Adolescent food frequency and socio-economic status in a private urban and peri-urban school in Hilton, KwaZulu-Natal

Audain KA, BSc, MSc, MedBiochem, PhD Student; **Kassier SM,** MSc Dietetics, RD, Lecturer
Veldman FJ, PhD Nutrition, RN, Professor and Head of Department
Discipline of Dietetics and Human Nutrition, University of KwaZulu-Natal
Correspondence to: Keiron Audain, e-mail: keiron.audain@gmail.com
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Abstract

Objective: The objective of the study was to make a comparative analysis of the dietary preferences of adolescents attending an urban versus a peri-urban school in KwaZulu-Natal, in order to investigate the association between socio-economic status and food frequency.

Design: The design was a cross-sectional descriptive survey.

Setting: The setting was an urban and peri-urban high school in Hilton, KwaZulu-Natal.

Subjects: One hundred and eleven grade 9-11 learners from a peri-urban school, and 98 grade 9-11 learners from an urban school, volunteered to participate.

Outcome measures: A non-quantified food frequency questionnaire was used to assess food frequency. A socio-demographic questionnaire developed for the purpose of this study was utilised to collect information on parental education, employment status and household or accommodation data. A Household Food Insecurity Access Scale questionnaire was used to determine the household food insecurity of the learners.

Results: The findings indicated that there was a higher preference for globalised foods (high in fat and sugar), particularly fast food, by learners from the peri-urban school (p-value < 0.01). These learners were also more likely to consume locally available, high-fat snacks (p-value < 0.01). Grade 10 urban school learners consumed more red meat and processed meats than their peri-urban school counterparts (p-value < 0.01). Negative correlations were observed between parental education and employment status (particularly of the mothers) and fast food consumption in adolescents (p-value < 0.01).

Conclusion: A high frequency of globalised or energy-dense food intake was associated with low socio-economic status. Although healthy eating habits were generally poor in urban and peri-urban adolescents, food sources varied, possibly owing to cost and availability. The importance of a diverse diet and the inclusion of a wider range of affordable, nutrient-rich foods should be promoted in the school setting, and also to parents, particularly those of a lower socio-economic status.

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Introduction

Dietary habits have steadily shifted from traditional to more "globalised" foods in many low- and middle-income countries. Food items that are high in sugar, sodium, saturated fat and animal protein are now commonly consumed, most notably in socio-economically deprived areas.[1-3]

Adolescents, in particular, are experiencing this nutrition transition as they are routinely targeted by media advertising for globalised foods[3-5] and fast food restaurants.[6] As independent eating habits are usually formed during adolescence,[7] this is believed to be an important influence which contributes to nutritionally poor diets in adolescents.[8]

In South Africa, food items such as fizzy drinks, sweets and potato chips (crisps) are regularly consumed by adolescents.[8] The popularity of these foods, because of their energy density, accessibility and affordability, is one of the primary barriers to healthy eating in adolescents, particularly those from low-income areas.[8,9] Thus, when cost is a factor, adolescents may be more likely to choose a less healthy food option to meet their energy requirements.[2] In addition, many adolescents may perceive unhealthy foods to taste better and hence to be more desirable than healthy foods.[9] However,

key micro- and macronutrients necessary for sustaining optimum health are lacking in these foods.[2]

An estimated 23% of the global adolescent population resides in sub-Saharan Africa.[10] Approximately 20% of the total population (10.2 million) in South Africa is between the ages of 10 and 19 years.[10] From a nutritional perspective, adolescence is an important life stage, characterised by rapid growth.[7,11] Nutrient deficiencies caused by an inadequate diet can affect growth and sexual maturation.[7,11,12] A low intake of nutrient-dense foods in adolescence has also been linked to behavioural problems, including depression, a low attention span, regular late coming and/or absenteeism and poor academic performance,[13,14] an association which requires considerable attention, particularly when considering the multifactorial nature of behavioural disorders.

Furthermore, poor diet quality in adolescence can increase the risk of the development of noncommunicable diseases (NCDs) in adulthood, including cardiovascular disease, hypertension and type 2 diabetes.[1,15] The emergence of NCDs in middle-income countries, such as South Africa, has been linked to nutrition transition and a high rate of infectious disease in these countries, which together cause a "double burden" of disease.

