of learners' make towards childhood overweight and obesity

6.2.1 Presence of school food policies and nutritional quality of tuck shop items

Most tuck shops are privately managed and most schools do not impose monetary restrictions for tuck shop purchases. Nutritional analyses of tuck shop items in this study indicated that primary school tuck shops are selling some foods and beverages to children that encourage an unhealthy lifestyle. The homemade healthier options, provided by a small number of schools, such as salad rolls and salads, had high fat contents due to over generous ingredient quantities. Tuck shop managers perceive that it is more costly to sell healthier items and certain healthier items are not sold because of refrigeration restrictions imposed by a popular carbonated beverage distributor. As a consequence, primary school tuck shops are playing a role in promoting an early onset of childhood overweight and obesity, through the lack of adequate school food policies and through the poor nutritional quality of the tuck shop items that are sold to learners.

6.2.2 Factors influencing the purchase of tuck shop items and learners nutritional knowledge related to tuck shop purchasing practices

This study revealed a concerning incidence of overweight and obesity amongst Grade 4 learners. Most of the learners make purchases from their school tuck shop and most of the learners who are overweight or obese, are purchasing from their tuck shop frequently. Learners make tuck shop purchases of highly favoured items that are affordable and popular amongst peers. Choosing healthier items or alternatives is not a motivating factor behind tuck shop purchases. The current level of nutrition knowledge amongst Grade 4 learners is poor, especially regarding the South African Food Based Dietary Guidelines. Knowledge levels play a role in the frequency of tuck shop purchases, with those having a higher level of nutrition knowledge choosing to purchase from their tuck shop less frequently. Despite being able to distinguish between healthy and unhealthy items, learners are not translating this knowledge into application and practice. As a consequence, the tuck shop purchasing practices of Grade 4 learners are playing a role in promoting an early onset of childhood overweight and obesity.

6.3 Recommendations

This study has shown that primary school tuck shops of well resourced schools in Pietermaritzburg are contributing to childhood overweight and obesity through the poor nutritional quality of the items stocked at the tuck shop and through the poor tuck shop

purchasing practices of the learners purchasing from their tuck shop. Two main recommendations then arise related to 1) improving the nutritional quality of tuck shop items; and 2) improving the levels of nutrition knowledge along with motivating the frequent tuck shop purchasers to translate their improved nutrition knowledge levels into healthier tuck shop purchasing practices. This could be achieved through the following avenues:

School management:

It is recommended that the governing bodies and school principals play a greater and active role in the management of their school tuck shops. Together with consultation from dietetic and nutrition professionals, school management should place priority on:

- 1) Restricting the number of unhealthy items available for purchase;
- 2) Restricting the amount of money available for purchases;
- 3) Improving the resources available at the tuck shop to facilitate the display and promotion of healthier tuck shop items;
- 4) Educating tuck shop managers regarding the appropriate quality and quantity of ingredients used in the preparation of homemade tuck shop items;
- 5) Overcoming any negative attitudes and barriers that prevent tuck shop managers from making and selling healthy items, especially where private tuck shop managers have control over what is sold;
- 6) Placing greater emphasis on the importance of a healthy lifestyle, including dietary intake and physical activity, at both school (including aftercare) and home environment. This can be done by increasing the learner's exposure to positive healthy lifestyle messages not only through nutrition education but through other subjects offered to the learner – where healthy nutrition messages can be incorporated into the subject matter as examples.
- 7) Improving communication with parents about policies and restrictions on the food and beverages that the learner brings from home to eat at school as well as what is purchased at the school tuck shop;
- 8) Improving the education and knowledge of parents about appropriate weight ranges for their children to ensure that parents are able to pick up potential weight problems before they escalate into debilitating health problems;

- 9) Improve the nutrition education knowledge of teachers and learners by auditing nutrition education lessons to ensure that the material is both appropriate and relevant to South Africa.

Government / Department of Education should:

- 1) Prioritise improving levels of nutrition knowledge amongst learners by improving the quality of nutrition education. This can be done by standardizing nutrition education material and continuously auditing schools to ensure that the nutrition education taught and received is of an appropriate, high standard;
- 2) Prioritise nutrition education in the life orientation curriculum by increasing the number of hours spent per week teaching learners as well as ensuring that learners receive an excellent foundation of nutrition knowledge that they can carry forward throughout their school career;
- 3) Increase healthy lifestyle interventions at schools thereby improving the promotion of a healthy diet and adequate physical activity (during and after school) and ensuring that learners are able to translate knowledge into practice.

6.4 Study critique and recommendations for further research

The tuck shop survey had several limitations in that it relied on the opinions of the tuck shop managers and only included a “snap shot” of what the tuck shops had stocked on that particular day. Further study could include a more in depth analysis of what tuck shops stocked throughout the year to allow for “seasonality” of certain ingredients and items. One could also spend more time analysing the tuck shop inventory over a longer period to allow greater insight into actual tuck shop sales. It would be relevant to determine the influence that improving the marketing of healthy tuck shop items would have on their purchase and consumption. If greater resources were available, one could have used laboratory equipment such as bomb calorimetry to conduct nutritional analyses for greater accuracy, instead of relying on household measures and computer software.

Further study could make use of a larger sample of learners from multiple grades to ensure a more accurate reflection of all primary school learners’ tuck shop purchasing practices taking into

account any influences that adolescence may have on the child's purchasing decisions. One could also run nutrition education intervention programmes to determine whether an improvement in nutrition education would impact on both nutrition knowledge and the quality of tuck shop items frequently purchased. It would be worthwhile investigating the impact that tuck shop restrictions would have on income, should schools impose severe monetary and stock restrictions.

One could also investigate the influence that sources of food other than the school tuck shop have on the learners' dietary intake – including outside vendors and shops that learners may pass on the way to and from school, along with the home environment.

The influence that physical activity and sport during and after school has on tuck shop purchasing habits, along with BMI status should also be investigated. One could also investigate the influence and perception that the learners' culture has on the acceptability of overweight and obesity.

More focus group discussions, with larger sample sizes and using purposive sampling could also be conducted with frequent tuck shop purchasers to obtain insight into the factors affecting purchasing decisions. Additional items could also be investigated in these discussions including the factors influencing learners' perceptions of healthy food and tuck shop items.

Childhood overweight and obesity is not limited to well-resourced schools and so there is a need for further study to investigate schools from more poorly resourced areas where both underweight and overweight may exist.

COMPLETE REFERENCE LIST

- Abrahams Z, de Villiers A, Steyn NP, Fourie J, Dalais L, Hill J, Draper CE, Lambert EV (2011). What's in the lunchbox? Dietary behaviour of learners from disadvantaged schools in the Western Cape, South Africa. **Public Health Nutrition** doi:10.1017/S1368980011001108.
- Advertising Standards Authority of South Africa, ASA (2011). Appendix A – Marketing of health products. http://www.asasa.org.za/Default.aspx?mnu_id=44 (date accessed 4/09/2011).
- Armstrong MEG, Lambert MI, Sharwood KA, Lambert EV (2006). Obesity and overweight in South African primary school children – the Health of the Nation Study. **South African Medical Journal** 96(5): 439-444.
- Ball K, Crawford D (2005). Socioeconomic status and weight change in adults: a review. **Social Science & Medicine** 60: 1987-2010.
- Bevans KB, Sanchez B, Tenerall R, Forrest CB (2010). Children's eating behaviour: the importance of nutrition standards for foods in schools. **Journal of School Health** 81: 424-429.
- Birch LL, Fisher JO (1998). Development of eating behaviours among children and adolescents. **Pediatrics** 101: 539-549.
- Birch LL, Ventura AK (2009). Preventing childhood obesity: what works? **International Journal of Obesity** 33: S74-S81.
- Bowers D, House A, Owens D (2006). **Understanding Clinical Papers, 2nd ed.** Chichester: John Wiley & Sons.
- Britten N (1995). Qualitative interviews in medical research. **British Medical Journal** 311: 251-253.

- Brown R, Ogden J (2004). Children's eating attitudes and behaviour: a study of the modelling and control theories of parental influence. **Health Education Research** 19(3): 261-271.
- Carter MA, Swinburn B (2004). Measuring the 'obesogenic' food environment in New Zealand primary schools. **Health Promotion International** 19(1): 15-20.
- Cassim SB (2010). Food and beverage marketing to children in South Africa: Mapping the terrain. **South African Journal of Clinical Nutrition** 23(4): 181-185.
- Chioncel NE, Van der Veen RGW, Wildemeersch D, Jarvis P (2011). The validity and reliability of focus groups as a research method in adult education. **International Journal of Lifelong Education** 22(5): 495-517.
- Cleland V, Worsley A, Crawford D (2004). What are grade 5 and 6 children buying from school canteens and what do parents and teachers think about it? **Nutrition & Dietetics** 61: 145-150.
- Cohen L, Manion L, Morrison K (2005). **Research methods in Education, 5th ed.** RoutledgeFalmer: London.
- Collins CE, Watson J, Burrows (2010). Measuring dietary intake in children and adolescents in the context of overweight and obesity. **International Journal of Obesity** 34: 1103-1115.
- Collison KS, Zaidi MZ, Subhani SN, Al-Rubeaan K, Shoukri M, Al-Mohanna FA (2010). Sugar-sweetened carbonated beverage consumption correlates with BMI, waist circumference, and poor dietary choices in school children. **Biomed Central Public Health** 10:234 available at <http://www.biomedcentral.com/1471-2458/10/234>.
- Condon EM, Crepinsek MK, Fox M (2009). School meals: types of foods offered to and consumed by children at lunch and breakfast. **Journal of the American Dietetic Association** 109: S67-S78.

- Dammann K, Smith C (2010). Food-related attitudes and behaviours at home, school and restaurants: perspectives from racially diverse, urban low-income 9- to 13-year old children in Minnesota. **Journal of Nutrition Education and Behaviour** 42: 389-397.
- Davidson F (2007). Childhood obesity prevention and physical activity in schools. **Health Education** 107(4):377-395.
- Department of Education (2002). **Revised National Curriculum Statement Grades R-9 (Schools): Life Orientation**. Pretoria
- DeVault N, Kennedy T, Hermann J, Mwavita M, Rask P, Jaworsky A (2009). It's all about kids: Preventing overweight in elementary school children in Tulsa, OK. **Journal of American Dietetic Association** 109(5): 680 - 687.
- Dorfman L, Wallack L (2007). Moving nutrition upstream: the case for reframing obesity. **Journal of Nutrition Education and Behaviour** 39: S45-S50.
- Du Toit G, van der Merwe MT (2003). The epidemic of childhood obesity. **South African Medical Journal** 93(1): 49-50.
- Finch M, Sutherland R, Harrison M, Collins C (2006). Canteen purchasing practices of year 1-6 primary school children and association with SES and weight status. **Australian and New Zealand Journal of Public Health** 30(3): 247-251.
- Finch M (2010). Program manager and public health nutritionist, University of Newcastle, Australia. E-mail communication, 2 February 2010.
- Finnerty T, Reeves S, Dabinett J, Jeanes YM, Vogele C (2009). Effects of peer influence on dietary intake and physical activity in school children. **Public Health Nutrition** 13(3): 376-383.
- Florence MD, Asbridge M, Veugelers PJ (2008). Diet quality and academic performance. **Journal of School Health** 78(4): 209-215.

- Food and Drug Administration (2003). Claims that can be made for conventional foods and dietary supplements. <http://www.fda.gov/food/labellingnutrition/labelclaims/ucm111447.htm>, (date accessed 18/01/2010).
- French SA, Stables G (2003). Environmental interventions to promote vegetable and fruit consumption among youth in school settings. **Preventive Medicine** 37:593-610.
- French SA, Story M, Fulkerson JA, Hannan P (2004). An environmental intervention to promote lower-fat food choices in secondary schools: Outcomes of the TACOS study. **American Journal of Public Health** 94(9): 1507-1512.
- Gantz W, Schwartz N, Angelini JR, Rideout V (2007). Food for thought television food advertising to children in the United States. **The Kaiser Family Foundation** Report No: 7618.
- Gidding SS, Dennison BA, Birch LL, Daniels SR, Gilman MW, Lichtenstein AH, Rattay KT, Steinberger J, Stettler N, Van Horn L (2005). Dietary recommendations for children and adolescents: a guide for practitioners: a consensus statement from the American Heart Association. **Circulation** 112: 2061-2075.
- Goddard W, Melville S (2001). **Research methodology: An introduction, 2nd ed.** Landsowne: Juta.
- Gould E, Russell J, Barker ME (2006). School lunch menus and 11 to 12 year old children's food choice in three secondary schools in England – are the nutritional standards being met? **Appetite** 46: 86-92.
- Halcomb E, Ghodlizadaeh L, DiGiacomo M, Phillips J, Davidson PM (2007). Literature review: Considerations in undertaking focus group research with culturally and linguistically diverse groups. **Journal of Clinical Nursing** 16(6): 1000-1011.

Harrison K, Bost KK, McBride BA, Donovan SM, Grigsby-Toussaint DS, Kim J, Liechty JM, Wiley A, Teran-Garcia M, Costa Jacobsohn G (2011). Toward a developmental conceptualisation of contributors to overweight and obesity in childhood: the Six-Cs model. **Child Development Perspectives** 5(1): 50-58.

He M, Evans A (2007). Are parents aware that their children are overweight or obese? **Canadian Family Physician** 53:1493-1499.

Hesketh K, Waters E, Green J, Salmon L, Williams J (2005). Healthy eating, activity and obesity prevention: a qualitative study of parent and child perceptions in Australia. **Health Promotion International** 20(1): 19-26.

Hoelscher DM, Day S, Lee ES, Frankowski RF, Kelder SH, Ward JL, Scheurer ME (2004). Measuring the prevalence of overweight in Texas schoolchildren. **American Journal of Public Health** 94(6): 1002 - 1008.

Horner SD (2000). Focus on research methods: Using focus group methods with middle school children. **Research in Nursing & Health** 23: 510-517.

Horowitz JA, Vessey JA, Carlson KL, Bradley JF, Montoya C, McCullough B (2003). Conducting school-based focus groups: Lessons learned from the CATS project. **Journal of Pediatric Nursing** 18(5): 321-331.

International Association for the Study of Obesity (2011). <http://www.iaso.org/>, (date accessed 1/09/11).

International Expert Meeting (2009). Adapted summary statement of the International Expert Meeting: Health Significance of Fat Quality of the Diet. International Union of Nutritional Sciences and World Heart Federation, Cape Town, South Africa.

Jaime PC, Lock K (2009). Do school based food and nutrition policies improve diet and reduce obesity? **Preventive Medicine** 48: 45-53.

- Kahlor L, Mackert M, Junker D, Tyler D (2011). Ensuring children eat a healthy diet: A theory-driven focus group study to inform communication aimed at parents. **Journal of Pediatric Nursing** 26(1): 13-24.
- Khan ME, Manderson L (1992). Focus groups in tropical diseases research. **Health Policy and Planning** 7(1): 56-66.
- Kibblewhite S, Bowker S, Jenkins HR (2010). Vending machines in hospitals – are they healthy? **Nutrition & Food Science** 40(1): 26-28.
- Kim Y, Chang H (2011). Correlation between attention deficit hyperactivity diagnosis and sugar consumption, quality of diet, and diet behaviour in school children. **Nutrition Research and Practice** 5(3): 236-245.
- Kitzinger J (1995). Introducing focus groups. **British Medical Journal** 311: 299-302.
- Kraak V, Pelletier D (1998). The influence of commercialism on the food purchasing behaviour of children and teenage youth. **Family Economics and Nutrition Review** 11(3): 15-24.
- Krueger RA (1994). **Focus Groups: A practical guide for applied research, 2nd ed.** Thousand Oaks: Prentice Hall.
- Kruger R, Kruger HS, MacIntyre UE (2005). The determinants of overweight and obesity among 10- to 15- year-old schoolchildren in the North West Province, South Africa – the THUSA BANA (Transition and Health during Urbanisation of South Africans; BANA, children) study. **Public Health Nutrition** 9(3): 351 – 358.
- Kubik MY, Lytle LA, Hanan PJ, Perry CL, Story M (2003). The association of the school food environment with dietary behaviours of young adolescents. **American Journal of Public Health** 93: 1168-1173.
- Kubick MY, Lytle LA, Story M (2005). Soft drinks, candy and fast food: what parents and teachers think about the middle school food environment. **Journal of the American Dietetic Association** 105(2): 233-239.

- Labadarios D, Steyn NP, Maunder E, MacIntyre U, Gericke G, Swart R, Huskisson J, Dannhauser A, Vorster HH, Nesmvuni AE, Nel JH. The National Food Consumption Survey (NFCS): South Africa, 1999 (2005). **Public Health Nutrition** 85(5): 533-543.
- Labadarios (2008). National Food Consumption Survey – Fortification Baseline (NCFS-FB-South Africa: Executive Summary. **South African Journal of Clinical Nutrition** 21: Suppl. 2: 247–300.
- Leedy PD, Ormrod JE (2001). **Practical research: planning and design 7th ed.** New Jersey: Prentice Hall.
- Lissau I, Poulsen J (2005). Nutrition policy, food and drinks at school and after school care. **International Journal of Obesity** 29: S58-S61.
- Lloyd JL, Logan S, Graeves CJ, Wyatt KM (2011). Evidence, theory and context – using intervention mapping to develop a school-based intervention to prevent obesity. **International Journal of Behavioural Nutrition and Physical Activity** <http://www.ijbnpa.org/content/8/1/73/>, (date accessed 11/11/2011).
- Lucan SC, Karpyn A, Sherman S (2010). Storing empty calories and chronic disease risk: snack-food products, nutritive content, and manufacturers in Philadelphia corner stores. **Journal of Urban Health: Bulletin of the New York Academy of Medicine** 87(3): 394-409.
- Lobstein T, Baur L, Uauy R (2004). Obesity in children and young people: a crisis in public health. **Obesity Reviews** 5(Suppl 1): 4-85.
- Massey OT (2011). A proposed model for the analysis and interpretation of focus groups in evaluation research. **Evaluation and Program Planning** 34: 21-28.
- Mays N, Pope C (1995). Rigour and qualitative research. **British Medical Journal** 311: 109-112.

- McKinley MC, Lowis C, Robson PJ, Wallace JMW, Morrissey M, Moran A, Livingstone MBE (2005). It's good to talk: children's views on food and nutrition. **European Journal of Clinical Nutrition** 59: 542-551.
- Moschonis G, Tanagra S, Vandorou A, Kyriakou AE, Dede V, Siatitsa PE, Koumpitski A, Androutsos O, Grammatikaki E, Kantilafiti M, Naoumi A, Farmaki AE, Siopi A, Papadopoulou EZ, Voutsadaki E, Chlouveraki F, Maragkopoulou K, Argyri E, Giannopoulou A, Manios Y (2010). Social, economic and demographic correlates of overweight and obesity in primary-school children: preliminary data from the Healthy Growth Study. **Public Health Nutrition** 13(10A): 1693-1700.
- Naidoo R, Coopoo Y, Lambert EV, Draper C (2009). Impact of a primary school-based nutrition and physical activity intervention on learners in KwaZulu-Natal, South Africa: a pilot study. **South African Journal of Sports Medicine** 21(1): 7-12.
- Neumark-Sztainer D, Story M, Perry C, Casey MA (1999). Factors influencing food choices of adolescents: findings from focus-group discussions with adolescents. **Journal of the American Dietetic Association** 99: 929-937.
- Noble C, Corney M, Eves A, Kipps M, Lumbers M (2000). Food choice and school meals: primary schoolchildren's perceptions of the healthiness of foods and the nutritional implications of food choices. **Hospitality Management** 19: 413-432.
- O'Dea J, Nguyen Hoang TDG, Dibley MJ (2011). Plateau in obesity and overweight in a cross sectional study of low, middle and high socioeconomic status schoolchildren between 2004 and 2009. **International Journal of Public Health** Available on DOI 10.1007/s00038-011-0280-6.
- Oldewage-Theron WH, Egal AA (2010). Nutrition knowledge and nutritional status of primary school children in QwaQwa. **South African Journal of Clinical Nutrition** 23(3): 149-154.

- Oldewage-Theron W, Egal A (2011). Influence of nutrition education on nutrition knowledge of life skill education in public schools in South Africa, oral abstract. **Journal of Nutrition Education and Behaviour** 43(4S1):S11.
- Oosthuizen D, Oldewage-Theron WH, Napier C (2011). The impact of a nutrition programme on the dietary intake patterns of primary school children. **South African Journal of Clinical Nutrition** 24(2):75-81.
- Owen S, Schickler P, Davies J (1997). Food choice: how to assess attitudes of pre-adolescent children. **Nutrition & Food Science** 1: 5-11.
- Patrick H, Nicklas TA (2005). A review of family and social determinants of children's eating patterns and diet quality. **Journal of the American College of Nutrition** 24(2): 83-92.
- Pirouzina M (2001). The association between nutrition knowledge and eating behaviour in male and female adolescents in the US. **International Journal of Food Sciences and Nutrition** 52: 127-132.
- Porcellato L, Dughill L, Springett J (2002). Using focus groups to explore children's perceptions of smoking: reflections on practice. **Health Education** 102(6): 310-320.
- Rebok G, Riley A, Forrest C, Starfield B, Green B, Robertson J, Tambor E (2001). Elementary school-aged children's reports of their health: A cognitive interviewing study. **Quality of Life Research** 10: 59-70.
- Reinehr T, Kersting M, Chahda C, Andler W (2003). Nutritional knowledge of obese compared to non obese children. **Nutrition Research** 23: 645-649.
- Sanigorski AM, Bell AC, Kremer PJ, Swinburn BA (2005). Lunchbox contents of Australian school children: room for improvement. **European Journal of Clinical Nutrition** 59: 1310-1316.