Nationally, South Africa is considered to be a food-secure country. However, many individuals remain vulnerable to food insecurity at household level.[16] The General Household Survey of 2007 estimated that 10.6% of adults and 12.2% of children were food insecure.[17] However, according to the first results of the South African National Health and Nutrition Examination Survey (SANHANES-1), published in 2013, only 43.7% of South African households are food secure, which indicates that the prevalence of food insecurity is rising.[18] The ability to purchase sufficient and nutritious food largely depends on household income. Hence, low-income households are generally expected to be more food insecure, and often exhibit coping strategies, such as the consumption of a less diversified and less nutritious diet overall.[7]

The South African food-based dietary guidelines were designed to assist the population to achieve dietary diversity and to address nutrition-related public health issues, such as undernutrition and obesity.[19] Yet, according to SANHANES-1, only 4.6% of South African adolescents follow the recommended guidelines with regard to the consumption of fruit and vegetables.[18] Dietary intake has been shown to have a strong association with socio-economic status, particularly in low- to middle-income countries, in which dietary diversity is rarely achieved in low-income households.[20]

Conversely, households with a higher income follow a more diverse diet.[21] Therefore, it is largely believed that improving socio-economic conditions results in an improvement in dietary intake by increasing access to a wider range of quality foods.[22]

To date, there has been limited research on the association between socio-economic status and food frequency in adolescents, particularly in low- to middle-income countries. This is an important public health issue, given the risk of NCDs developing in later years as the majority of adolescents in the world live in low- to middle-income countries.[18] NCDs are responsible for 36 million deaths each year, while roughly 29 million occur in low- to middle-income countries.[23]

Method

Study objectives

The aim of this study was to compare the food frequency of adolescent learners from an urban school with that of those in a peri-urban school in Hilton, KwaZulu-Natal. Although these schools are in very close geographical proximity to each other, they have a differing socio-economic status.

Study population, design and methods

The study population in this cross-sectional descriptive study consisted of grade 9-11 adolescents from two secondary schools; one a private urban school and the other a peri-urban school, both situated in Hilton. Hilton is a small town situated on the outskirts of Pietermaritzburg in KwaZulu-Natal. The private urban school runs an outreach programme which formally trains the principals and teachers of schools from peri-urban communities within the Hilton area. Also, learners from the private urban school mentor learners from the peri-urban school.

Secondary schools in South Africa are classified according to national and provincial quintiles, ranging from 1-5.[24] Classification is based on socio-economic information from the catchment area in which the school is located, and includes parental income, education level and employment status.[22] Quintile 1 (Q1) schools cater to the 20% of learners with the lowest socio-economic status, while Q5 schools cater to the 20% of learners with the highest socio-economic status.[24] In this study, the private urban school is classified as a Q5 school with a diverse learner population (black, Indian, white and coloured pupils). The peri-urban school is classified as a Q1 school with predominantly black learners. Participants fell within a younger age range of 14-17 years at the private urban school, whereas participants were aged 14-21 years at the peri-urban school.

A total of 209 learners, 98 from the private school and 111 from the peri-urban school, volunteered to participate in the study, which was executed between June and August 2013. Participants were briefed on the study objectives in either English or *isiZulu,* and asked to sign an informed consent form. Learners in grades 8 and 12 were excluded from the study. For the purposes of the study, it was assumed that the participants responded sincerely and truthfully.

The questionnaires used in this study were self-administered and included a non-quantified food frequency questionnaire (FFQ), a socio-demographic questionnaire and a Household Food Insecurity Access Scale (HFIAS) questionnaire.

The FFQ was adapted by six South African dietitians for the purpose of determining the eating habits and traditional food consumption of urban Zulu women.[25] It provided eight consumption choices for 61 foods. The food items were grouped into eight categories according

to the similarity of nutritional content as follows: starches, vegetables, fruit, dairy, meat, fast food or takeaways, snacks and drinks.

Responses to consumption frequency were assigned values ranging from 0-8:

- A score of 0: Never or less than once per month.
- A score of 1: 1-3 times a month.
- A score of 2: Once a week.
- A score of 3: 2-4 times a week.
- A score of 4: 5-6 times a week.
- A score of 5: Once a day.
- A score of 6: 2-3 times a day.
- A score of 7: 4-5 times a day.
- A score of 8: Six or more times a day.

A socio-demographic questionnaire was developed for the purpose of this study to collect information on parental education, employment and household or living arrangements.