- Sapp SG, Jensen HH (1997). Reliability and validity of nutrition knowledge and diet-health awareness tests developed from the 1989 - 1991 diet and health knowledge Surveys. **Journal of Nutrition Education** 29(2): 63 - 72.
- School Food Trust (2010) School Food Trust: Eat Better Do Better. <http://www.schoolfoodtrust.gov.uk>, (date accessed 11/07/2011).
- Sjoberg A, Moraesus L, Yngve A, Poortvliet E, Al-Ansari U, Lissner L (2011). Overweight and obesity in a representative sample of schoolchildren – exploring the urban-rural gradient in Sweden. **Obesity Reviews** 12: 305-314.
- Statistics South Africa (2011). Midyear population estimates 2011. <http://www.statssa.gov/publications/P0302/P03022011.pdf>, (date accessed 1/09/11).
- Steyn NP, Labadarios D, Maunder E, Nel J, Lombard C (2005). Secondary anthropometric data analysis of the national food consumption survey in South Africa: The double burden. **Nutrition** 21:4-13.
- Steyn NP, Lambert EV, Parker W, Mchiza Z, de Villiers A (2009). A review of school nutrition interventions globally as an evidence base for the development of the HealthKick programme in the Western Cape, South Africa. **South African Journal of Clinical Nutrition** 22(3):145-152.
- St-Onge MP, Keller KL, Heymsfield SB (2003). Changes in childhood food consumption patterns: a cause for concern in light of increasing body weights. **American Journal of Clinical Nutrition** 78: 1068-1073.
- Story M, Kaphingst KM, Robinson-O'Brien R, Glanz K (2008). Creating healthy food and eating environments: policy and environmental approaches. **Annual Reviews Public Health** 29: 253-272.
- Story M, Neumark-Sztainer D, French S (2002). Individual and environmental influences on adolescent eating behaviours. **Journal of the American Dietetic Association** 102(3): S40-S51.

- Story M (2009). The third school nutrition dietary assessment study: Findings and policy implications for improving the health of US children. **Journal of the American Dietetic Association** 109 (Suppl. 1): S7-S13.
- Temple NJ, Steyn NP, Myburgh NG, Nel JH (2006). Food items consumed by students attending schools in different socioeconomic status areas in Cape Town, South Africa. **Nutrition** 22: 252-258.
- The Botanical Society of South Africa (2010) KwaZulu-Natal Inland branch Newsletter July 2010, 3:2010.
- Turconi G, Celsa M, Rezzani C, Biino G, Sartirana MA, Roggi C (2003). Reliability of a dietary questionnaire on food habits, eating behaviour and nutritional knowledge of adolescents. **European Journal of Clinical Nutrition** 57: 753-763.
- Tuuri G, Zanovec M, Silverman L, Geaghan J, Solmon M, Holston D, Guarino A, Roy H, Murphy E (2009). “Smart Bodies” school wellness program increased children’s knowledge of healthy nutrition practices and self-efficacy to consume fruit and vegetables. **Appetite** 52: 445-451.
- Vereecken CA, Bobelijn K, Maes L (2005). School food policy at primary and secondary schools in Belgium-Flanders: does it influence young people’s food habits? **European Journal of Clinical Nutrition** 59: 271-277.
- Wang Y, Lobstein T (2006). Worldwide trends in childhood overweight and obesity. **International Journal of Pediatric Obesity** 1: 11-25.
- Wardle J, Parmenter K, Waller J (2000). Nutrition knowledge and food intake. **Appetite** 34:269-275.
- Warren E, Parry O, Lynch R, Murphy S (2008). ‘If I don’t like it then I can choose what I want’: Welsh school children’s accounts of preference for and control over food choice. **Health Promotion International** 23(2): 144-151.

- Weber ML, Morais TB (2010). Nutritional composition, assessed by chemical analyses, of prepared foods available for primary-school children: a comparison of public and private schools. **Public Health Nutrition** doi:10.1017/S1368980010000534.
- Weschler H, Devereaux RS, Davis M, Collins J (2000). Using the school environment to promote physical activity and healthy eating. **Preventive Medicine** 31: S121-S137.
- Wiles NJ, Northstone K, Emmet P, Lewis G (2009). “Junk food” diet and childhood behavioural problems: Results from the ALSPAC cohort. **European Journal of Clinical Nutrition** 63(4): 491-498.
- Wolff E, Dansinger ML (2008). Soft drinks and weight gain: how strong is the link? **Medscape Journal of Medicine** 10(8):189-197.
- Wood Charlesworth L, Rodwell, M (1997). Focus groups with children: A resource for sexual abuse prevention program evaluation. **Child Abuse & Neglect** 12: 1205-1216.
- World Health Organisation (2010) Childhood overweight and obesity. <http://www.who.int/dietphysicalactivity/childhood/en/>, (date accessed 5/01/2010).
- World Health Organization (2011). Growth reference data for 5 – 19 years. http://www.who.int/growthref/growthref_who_bull/en, (date accessed 9/05/2011).
- Worsley A (2005). Children’s healthful eating: from research to practice. **Food and Nutrition Bulletin** 26(2)Suppl2: S135-S143.
- X-rates.com. Currency Calculator. <http://www.x-rates.com/calculator.html>, (date accessed 10/10/2011).
- Zeinstra GG, Koelen MA, Kok FJ, de Graaf C (2007). Cognitive development and children’s perceptions of fruit and vegetables; a qualitative study. **International Journal of Behavioral Nutrition and Physical Activity** 4:30

APPENDIX A: LIST OF PARTICIPATING SCHOOLS**TUCK SHOP SURVEY:**

1. Athlone Primary School
2. Bisley Park Primary School
3. Clarendon Primary School
4. Grange Primary School
5. Longmarket Primary School
6. Merchiston Primary School
7. Northern Park Primary School
8. Piet Retief Primary School
9. Pelham Primary School
10. Prestbury Primary School
11. Scottsville Primary School

LEARNER QUESTIONNAIRE:

1. Athlone Primary School (n = 52)
2. Piet Retief Primary School (n = 59)
3. Pelham Primary School (n = 100)
4. Scottsville Primary School (n = 100)

FOCUS GROUP:

Pelham Primary School (girls n = 5; boys n = 5)

APPENDIX B: LETTERS REQUESTING PERMISSION& INFORMED CONSENT



THE SCHOOL PRINCIPAL

Dear Sir / Madam,

RE: REQUEST FOR PERMISSION TO CONDUCT RESEARCH IN YOUR SCHOOL

I am a staff member of the Discipline of Dietetics and Human Nutrition at the University of KwaZulu-Natal, Pietermaritzburg. I am studying toward my PhD and my research topic is entitled "The tuck shop purchasing practices of Grade 4 Learners at selected Pietermaritzburg Primary Schools."

I am hereby requesting permission to use your school in my study. I would like to visit your tuck shop and possibly interview all of the Grade 4 learners in your school. Should you agree to participate, I will formally request consent from the parents/guardians of your learners, as well as assent from the learners themselves.

The information obtained from your school and learners will be collected on an anonymous, strictly confidential and voluntary basis. You may withdraw the participation of your school at any stage of the study. There will not be any negative or undesirable consequences should you choose to do so.

Should you have any queries regarding my research, please feel free to contact me on 033-260 5430 or wilesn@ukzn.ac.za

Yours Sincerely,

Nicky Wiles
UKZN Staff member & PhD student
wilesn@ukzn.ac.za
033 260 5430

Professor Frederick Veldman
PhD Supervisor
veldmanf@ukzn.ac.za
033 260 5453

Professor Maryann Green
PhD Supervisor
green@ukzn.ac.za
033 260 5271

INFORMED CONSENT FROM THE SCHOOL PRINCIPAL:

I hereby confirm that I have been informed by UKZN PhD student Nicola Wiles about the nature of her study "The tuck shop purchasing practices of Grade 4 Learners at selected Pietermaritzburg Primary Schools."

- I have also received, read and understood the written information in the letter requesting permission to use my School in this study.
- I understand that I may contact Ms Wiles (033-260 5430, wilesn@ukzn.ac.za) or her supervisors Professor F Veldman (033-2605453) or Professor JM Green (033-2605271) at any time if I have questions about the research.
- I understand that my School's involvement in the study is on a strictly anonymous, confidential and voluntary basis and that both assent and consent for any learner participation will be requested from the learner and their parent / guardian.
- I understand that I may withdraw my School's participation in the study without any fear of negative or undesirable consequences should I choose to do so.

I hereby consent for my School to participate.

Name: _____ Signature: _____

School Name: _____ Date: _____

**TUCK SHOP MANAGER**

Dear Sir / Madam,

RE: REQUEST FOR PERMISSION TO CONDUCT RESEARCH IN YOUR TUCKSHOP

I am a staff member of the Discipline of Dietetics and Human Nutrition at the University of KwaZulu-Natal, Pietermaritzburg. I am studying toward my PhD and my research topic is entitled "The tuck shop purchasing practices of Grade 4 Learners at selected Pietermaritzburg Primary Schools."

I am hereby requesting permission to use your tuck shop in my study. The information obtained from you will be collected on an anonymous, strictly confidential and voluntary basis. You may withdraw the participation of your tuck shop at any stage of the study. There will not be any negative or undesirable consequences should you choose to do so.

Should you have any queries regarding my research, please feel free to contact me on 033-260 5430 or wilesn@ukzn.ac.za

Yours Sincerely,

Nicky Wiles
UKZN Staff member & PhD student
wilesn@ukzn.ac.za
033 260 5430

Professor Frederick Veldman
PhD Supervisor
veldmanf@ukzn.ac.za
033 260 5453

Professor Maryann Green
PhD Supervisor
green@ukzn.ac.za
033 260 5271

INFORMED CONSENT FROM THE TUCK SHOP MANAGER:

I hereby confirm that I have been informed by UKZN PhD student Nicola Wiles about the nature of her study "The tuck shop purchasing practices of Grade 4 Learners at selected Pietermaritzburg Primary Schools."

- I have also received, read and understood the written information in the letter requesting permission to use my tuck shop in this study
- I understand that I may contact Ms Wiles (033-260 5430, wilesn@ukzn.ac.za) or her supervisors Professor F Veldman (033-2605453) or Professor JM Green (033-2605271) at any time if I have questions about the research
- I understand that my tuck shop's involvement in the study is on a strictly anonymous, confidential and voluntary basis
- I understand that I may withdraw my School's participation in the study without any fear of negative or undesirable consequences should I choose to do so.

I hereby consent to participate.

Name: _____

Signature: _____

School Name: _____

Date: _____



GRADE 4 LEARNERS

Dear Primary School learner,

RE: REQUEST FOR ASSENT TO CONDUCT AN INTERVIEW

I am a staff member of the Discipline of Dietetics and Human Nutrition at the University of KwaZulu-Natal, Pietermaritzburg. I am studying toward my PhD and my research topic is entitled "The tuck shop purchasing practices of Grade 4 Learners at selected Pietermaritzburg Primary Schools."

I am hereby requesting assent to interview you during my study. Should you agree to participate, I will also formally request consent from your parents/guardians.

The information obtained from you will be collected on an anonymous, strictly confidential and voluntary basis. You may withdraw your participation at any stage of the study. There will not be any negative or undesirable consequences should you choose to do so.

Should you have any queries regarding my research, please feel free to contact me on 033-260 5430 or wilesn@ukzn.ac.za

Yours Sincerely,

Nicky Wiles
UKZN Staff member & PhD student
wilesn@ukzn.ac.za
033 260 5430

Professor Frederick Veldman
PhD Supervisor
veldmanf@ukzn.ac.za
033 260 5453

Professor Maryann Green
PhD Supervisor
green@ukzn.ac.za
033 260 5271

INFORMED ASSENT FROM THE PRIMARY SCHOOL LEARNER:

I hereby confirm that I have been informed by UKZN PhD student Nicola Wiles about the nature of her study "The tuck shop purchasing practices of Grade 4 Learners at selected Pietermaritzburg Primary Schools."

- I have also received, read and understood the written information in the letter requesting assent to interview me in her study.
- I understand that I may contact Ms Wiles (033-260 5430, wilesn@ukzn.ac.za) or her supervisors Professor F Veldman (033-2605453) or Professor JM Green (033-2605271) at any time if I have questions about the research.
- I understand that my involvement in the study is on a strictly anonymous, confidential and voluntary basis and that consent to participate will be requested from my parents / guardians.
- I understand that I may withdraw my participation in the study without any fear of negative or undesirable consequences should I choose to do so.

I hereby assent to participate in this study.

Name: _____ Signature: _____

School Name: _____ Date: _____



PARENT / GUARDIAN OF LEARNER

Dear Sir / Madam,

RE: REQUEST FOR PERMISSION TO INTERVIEW YOUR CHILD

I am a staff member of the Discipline of Dietetics and Human Nutrition at the University of KwaZulu-Natal, Pietermaritzburg. I am studying toward my PhD and my research topic is entitled "The tuck shop purchasing practices of Grade 4 Learners at selected Pietermaritzburg Primary Schools."

I am hereby requesting permission to obtain information from your child for use in my study. This information will be collected on an anonymous, strictly confidential and voluntary basis. Your child may withdraw from participating in my study at any point should they wish. They will not face any negative or undesirable consequences should they choose to withdraw.

Should you have any queries regarding my research, please feel free to contact me on 033-260 5430 or wilesn@ukzn.ac.za

I would be most grateful if you could sign the attached form and return it to your child's school as soon as possible.

Yours Sincerely,

Nicky Wiles
UKZN Staff member & PhD student
wilesn@ukzn.ac.za
033 260 5430

Professor Frederick Veldman
PhD Supervisor
veldmanf@ukzn.ac.za
033 260 5453

Professor Maryann Green
PhD Supervisor
green@ukzn.ac.za
033 260 5271

INFORMED CONSENT FROM THE LEARNER'S PARENT / GUARDIAN:

I hereby confirm that I have been informed by UKZN PhD student Nicola Wiles about the nature of her study "The tuck shop purchasing practices of Grade 4 Learners at selected Pietermaritzburg Primary Schools."

- I have also received, read and understood the written information in the letter requesting permission to interview my child in this study.
- I understand that I may contact Ms Wiles (033-260 5430, wilesn@ukzn.ac.za) or her supervisors Professor F Veldman (033-2605453) or Professor JM Green (033-2605271) at any time if I have questions about the research.
- I understand that my child's involvement in the study is on an anonymous, strictly confidential and voluntary basis. I also understand that my child may withdraw from participating in this study at any point should they wish, without fear of any negative or undesirable consequences.

I hereby consent for my child to participate.

Name: _____ Signature: _____

Child's Name: _____ Child's Class: _____

School Name: _____ Date: _____

I would not like my child to participate in this study.

APPENDIX C: UKZN ETHICAL CLEARANCE LETTER



RESEARCH OFFICE (GOWAN MBDINI CENTRE)
WESTVILLE CAMPUS
TELEPHONE NO.: 031 – 2603517
EMAIL : eshrcc@ukzn.co.za

22 JANUARY 2016

MS. N.L. WILES (802119340)
SASA

Dear Ms. Wiles

PROTOCOL REFERENCE NUMBER: HSE/0861/090
PROJECT TITLE: "THE FOOD AND BEVERAGE PURCHASES MADE AT PRIMARY SCHOOL TUCK SHOPS, RELATED TO THE NUTRITIONAL KNOWLEDGE AND SOCIO-DEMOGRAPHIC CHARACTERISTICS OF LEARNERS"

EXPEDITED APPROVAL

This letter serves to notify you that your application in connection with the above has been granted full approval through an expedited review process.

Any alterations to the approved research protocol i.e. Questionnaire/Interview Schedule, Informed Consent Form, Title of the Project, Location of the Study must be reviewed and approved through the amendment modification prior to its implementation. Please quote the above reference number for all queries relating to this study.

PLEASE NOTE: Research data should be securely stored in the school department for a period of 5 years

Best wishes for the successful completion of your research protocol

Yours faithfully

PROFESSOR STEVEN COLLINS (CHAIR)
SOCIAL SCIENCES & HUMANITIES RESEARCH ETHICS COMMITTEE

cc: Supervisor (Prof. M Green)
cc: Dr. M Paterson
cc: Ms. M Francis

APPENDIX D: PERMISSION FROM THE DEPARTMENT OF EDUCATION



kzn education

Department:
Education
KWAZULU-NATAL

**MS N WILES
UNIVERSITY OF KWAZULU NATAL
PRIVATE BAG X01
SCOTTSVILLE
3209**

Enquiries: Sibusiso Alwar

Date: 08/02/2010

Reference: 0015/2010

RESEARCH PROPOSAL: THE FOOD AND BEVERAGE PURCHASES MADE AT PRIMARY SCHOOL TUCK SHOPS, RELATED TO THE NUTRITIONAL KNOWLEDGE AND SOCIO-DEMOGRAPHIC CHARACTERISTICS OF GRADE 4 LEARNERS.

Your application to conduct the above-mentioned research in schools in the attached list has been approved subject to the following conditions:

1. Principals, educators and learners are under no obligation to assist you in your investigation.
2. Principals, educators, learners and schools should not be identifiable in any way from the results of the investigation.
3. You make all the arrangements concerning your investigation.
4. Educator programmes are not to be interrupted.
5. The investigation is to be conducted from 08 February 2010 to 08 February 2011.
6. Should you wish to extend the period of your survey at the school(s) please contact Mr Sibusiso Alwar at the contact numbers above.
7. A photocopy of this letter is submitted to the principal of the school where the intended research is to be conducted.
8. Your research will be limited to the schools submitted.
9. A brief summary of the content, findings and recommendations is provided to the Director: Resource Planning.

...dedicated to service and performance
beyond the call of duty.

KWAZULU-NATAL DEPARTMENT OF EDUCATION

POSTAL: Private Bag X9107, Pietermaritzburg, 3200, KwaZulu-Natal, Republic of South Africa

PHYSICAL: Office 025, 188 Pietermaritz Street, Metropolitan Building, PIETERMARITZBURG 3201

TEL: To: +27 33 341 6910/2611 | Fax: +27 33 341 8612 | Email: alwar@kzn.gov.za / sibusiso.alwar@kzn.gov.za



kzn education

Department:
Education
KWAZULU-NATAL

10. The Department receives a copy of the completed report/dissertation/thesis addressed to:

The Director: Resource Planning
Private Bag X9137
Pietermaritzburg
3200

We wish you success in your research.

Kind regards

R. Cassius Lubisi (PhD)
Superintendent-General

...dedicated to service and performance
beyond the call of duty.

KWAZULU-NATAL DEPARTMENT OF EDUCATION

POSTAL: Private Bag X9137, Pietermaritzburg, 3200, KwaZulu-Natal, Republic of South Africa

PHYSICAL: Office C25, 188 Pietermaritz Street, Metropolitan Building, PIETERMARITZBURG 3201

TEL: Tel: +27 33 341 8610/8611 | Fax: +27 33 341 8612 | E-mail: rlubisi@kwa-zulu-natal.gov.za / rlubisi@kwa-zulu-natal.gov.za



kzn education

Department:
Education
KWAZULU-NATAL

**MS N WILES
UNIVERSITY OF KWAZULU NATAL
PRIVATE BAG X01
SCOTTSVILLE
3209**

Enquiries: Sibusiso Alwar

Date: 08/02/2010

Reference: 0015/2010

PERMISSION TO INTERVIEW LEARNERS AND EDUCATORS

The above matter refers.

Permission is hereby granted to interview Departmental Officials, learners and educators in selected schools of the Province of KwaZulu-Natal subject to the following conditions:

1. You make all the arrangements concerning your interviews.
2. Educators' programmes are not interrupted.
3. Interviews are not conducted during the time of writing examinations in schools.
4. Learners, educators and schools are not identifiable in any way from the results of the interviews.
5. Your interviews are limited only to targeted schools.
6. A brief summary of the interview content, findings and recommendations is provided to my office.
7. A copy of this letter is submitted to District Managers and principals of schools where the intended interviews are to be conducted.

The KZN Department of education fully supports your commitment to research: **The food and beverage purchases made at primary school tuck shops, related to the nutritional knowledge and socio-demographic characteristics of grade 4 learners.**

It is hoped that you will find the above in order.

Best Wishes

**R Cassius Lubisi, (PhD)
Superintendent-General**

...dedicated to service and performance
beyond the call of duty.

KWAZULU-NATAL DEPARTMENT OF EDUCATION

POSTAL: Private Bag X9137, Pietermaritzburg, 3200, KwaZulu-Natal, Republic of South Africa

PHYSICAL: Office G25, 168 Pietermaritz Street, Metropolitan Building, PIETERMARITZBURG 3201

TEL: Tel: +27 33 341 8610/8611 | Fax: +27 33 341 5612 | E-mail: sibusiso.alwar@kzndoe.gov.za / rcassiuslubisi@kzndoe.gov.za



kzn education

Department:
Education
KWAZULU-NATAL

**MS N WILES
UNIVERSITY OF KWAZULU NATAL
PRIVATE BAG X01
SCOTTSVILLE
3209**

Enquiries: Sibusiso Alwar

Date: 08/02/2010

Reference: 0015/2010

LIST OF SCHOOLS

1. Athlone Primary School
2. Bisley Primary School
3. Clarendon Primary School
4. Grange Primary School
5. Laddsworth Primary School
6. Longmarket Primary School
7. Merchiston Primary School
8. Northern Park Primary School
9. Pelham Primary School
10. Piet Retief Primary School
11. Prestbury Primary School
12. Scottsville Primary School

Kind regards

**R Cassius Lubisi, (PhD)
Superintendent-General**

...dedicated to service and performance
beyond the call of duty.

KWAZULU-NATAL DEPARTMENT OF EDUCATION

POSTAL: Private Bag X9137, Pietermaritzburg, 3200, KwaZulu-Natal, Republic of South Africa

PHYSICAL: Office 525, 188 Pietermaritz Street, Metropolitan Building, PIETERMARITZBURG 3201

TEL: Tel: +27 33 341 8510/8611 | Fax: +27 33 341 8612 | E-mail: sibusiso.alwar@kzn.gov.za / alwar@kzn.gov.za

APPENDIX E: TUCK SHOP SURVEY**SCHOOL CODE:** _____**DATE:** _____**TOTAL NUMBER OF LEARNERS:** _____

1. School Policy regarding the food and beverage items that may and may not be brought from home:

a	Yes	
b	No	

If yes, elaborate: _____

2. School Policy regarding maximum amount of money learners may spend at the tuckshop:

a	Yes	
b	No	

If yes, elaborate: _____

3. School Policy regarding tuck shop purchases? E.g. restrictions for particular grades

a	Yes	
b	No	

If yes, elaborate: _____

4. Motivation behind tuck shop formation? E.g. fund raising opportunity, private tender

5. Who runs the tuck shop?

a	Teacher/s	
b	Parent/s	
c	Governing Body	
d	Private Person	
e	Other – specify	

6. Does this person / these people have any input as to what stock is purchased and what food and beverage items (including homemade) are available for sale to learners: _____

7. What day(s) of the week does the tuck shop run?

a	Everyday	
b	Once a week – specify:	
c	Twice a week – specify:	
d	Three times a week – specify	
e	Four times a week – specify:	
f	Other – specify	

8. What period(s) of the day is the tuck shop open?

a	Before School	
b	First and second break	
c	First, second break and after school	
d	Before school, both breaks and after school	
e	First break only	
f	Second break only	
g	After school	
h	Other – specify	

INVENTORY OF ITEMS FOR SALE:

9. Beverages:

	ITEM	Yes	No	Sale Price	Number of Items sold per week
a	Carbonated Soft Drink (Coke, Fanta, Sprite)				
b	Carbonated Soft Drink Sugar Free (Coke Zero, Sprite Zero)				
c	Fruit Juice Canned Fizzy(LiquiFruit / Just Juice, Appletiser)				
d	Fruit Juice Tetrapack (Liquifruit, Ceres)				
e	Fruit Mix Blend (Tropica, Clover Guava / Orange Nectar)				
f	Iced Popsicle (Splash)				
g	Flavoured Milk (Clover SuperMoo, Milo)				
h	Drinking Yoghurt / Yogisip				
i	Iced Tea				
j	Bottled water (still/sparkling)				
k	Bottled water (flavoured sparkling)				
l	Energy drinks (Red Bull, Guaranna)				
m	Sports drinks (Powerade / Energade / Lucozade)				
n	Hot beverage (tea / coffee / hot chocolate)				
o	Other – specify				

10. Snack Items:

	ITEM	Yes	No	Sale Price	Number of Items sold per week
a	Corn Crisps (Niknaks, Fritos, Doritos, Cheese Naks, Big Corn Bites, Corn Nibs)				
b	Potato Crisps (Assorted Flavours)				
c	Crisps -Puffs and Curls (Flings, Ghost pops, Cheese Curls)				
d	Dried Fruit				
e	Nuts (Mixed, Peanuts)				
f	Peanuts and Raisins				
g	Pretzels				
h	Cake				
i	Muffins – health				
j	Muffins – chocolate, caramel				
k	Muffins – blueberry				
l	Muffins – other				
m	Doughnuts				
n	Chelsea buns				
o	Pastries: sweet eg Danish				
p	Pastries: savoury eg Samoosa				
q	Fruit				
r	Yoghurt				
s	Other – specify:				

11. Sweets and Chocolates:

	ITEM	Yes	No	Sale Price	Number of Items sold per week
a	Loose sweets, assorted including suckers, fizzers, liquorice				
b	Sweet packets (jelly beans, liquorice allsorts, wine gums)				
c	Nougat				
d	Chocolate (50g bar)				
e	Chocolate (mini two block)				
f	Muesli bar / Snacker				
g	Other - specify:				

12. Lunch items:

	ITEM	Yes	No	Sale Price	Number of Items sold per week
a	Pies				
b	Sausage Roll				
c	Sandwich –cheese and tomato				
d	Sandwich – tuna mayonnaise				
e	Sandwich - ham, cheese, tomato				
f	Sandwich – chicken mayonnaise				
g	Sandwich – other				
h	Hot dog				
i	Wors Roll				
j	Burger - beef				
k	Burger - chicken				
l	Burger – vegetarian				
q	Chicken Pieces				
r	Ready Meals eg curry, stews				
s	Ready Meal other				
t	Ready Meal with Pasta				
u	Ready Meal with Rice				
v	Ready Meal with Potatoes				
w	Ready Meal with Bread				
x	Ready Meal starch other:				
y	Salad – green				
z	Salad – coleslaw				
aa	Salad - potato				
ab	Salad - other				
ac	Slap Chips				
ad	Soup				
ae	Other-specify:				

13. In your opinion which of the above lunch items are the three most popular items for sale?

- a) _____
 b) _____
 c) _____

14. In your opinion what are the three most popular items bought at the first break?

- a) _____
 b) _____
 c) _____

15. In your opinion what are the three most popular beverages for sale?

- a) _____
 b) _____
 c) _____

16. In your opinion what is the average amount of money spent per learner at:
- a) First break: _____
- b) Lunch break: _____

17. Are children generally buying single items or "whole" meals:

a	single Items	
b	"whole" meals	

18. In your opinion what grade of learners are the most popular customers at the tuck shop:

a	Grade 1	
b	Grade 2	
c	Grade 3	
d	Grade 4	
e	Grade 5	
f	Grade 6	
g	Grade 7	

Other: _____

19. Do you have a day of the week that you receive more customers than usual?

a	Yes	
b	No	

If yes, please choose the most popular day:

a	Monday	
b	Tuesday	
c	Wednesday	
d	Thursday	
e	Friday	

20. In your opinion are the majority of learners using the tuckshop frequent customers? I.e. more than three times per week?

a	Yes	
b	No	

Number of Learners in Each Grade:

Grade	Total Number
1	
2	
3	
4	
5	
6	
7	

APPENDIX F: LEARNER QUESTIONNAIRE

SCHOOL CODE: _____

DATE: _____

CONSENT OBTAINED: _____

SECTION A: ANTHROPOMETRIC MEASUREMENTS

	WEIGHT (kg)
1	
2	
3	
AVERAGE	

	HEIGHT (m)
1	
2	
3	
AVERAGE	

SECTION B: DEMOGRAPHIC INFORMATION

1. Are you a:

		Tick one:
a	Boy	
b	Girl	

2. How old are you? _____

3. How many people do you live with during the school week? _____

4. How many of these people work? _____

5. Write down each person you live with during the school week and what work they do:

For example: Mom is a Nurse, Dad is a Policeman

6. Tick the following items that you have in your home:

		Tick what you have			Tick what you have
a	Daily Newspaper eg Witness		i	Stove	
b	Weekly or monthly magazine		j	Internet access	
c	Radio		k	Video/DVD player	
d	TV set		l	Refrigerator	
e	Computer/laptop		m	Car	
f	Tap water (cold)		n	Electricity	
g	Tap water (hot)		o	Flushing toilet	
h	House made of bricks		p	Ordinary telephone	

7. Has your doctor ever told you or anyone in your family that you have any of the following health problems? You may **choose more than one**:

		Me	Person/People that I live with
a	“High Sugar” or Diabetes		
b	High Blood Pressure		
c	High Cholesterol		
d	Heart Disease		
e	Obesity / overweight		

8. Does your school give you food regularly?

		Tick one:
a	Yes	
b	No	

9. Do you eat breakfast before school starts?

		Tick one:
a	Yes	
b	No	

10. Do you ever buy food or drinks from your school’s tuck shop?

		Tick one:
a	Yes	
b	No	

If you have answered “no” to the above question, you do not need to complete Section C and can move on to Section D. Please carry on with Section C if you have answered yes.

SECTION C: TUCK SHOP PURCHASING HABITS

11. How many times a week do you usually buy food or drinks from the school tuck shop?

		Tick one:
a	Once a week	
b	Twice a week	
c	Three times a week	
d	Four times a week	
e	Every day	

12. When do you usually go to the tuck shop?

		Tick one:
a	First break	
b	Second break	
c	Both breaks	

13. How much money do you usually have to spend per day at the tuck shop? _____

14. Where does the money that you spend at the tuck shop come from? You may **tick more than one** option:

		Tick
a	My parents / guardians give me money	
b	I use my own money	
c	I borrow money from a friend	
d	If not listed write here:	

15. Do you bring a packed lunch or food from home to eat during the school breaks?

		Tick one:
a	Yes	
b	No	

16. If yes, write down what you brought from home to eat today. If you brought a sandwich write down what type of bread it is made of e.g. brown or white.

17. If you bring food from home, who prepares it for you most often?

		Tick one:
a	A family member / or the person looking after me	
b	The person employed to work in my house	
c	I make my own lunch	
d	If not listed, write here:	

18. When you go to the tuck shop what do you usually buy? You may **tick more than one** option:

		First Break	Second Break
a	Something to drink		
b	Something to eat eg: pie or sandwich		
c	Sweets or chocolates		
d	Packet of chips, popcorn or snack		
e	Fruit		
f	If it is not listed write here:		

19. Why do you buy the items listed in the above question? **Place a tick in the column that most suits your opinion** about each statement. Neutral means you neither agree nor disagree with this statement.

		Strongly agree	Agree	Neutral	Disagree	Strongly disagree
a	The person looking after me has told me that I am only allowed to buy this item / these items					
b	My friends buy this item / these items					
c	This item is my favourite thing to eat or drink					
d	I think this item will help keep my body healthy					
e	I only have enough money to buy this item / these items					
f	I don't like what I brought for lunch from home					
g	I am not allowed to eat or drink this item at home					
h	If your reason is not listed, write here:					

20. Which of these are your top three reasons of importance – place **one tick** next to your most important reason in each column:

		Most important Tick one	Second most Tick one	Third most Tick one
a	The person looking after me has told me that I am only allowed to buy this item / these items			
b	My friends buy this item / these items			
c	This item is my favourite thing to eat or drink			
d	I think this item will help keep my body healthy			
e	I only have enough money to buy this item / these items			
f	I don't like what I brought for lunch from home			
g	I am not allowed to eat or drink this item at home			
h	If your reason is not listed, write here:			

21. If you buy something to drink, what do you buy most often? Please **tick one option** in each column:

		First Break	Second Break
a	Coke / Fanta / Sprite / Cream Soda / Iron Brew		
b	Coke Zero / Diet Coke / Tab / Sprite Zero / Fanta Zero		
c	Minute maid / Just Juice / 5 Alive / Canned fruit juice		
d	Liqui-fruit / Ceres fruit juice / fresh fruit juice		
e	Guava, Orange or mixed fruit juice in a plastic bottle		
f	Powerade		
g	Splash / Frozen yoghurt		
h	Flavoured Milk e.g Chocolate milk , Milo		
j	Tea / Coffee / Hot chocolate		
k	If not listed write here:		
l	I don't buy anything to drink at the tuck shop		

22. If you buy sweets and chocolates, what do you buy most often? Please **tick one option** for each column:

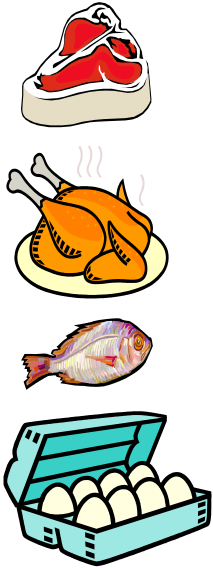




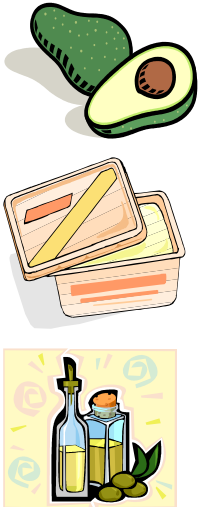
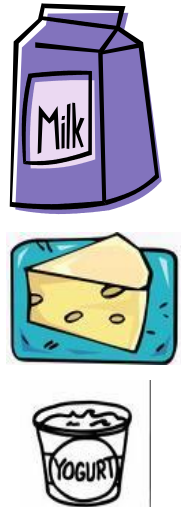
		First Break	Second Break
a	Loose sweets eg: Smoothies, Fizzers, Suckers, Liquorice		
b	Packet of Sweets eg: Jelly Beans, Liquorice Allsorts, Jelly Babies		
c	Jungle oats energy bar		
d	Cereal bar e.g Coco Pops, Special K		
e	Chocolate Bar (normal size)		
f	Chocolate – Mini Bar		
g	Black Cat booster bar		
h	If not listed, write here:		
i	I don't buy any sweets or chocolates		

23. If you buy something to eat, what do you buy most often? Please tick the items you buy **most often**:

		First Break	Second Break
a	Small packet of Cheap corn chips (Yobos, Frinax, Frimax)		
b	Normal size packet corn chips (Niknaks, Fritos, Doritos, CheeseNaks)		
c	Potato Chips (Simba Lays, Willards crinkle cut)		
d	Doughnut		
e	Chocolate muffin		
f	Health Muffin		
g	Small packet of biscuits		
h	Samoosa		
i	Dried Fruit stick / dried fruit chips		
j	Popcorn		
k	Peanuts		
l	Peanuts and raisins		
m	Jelly and Custard		
n	Homemade crunchies		
o	Pretzels		
p	Bananas		
q	Fruit Salad		
r	Yoghurt		
s	Pies		
t	Sausage roll		
u	Toasted sandwich		
v	Hot dog		
w	Hot chips / slap chips / French fries		
x	Beef burger		
y	Pizza		
z	Assorted filled salad rolls e.g chicken, ham, cheese		
aa	salads		
	If not listed, write here:		

SECTION D: NUTRITION KNOWLEDGE ASSESSMENT

24. Look at the following pictures and write down the LETTER (A, B, C, D, E, F or G) of the food group you think best fits the answer to the questions below (You can choose a group more than once)

<p>Meat, Chicken, Fish, Eggs</p> <p>A</p> 	<p>Brown Bread, Rice, Samp, Mealie meal</p> <p>B</p> 	<p>Vegetables</p> <p>C</p> 	<p>Fruit</p> <p>D</p> 	<p>Sugar, Sweets</p> <p>E</p> 	<p>Fats, oils</p> <p>F</p> 	<p>Milk, Maas, Yoghurt, Cheese</p> <p>G</p> 
---	--	--	---	---	--	---

- a Choose the food group that you should eat the **MOST** of every day
- b Choose the food group/s that you should eat the **LEAST** of every day
- c Choose the food group/s that contains foods with **LOTS OF FIBRE (roughage)**
- d Choose the food group that gives your body the best **ENERGY**
- e Choose the food group that your **BODY uses to BUILD MUSCLES**
- f Choose the food group/s that best **PROTECTS THE BODY AGAINST ILLNESSES**

25. To keep your body healthy, how many helpings of fruit and vegetables should you eat every day?
Please tick **only one** option.

		Tick one:
a	At least 1	
b	3 or 4	
c	5 or more	
d	It doesn't matter how many	

26. It is important to eat small amounts of healthy fats and oils because:
Please tick **one option next to each statement**

a	Fats give you energy and keep you warm	Yes	No	Don't know
b	Fats help your body to build muscle	Yes	No	Don't know
c	Fats help you to absorb certain important nutrients	Yes	No	Don't know

27. When you eat too much fat you can:
Please tick **one option next to each statement**

a	Become fat (overweight)	Yes	No	Don't know
b	Get high blood pressure when you are older	Yes	No	Don't know
c	Have a heart attack when you are older	Yes	No	Don't know

28. Eating a lot of sugar, sweets and sweet food:
Please tick **one option next to each statement**




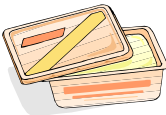




a	Is good for health	Yes	No	Don't know
b	Can make you fat	Yes	No	Don't know
c	Is bad for your teeth	Yes	No	Don't know

29. It is important to eat enough fibre (roughage) because:

Please tick **one option next to each statement**

a	Fibre helps you to go to the toilet regularly	Yes	No	Don't know
b	Fibre protects you against diseases like heart disease	Yes	No	Don't know

30. Which of the following foods contain **healthy fats**? Please tick **one option next to each statement**

a	Red meat and chicken with skin		Yes	No	Don't know
b	Chips, crisps		Yes	No	Don't know
c	Nuts		Yes	No	Don't know
d	Soft margarine in tub		Yes	No	Don't know
e	Avocado pear		Yes	No	Don't know
f	Vetkoek and doughnuts		Yes	No	Don't know
g	Pilchards/Sardines		Yes	No	Don't know
h	Polony		Yes	No	Don't know

Thank you for participating in this questionnaire☺

APPENDIX G: FOCUS GROUP AGENDA

1. Discussion Starter
2. Warm Up Activity
3. Topics to be covered:
 - 3.1 What types of food do you bring from home to eat at school?
 - Do you like the food that you bring?
 - Do you eat all of it?
 - Do you share what you bring with your friends?
 - How often do you bring food?

- 3.2 What foods do you think are healthy foods and why?

These are the foods that your tuck shop stocks (hand out). Tell me whether you think they are healthy or unhealthy and why? (Subjects to place “foods” on white board under healthy or unhealthy categories).

- | | |
|----------------------|-------------------------|
| • Cereal bars | • Popcorn |
| • Yoghurt | • Splashes |
| • Fruit | • Vetkoek |
| • Hot chips | • Chips |
| • Salad | • Flapjacks |
| • Two-minute noodles | • Pizza |
| • Sandwiches | • Wors and hotdog rolls |
| • Toasted sandwiches | • Sausage rolls |
| • Milo | • Cold drink |
| • Dried fruit stick | • Jelly & Custard |
| • Fruit juice | • Burgers |
| • Fruit Salad | • Sweets & Chocolates |
| • Powerade | |

Does the group agree with placements?

- 3.3 Why do you think it is important that we eat healthy food?
- 3.4 Why do you think it is important that we should not eat unhealthy food?
- 3.5 How many times do you go to the tuck shop?
- What do you buy most often from your school tuck shop?
 - Why do you buy these items from the tuck shop?
- 3.6 Present subjects with seven statements regarding what they buy from the tuck shop, the group must choose the top three and rank in order of importance
- You go to the tuck shop because this is your favourite thing to eat or drink.
 - You go to the tuck shop because your friends buy these things.
 - You only have enough money to buy this item.
 - The person who looks after you says you are only allowed to buy these things from the tuck shop.
 - You are not allowed to eat or drink this at home.
 - You buy this because you think it will keep your body healthy.
 - You don't like what you brought for lunch from home so you buy this item from the tuck shop.
- 3.7 Is there anything that you wish your tuck shop stocked but isn't there now? Why?
- 3.8 Remove all unhealthy items from white board. If your tuck shop only stocked these healthy items would you still go to it? Why?
4. End summary

APPENDIX H: PUBLISHED ARTICLE FROM CHAPTER 4

Original Research: The variety, popularity and nutritional quality of tuck shop items available for sale to primary school

The variety, popularity and nutritional quality of tuck shop items available for sale to primary school learners in Pietermaritzburg, South Africa

¹Wilco M., MSc(Dietetics)

²Green JM PhD(Educational Administration)

³Waldman F.J. PhD(Nutrition)

¹Discipline of Dietetics and Human Nutrition and ²Discipline of Rural Resource Management, School of Agricultural Sciences and Agribusiness, Faculty of Science and Agriculture, University of KwaZulu-Natal

Correspondence to: Wilco Wilco, email: wilco@ukzn.ac.za
Keywords: school feeding, tuck shop, Pietermaritzburg, South Africa

Abstract

Objectives: To determine the variety, popularity and nutritional quality of the food and beverages sold to primary school pupils.

Method: A cross-sectional tuck shop survey. Nutritional analyses were conducted using the South African Medical Research Council Foodfinder 3 for Windows[®] software. Eleven mixed-race, well-resourced, government primary schools were studied in Pietermaritzburg, South Africa. Subjects included tuck shop managers from each school.

Results: Savoury pies were the most popular lunch item for all learners for both breaks ($n = 5, 45\%$, and $n = 3, 27.3\%$), selling the most number of units (43) per day at eight schools (72.7%). Iced popsicles were sold at almost every school, ranked as the cheapest beverage, and also sold the most number of units (40.7). Healthy beverages sold included canned fruit juice and water, while healthy snacks consisted of dried fruit, fruit salad, bananas, yoghurt and health muffins. The average healthy snack contained almost half the kilojoules of the unhealthy counterpart (465 kJ vs. 806 kJ). Nutritional analyses of the healthy lunch options revealed total fat contents that exceeded the Dietary Reference Intake and South African recommended limits. Perceived barriers to stocking healthy items included cost and refrigeration restrictions.

Conclusion: School tuck shops are selling products that encourage an unhealthy lifestyle, thereby promoting the obesity epidemic. Extensive consultation is required among dietitians, school principals and privatised tuck shop managers to overcome barriers to stocking healthy food in tuck shops.

Peer reviewed. (Submitted: 2011-03-29 Accepted: 2011-07-17). © SAJCN

S Afr J Clin Nutr 2011;24(3):129-135

Introduction

The World Health Organization (WHO) considers childhood obesity to be "one of the most serious public health challenges of the 21st century."¹ International figures from 2010 approximate that over 42 million children under the age of five are overweight. Almost 35 million of these children reside in developing countries.¹ In South Africa, the 2005 National Food Consumption Survey revealed that 19% of South African children aged one to nine years were overweight, while four per cent were obese.² Both overweight and obese children have an increased risk of developing so-called lifestyle diseases at a young age.¹ Preventing childhood obesity, therefore, is extremely important. Along with encouraging physical activity, it is recommended that children increase their dietary intake of fruit and vegetables, legumes, whole grains and nuts, and restrict their intake of sugar and fat, especially saturated fat.³ This also requires addressing attitudes and beliefs surrounding food in young children.

A child's attitudes and beliefs surrounding food is greatly shaped by two influences: the home and school environments.³ In the

early stages of childhood, a parent has the greatest influence and responsibility in establishing these attitudes and beliefs.^{4,5} However, as the child grows, this influence is soon replaced by the media and peers, as well as the quality of the nutrition education received at school.⁶ Children spend a substantial amount of time at school. The classroom, therefore, is considered to be an appropriate environment where one may influence knowledge about nutrition and thereby equip children with the skills necessary to maintain a healthy lifestyle.^{1,6} In South Africa, at the time of this study, nutrition education formed part of the Life Orientation curriculum for General Education Training (GET) pupils, from grades R (pre-grade 1) to 9; and the Life Science curriculum for Further Education Training (FET) learners in grades 10 to 12. However, it should be acknowledged that even though children could possess adequate knowledge to assist them with making healthy food choices, the variety of food at their disposal could, in the long run, remain a limiting factor in exercising this choice.

Resource-rich schools have a designated tuck shop where pupils are likely to purchase either a "complete" lunch option, or food and

beverage items to supplement what was brought from home. Some schools provide learners daily with two opportunities – during their first and second break – to purchase food and beverages. While some tuck shops are used as a fundraising opportunity, others may be outsourced to “for-profit” private individuals. A poor food choice of one meal during the day may not necessarily lead towards childhood obesity. Yet, it is important to acknowledge that most children buy from tuck shops almost daily. It is therefore important to identify the food that these children purchase, as well as the nutritional quality of the food and beverages at their disposal.⁹ Understanding the food choices that learners make is important because it is one of the few opportunities where pupils are able to exercise their own choice of food and beverages, assuming they are not preparing their own food at home. Those who are frequent customers, with at least three visits to the tuck shop per week (personal e-mail communication from M Finch, programme manager and public health nutritionist, University of Newcastle, Australia, 2010 Feb 2), and make poor food and beverage choices may be at risk of becoming overweight. There is currently great concern among health professionals, public health advocates, educators and politicians regarding the food and beverages obtainable at schools.¹ Along with providing adequate nutrition education, WHO recommends that schools serve food that meets specified nutrient standards and includes healthy choices such as water, milk, juice, fruit and vegetables, sandwiches and low-fat snacks.¹ South African researchers investigating food items consumed by adolescents defined “unhealthy foods” as those containing an elevated fat, sugar and sodium content, poor nutrient density and low amounts of dietary fibre.⁷

There is a paucity of knowledge regarding primary school tuck shop utilisation in South Africa. The purpose of this study, therefore, was to determine school recommendations regarding the utilisation and management of the tuck shop, the variety of food and beverage items that were sold to learners, the items that were popular among learners and the nutritional quality of both “healthy” and “unhealthy” items sold at the tuck shop. The research reported in this article formed part of a comprehensive study investigating the tuck shop purchasing practices, eating habits and nutrition status of grade 4 pupils.

Method

Subjects

This study took place at 11 government primary school tuck shops in various suburban areas of Pietermaritzburg. These schools were chosen because they had learners from all race groups (black, coloured, Indian and white) and were classified as quintile 5, meaning the bulk of the school's funding was generated from school fees, as opposed to a quintile 1 school which received all of its funding from the government. The researcher chose quintile 5 schools, expecting that they had greater access to resources and, as a result, their tuck shops would accommodate a greater variety

of stock, including “healthy” and “unhealthy” food items. It was also expected that the learners at these schools would have more money to spend. From the 33 quintile 5 primary schools in Pietermaritzburg, only 11 had learners of all race groups.

Ethics approval

Ethics approval was obtained from the University of KwaZulu-Natal (HSS/0981/09D). Permission to work in the schools was obtained from the Department of Education, while written consent and permission to be interviewed was obtained from both the principal and tuck shop manager of the selected schools.

Data collection

A survey questionnaire was used to interview the tuck shop managers on site. The first part of the questionnaire addressed the tuck shop manager's awareness of official school recommendations on tuck shop use, the second part obtained information regarding the variety of food and beverages available for sale, while the third part addressed the popularity of these items. Measuring cups and spoons were used to quantify the measurement of ingredients used for items made on site. The same researcher completed all 11 interviews. The questionnaire was standardised using one of the participating schools.

Data analysis

All items available at tuck shops were categorised as beverages, snack items, sweets and chocolates or lunch. It should be noted that while “lunch” was intended to refer to what the pupil would have regarded as a main meal option, many of the items listed in the lunch category were available for learners to purchase during both school breaks. The nutritional analyses of tuck shop items were conducted using the South African Medical Research Council (MRC) Foodfinder 3 for Windows® software, and where specific items such as beverages were not found, the nutrition information on the food label of the product was used. Descriptive analyses were carried out using the statistical package SPSS® version 15.0 (SPSS® Inc, Chicago IL, United States of America).

Results

All 11 qualifying schools agreed to participate in this study. The most common period of the day that the tuck shops were open were during the first and second breaks only ($n = 5$, 45.5%), followed by both breaks and after school ($n = 2$, 18.2%). Ten of the schools (90.9%) ran their tuck shops from Monday to Friday. The remaining tuck shop was only open once a week, on a Friday, and for one break only because the school closed early. This particular tuck shop was managed by school staff and only stocked sweets, crisps and carbonated beverages. Overall, the most popular day of the week for tuck shop purchases was Friday ($n = 6$, 54.5%), followed by the parents' payday ($n = 3$, 27.3%), and then Monday ($n = 2$, 18.2%).

School recommendations regarding tuck shop stock and use by pupils

The persons managing the tuck shop and the amount of input the tuck shop manager had regarding the type of products that were stocked, is presented in Table I. Nine of the 11 tuck shops (81.8%) were privately managed. One of the schools that had no input regarding what was stocked had been restricted to selling 'sweets and treats' only on Friday mornings. One tuck shop manager had to have all of her food and beverage choices approved by the school's occupational therapist. This tuck shop manager had also been instructed to cut down on the amount of loose sweets and limit crisps to lightly salted varieties. Another was permitted to stock any item provided it came with a label that included nutrition information.

Table I: Management of the tuck shop and amount of input tuck shop managers had regarding the products that were stocked (n = 11)

	Management		Manager's input regarding products that were stocked					
			Full		Partial		School input only	
	n	%	n	%	n	%	n	%
Privately managed	9	81.8	5	45.5	1	9.1	3	27.3
School managed	2	18.2	0	0	0	0	2	18.2

Two of the 11 schools (18.2%) had recommendations regarding the maximum amount of money that pupils were allowed to spend during each visit to the tuck shop. One of the schools had a R10 limit, while the second school restricted their junior primary learners to spending a maximum of R5 on their "sweets and treats" day. Six (54.5%) of the schools restricted the breaks within which specific grades of learners could purchase tuck shop items. Most of the break restrictions pertained to junior primary members and included either limiting their tuck shop purchasing to once a week (18.2%, n = 2), or prohibiting them from purchasing any sweets, chips and fizzy drinks (18.2%, n = 2).

Variety items available for sale

The variety of tuck shop items, along with the average number of units sold per day, price range and average price per item, are presented in Table II. This information was based on each tuck shop manager's estimation. Only those items that were stocked by at least two schools (n = 18.2%) are shown in this table. It can be seen that frozen popsicles were sold at almost every school, were the cheapest beverage with an average cost of R1.55, and sold the most number of units (40.7 units per day) when compared to all other available beverages. Flavoured milks, at an average cost of R6.50, sold the least number of units per day (1.5). Among the snack items, the small packets of corn crisps were the cheapest at an average cost of R1.19, and sold the most number of units per day (68.8 units per day). Although reasonably priced compared to other snack items at R1.75, bananas were only stocked by two schools (18.2%) and sold the least number of units per day (2.5). Regarding lunch items,

savoury pies had the most number of units (43) sold per day by eight of the schools (72.7%), while salads were the most expensive lunch item at an average cost of R10.75 per day and selling an average of three units a day by only two schools (18.2%).

Popularity of tuck shop items

All tuck shop managers confirmed that the bulk of their customers purchased tuck shop items frequently, i.e. they made purchases at least three times a week. Tuck shop managers were asked whether the learners were purchasing single items or meal combinations, for example a beverage and something to eat. Seven (63.6%) tuck shop managers thought that their customers were purchasing meal combinations, while three (27.3%) thought that the pupils purchased single items, and one (9.1%) felt that half the learners purchased single items and half purchased meal combinations. Grade 7 pupils were the most popular customers for five (45.5%) tuck shop managers, while senior primary learners (grade 4 to 6) were the most popular customers for two tuck shop managers (18.2%). The mean amount spent at first break was R7.09 while at second break it was R9.14.

Savoury pies were the most popular among all learners for both first and second break (n = 5, 45% and n = 3, 27.3%). Savoury pies ranked as the most popular item bought during the first break. Yet, for those who chose another option as most popular, pies, once again, were selected as the third most popular item. The most popular beverage among learners was Coca-Cola (n = 5, 45.5%), followed by assorted cans (n = 6, 54.5%) and Fanta (n = 3, 27.3%).

Nutritional quality of tuck shop items

Items from Table II were further categorised based on what Temple et al classified as 'unhealthy' (Table III). These categories, which focus on the total and saturated fat contents of a food item, are also in line with the South African recommended dietary goals for fat.⁶ If one were to compare likely meal combinations from the tuck shop stock, a 'healthy' combination consisting of a health muffin, yoghurt, fruit and canned fruit beverage would provide 2 073 kJ of energy, 5.7 g of total fat and 8.3 g of added sugar. An 'unhealthy' combination, on the other hand, of a savoury pie and canned beverage would provide 2 715 kJ of energy, 31.5 g of total fat and 34 g of added sugar. The two items from the 'unhealthy' option would cost R14.51 while the four items from the 'healthy' option would cost R14.25.

The average healthy snack contained just under half the kilojoules of its unhealthy counterpart (465 kJ vs. 806 kJ), had only 1.2 g of total fat compared to 10.2 g and had just over double the dietary fibre content (3 g vs. 1.4 g). While the average healthy beverage is lower in kilojoules (350 kJ vs. 448 kJ), it did not contain any added sugar or cholesterol, compared to the average unhealthy beverage that contained an average 12.6 g of added sugar and 3.7 g of cholesterol.

The homemade salad rolls and salads had nutritional contents that prevented them from being categorised as healthy items. On average the salad roll's saturated fat content just exceeded

Table II: The variety of tuck shop items with number of items sold and prices

Tuck shop categories		Serving size	No of tuck shops that stocked these items	%	Average no units sold per day ^a	Price range of item	Average price per item	
Beverages	Frozen popcicles	70 g	10	90.9	40.7	R1.00–R2.50	R1.55	
	Assorted cans	330 ml	10	90.9	15.7	R6.00–R8.00	R6.45	
	Powerade	500 ml	9	81.8	4.8	R7.00–R9.00	R8.00	
	Still water	500 ml	8	72.7	4.4	R4.00–R6.00	R5.07	
	Flavoured water	500 ml	8	72.7	11.4	R6.00–R7.00	R6.36	
	Sugar-free cans	330 ml	8	72.7	4.3	R5.50–R8.00	R6.50	
	Canned fruit juice	330 ml	6	54.5	3.5	R6.00–R7.00	R6.50	
	Mixed fruit blends	250 ml	4	36.4	12.7	R2.50–R7.50	R4.83	
	Flavoured milk	275 ml	2	18.2	1.5	R6.00–R7.00	R6.50	
Snack items	Potato crisps	30 g	10	90.9	18.8	R2.50–R4.00	R3.30	
	Popcorn	500 ml	9	81.8	30.2	R2.00–R7.00	R3.50	
	Small corn crisps	20 g	8	72.7	68.8	R0.50–R2.50	R1.19	
	Samosas	75 g	4	36.4	46.5	R2.00–R3.00	R2.75	
	Peanuts and raisins	32 g	5	45.5	4.3	R2.00–R3.00	R2.50	
	Doughnuts	45 g	3	27.3	38.7	R3.00–R4.00	R3.33	
	Corn crisps	30 g	3	27.3	12.7	R2.00–R4.00	R3.00	
	Peanuts	32 g	3	27.3	5.0	R2.00	R2.00	
	Chocolate muffins	48 g	2	18.2	22.0	R2.00–R4.50	R3.25	
	Packets of biscuits	33 g	2	18.2	11.0	R2.50–R4.50	R3.50	
	Dried fruit stick	25 g	2	18.2	8.0	R2.50	R2.50	
	Homemade crunchies	25 g	2	18.2	4.0	R4.00	R4.00	
	Health muffins	48 g	2	18.2	18.0	R3.00–R4.00	R3.50	
	Pretzels	25 g	2	18.2	12.5	R1.00–R1.50	R1.25	
	Bananas	75 g	2	18.2	2.5	R1.50–R2.00	R1.75	
	Fruit salad	375 ml	2	18.2	3.5	R5.00–R6.00	R5.75	
	Jelly and custard	250 ml	2	18.2	12.5	R4.00–R6.00	R5.00	
	Yoghurt	100 g	2	18.2	3.5	R2.50	R2.50	
	Sweets and chocolates	Packets of sweets	75 g	9	81.8	23.8	R1.50–R4.50	R3.31
		Chocolates (mini size)	23 g	7	63.6	27.2	R2.50–R3.50	R3.07
Chocolates (normal)		48 g	7	63.6	7.0	R3.50–R7.00	R6.00	
Lollipops		13 g	6	54.5	15.0	R0.50–R1.50	R1.00	
Muesli energy bars		45 g	6	54.5	6.0	R4.00–R6.00	R5.33	
Lunch items	Pies	170 g	8	72.7	43.0	R7.00–R10.00	R8.06	
	Hot dogs	1 each	7	63.6	22.4	R5.00–R8.00	R6.71	
	Assorted salad rolls	1 each	5	45.5	11.0	R6.00–R10.00	R9.00	
	Toasted sandwiches	1 each	5	45.5	17.4	R6.00–R11.00	R7.90	
	Pizzas	80 g	5	45.5	6.3	R7.50–R8.00	R7.83	
	Beef burgers	1 each	4	36.4	15.4	R7.00–R12.00	R9.40	
	Hot chips	250 g	4	36.4	22.5	R4.00	R4.00	
	Sausage rolls	165 g	3	27.3	26.0	R4.50–R9.00	R7.17	
	Salads	1 each	2	18.2	3.0	R8.50–R15.00	R10.75	

^aOnly the schools that stocked these items were included in the calculation to determine the average units sold per day

Table III: The nutritional value of "unhealthy" items based on Temple et al⁸ classification^a

Tuck shop items	Serving size	Average kilojoules per serving	Protein (g)	Total fat (g)	Saturated fat (g)	Dietary fibre (g)	Cholesterol (mg)	Added sugar (g)	Sodium (mg)
Beverages									
Assorted cans	330 ml	577	0	0	0	0	0	34.0	23
Sugar-free cans	330 ml	3.5	0	0	*	0	0	0	39
Frozen popicles	70 g	83	0	0	0	0	0	4.5	4
Flavoured milk	275 ml	827	8.8	4.7	2.91	0	22	13.2	195
Mixed fruit blends	250 ml	550	2.0	0.3	0.10	5.0	0	24.0	10
Powerade	500 ml	646	0	0	*	0	*	*	120
Snack items									
Small corn crisps	20 g	411	0.8	4.5	0	0.3	0	0	290
Corn crisps	30 g	699	1.9	10.4	3.65	0.5	0	0	320
Potato chips	30 g	695	2.0	10.8	2.77	1.2	0	0	300
Doughnuts	45 g	780.5	2.5	8.9	1.38	1.3	9.5	7.9	91
Chocolate muffins	48 g	710	2.5	5.9	1.38	0.5	28	15.3	118
Packets of biscuits	33 g	672	1.6	6.2	3.47	0.4	17	13.7	74
Samosas	75 g	1 694	3.1	36.8	4.78	1.6	9	0.8	87.5
Popcorn	500 ml	633	3.1	7.0	1.05	3.8	0	0	821
Peanuts	32 g	830	8.5	15.8	2.19	2.8	0	0	139
Peanuts and raisins	32 g	635	4.7	8.0	1.13	2.1	0	0	72
Homemade crunchies	25 g	519	1.1	6.5	4.00	1.0	12	8.1	48
Pretzels	25 g	416	2.7	3.9	1.1	2.37	*	*	*
Jelly and custard	500 ml	1 796	14.45	8.25	3.825	0	200	62.65	150
Sweets and chocolates									
Packets of sweets	75 g	1 202	0	0.6	0.53	0	0	69.1	17
Lollipops	13 g	512	0	0.3	0.22	0	0	29.4	7
Chocolates (normal size)	48 g	1 006	3.0	12.1	7.70	0	11	26.8	73
Chocolates (mini size)	23 g	513	1.7	6.5	3.97	0	6	12.8	31
Lunch items									
Muesli energy bars	45 g	912	3	11.6	*	1.8	*	*	112
Pies	170 g	2 136	15.1	31.5	13.09	2.5	60	0	757
Sausage rolls	165 g	2 739	16.2	48.3	17.99	2.3	96	0	1 205
Toasted cheese	1 each	1 808	19.1	25.4	11.7	2.95	65	0	671
Toasted cheese and tomato	1 each	1 476	14	18.6	7.9	3.5	41	0	565
Toasted ham and cheese	1 each	1 083	12.1	8.9	3.7	3.6	25	0	608
Toasted chicken mayo	1 each	1 516	24.4	14.6	2.4	2.6	40.7	1.2	468
Hot dogs	1 each	805	7.3	8.3	0.35	0.9	0	0	756
Hot chips	250 g	3 193	10.8	37.0	4.7	8.8	0	0	495
Beef burgers	1 each	1 917	26.9	21.4	7.9	2.5	83	0.5	517
Pizzas	80 g	1 226	13.8	15.74	*	0.1	*	66.8	*
Salad rolls, chicken	1 each	2 339	16.5	43.3	2.8	3.8	41	2.1	456
Salad rolls, cheese	1 each	986	9.4	13.6	5.7	2.7	28	0	341
Salad rolls, ham	1 each	1 264	12.1	15.6	4.4	3.3	25	0.6	775
Salads	245 g	879	5.5	10.8	3.4	3.4	12	0.1	286

^a Nutrient analyses were obtained from Foodfinder 3 by Winson[®] and where specific items were not found, the nutrition information label was used. *Not specified on product label.

the recommended limit of 10% (containing 11%). However, their combined total fat average provided 60% of the total energy content. This is quite alarming considering that an average pie, which is an "unhealthy" choice, has a total fat content of 56%. The homemade salads, which contained either feta cheese or pecan nuts, also had a total fat content of 60%. Flavoured milk, while low in total fat (22% of total energy), had a saturated fat content that just exceeded the recommended limit of 10% (13%).

Discussion

The purpose of this study was to investigate the variety, popularity and nutritional quality of the food and beverages available for sale to primary school pupils, as well as school recommendations regarding tuck shop use and management.

School recommendations regarding tuck shops

Over 80% of the schools did not impose monetary restrictions at the tuck shop. It is therefore interesting to note that learners spent on average R5 during each break. A lack of restriction could have given free reign to learners to spend large amounts of money on multiple unhealthy choices. Schools could implement restrictions with regard to the total amount of money a learner spends during a single visit to the tuck shop. Otherwise, tuck shops should be encouraged to restrict the number of unhealthy items available for sale.

Variety and popularity of food and beverages

Iced popsicles were popular among pupils. An inexpensive product, these popsicles sold the most number of units each day. In contrast, flavoured milk, containing a greater nutrient value, sold the least number of units. Many of the tuck shop managers who chose not to stock flavoured milk did so because when they had stocked these items, they were not popular with their customers and expired before being purchased. It should be noted that Amalgamated Beverage Industries Ltd, distributor of Coca-Cola products, make a special display fridge available to schools on condition that only these products are displayed. Coca-Cola do not sell flavoured milks and so the two schools that stocked these items required an additional second fridge, which was placed at the back of the tuck shop. This lack of visibility may also have contributed towards the poor sales of these items. Tuck shop managers should be provided an opportunity to improve the display and promotion of additional food items, especially when these are healthier.

Portion size was not monitored by any of the participating schools. Two schools stocked not only the standard 330 ml can of carbonated beverage, but also a 500 ml and even a 1 litre option. The fact that some tuck shops keep stock of these large volume items is a reason for concern. It is highly likely that youngsters could consume the entire product and not have the necessary knowledge or "discipline" to limit their consumption to a normal portion size. Tuck shop managers reported that because the small packet size of corn crisps

was so inexpensive, learners would often buy more than one packet at a time.

The cheapest "healthy" snack in this study was bananas, which was not popular among learners at all. Some of the tuck shop managers of the schools who chose not to stock fruit explained that, when they had stocked fruit, it sat on the shelf and went off. It was also mentioned that many learners already brought fruit to school and therefore were not likely to purchase it from the tuck shop. Other researchers have found that fruit sells poorly in schools for similar reasons.^{4,7} Neumark-Sztainer et al found that learners are least likely to choose fruit compared to "unhealthy" items, because it is less practical to eat and deemed unpopular by peers.⁸

Nutritional quality of tuck shop food and beverages

The apparently "healthier" food items, for example salad rolls and salads, were high in both total and saturated fat. These items were also more expensive and if pupils would rather prioritise value for money over health benefits, they are unlikely to purchase these items. One would need to examine the contents, portion sizes and nutritional quality of the ingredients used in the salads and salad rolls and educate tuck shop managers about healthier modifications. For example, the manager could reduce the portion size of pecan nuts and use a lower-fat version of cheese. Some tuck shop managers chose not to make homemade items and rather purchased readymade items such as pies and pizzas from outsourced bakeries. Along with education on improving the nutritional quality of homemade items, these tuck shop managers would require extra motivation from the school principal regarding the necessity of preparing and stocking healthier products for sale.

Considering that only small numbers of these items were purchased each day, to make the homemade "healthy" items worthwhile for the tuck shop managers, it is also important that the learners are encouraged to choose the lower-fat options over the high-fat food. This could be done by emphasising the importance of a healthy lifestyle through nutrition education promotions. In the USA, French et al found that increasing the availability of low-fat items in combination with learner-based promotions resulted in increased sales of these items.⁷ This could provide extra motivation for the tuck shop managers relying on profit for their income.

The American researcher Story estimates that a child's lunch meal should comprise 33% of his or her total energy intake, with breakfast and supper comprising 25% and 33% respectively.⁴ The remaining 9% is what is termed "discretionary calories" to be used throughout the day. The last School Nutrition and Dietary Assessment Study (SNDA-III) conducted in the United States between 2004 and 2005 revealed that students participating in the National School Lunch Program consumed more than 35% of their total daily intake from items consumed at school.⁴ In the United Kingdom a School Food Trust was established in 2005 to implement 14 nutrient-based standards, derived from UK dietary reference values, on which all