In addition, the HFIAS[26] consists of nine questions that investigate whether or not the household experienced one or more types of food insecurity in the past four weeks, and if so, with what frequency. The HFIAS score measures the extent of food insecurity. Each question consists of two parts. Part A contains two possible responses of "yes" and "no", and Part B ("How often did this happen?") contains three possible responses of "rarely", "sometimes" or "often". The score ranges from 0-27, and the higher the score, the greater the extent of household food insecurity. The HFIAS-related conditions provide an indication of the percentage of households experiencing a specific condition in accordance with the possible responses of "rarely", "sometimes" or "often".[26]

At the time of the study, learners attending both the urban and peri-urban school were living at home. The individual HFIAS score was calculated for each learner by totalling the responses to the nine questions on food insecurity-related conditions. The average HFIAS score for each grade was then calculated using the following equation:

$$\frac{\text{Sum of HFIAS scores in each grade}}{\text{Number of HFIAS scores, i.e. households, in each grade.}}$$

Specific HFIAS-related conditions were investigated in the study with the following questions:

- *Question 3 (Q3):* In the past four weeks, did you have to eat a limited variety of foods due to a lack of money?
- *Question 7 Q7):* In the past four weeks, was there ever no food to eat of any kind in your household because of lack of money to obtain food?

The number of households experiencing one of these conditions at any given time was calculated using the following equation:

$$\frac{\text{Number of households with response of 1 to Q3/Q7}}{\text{Total number of households responding to Q3/Q7}} \times 100.$$

The number of households experiencing these conditions "often" was calculated using the following equation:

$$\frac{\text{Number of households with response of "often" to Q3b/Q7b}}{\text{Total number of households responding to Q3/Q7}} \times 100.$$

Participants from the peri-urban school were given the option of self-administered questionnaires in English or *isiZulu.* The questionnaires were piloted to five random grade 10 learners from both schools to ensure simplicity and straightforwardness. Data were collected by bilingual and appropriately trained fieldworkers who were available to assist participants if and when necessary.

The results were analysed using SPSS® 19. Statistical associations between the categorical variables were analysed using Pearson's chi-square test. A p-value of 0.05 was considered to be significant.

The study was approved by the Ethics Subcommittee (Humanities and Social Sciences) of the University of KwaZulu-Natal (Protocol Reference No. HSS/0271/013D), and was conducted according to the ethical guidelines and principles of the international Declaration of Helsinki, South African *Guidelines for good clinical practice,* and the Medical Research Council *Ethical guidelines for research.*

Results

Study population characteristics

The characteristics of the study population are summarised in Table I.

Table I: Characteristics of the study population

Characteristics	Urban (Q5) n = 98	% of group	Peri-urban (Q1) n = 111	% of group
Grade				
Grade 9	36	36.7	30	27
Grade 10	39	39.8	46	41.4
Grade 11	23	23.5	35	31.5
Race				
Black	30	30.6	108	97.3
White	56	57.1	0	0
Coloured	7	7.1	3	2.7
Indian	5	5.1	0	0
Gender				
Male	56	57.1	65	58.6
Female	42	42.9	46	41.4
Age				
Age range (years)	14 years, 4 months to 17 years 6 months		14 years, 2 months to 21 years, 10 months	

Q: quintile

Learners from the urban school had a diverse ethnic background, whereas peri-urban school learners were predominantly black Africans. Grade 10 and 11 learners from the peri-urban school were older than their counterparts at the urban school.

Overall, the peri-urban school learners reportedly had a higher intake frequency with regard to the following foods (Table II).

Table II: Mean frequency of intake scores for specific foods that differed significantly between the urban and peri-urban schools

Food groups	Foods	Urban (Q5)	Peri-urban (Q1)
Starches	Rice, mealie rice, samp, *phutu*, pap and *jeqe* (steamed bread)	0.80 ± 1.50	1.64 ± 2.18*
	Refined breakfast cereals	0.90 ± 1.57	1.34 ± 1.99*
	Potato cooked with added fat, e.g. margarine	0.48 ± 0.93	1.13 ± 1.67*
Vegetables	Vegetables prepared with sugar, fat or other sauces	0.76 ± 1.43	1.10 ± 1.66*
Fruit	Fresh fruit	1.81 ± 1.88	1.64 ± 2.28**
Dairy	Cheese (full fat)	0.94 ± 1.28	1.11 ± 1.84*
Meats	Sausages (Vienna, Russian and frankfurters)	0.46 ± 0.90	1.11 ± 1.79*
Fast foods	Pizza, pies, French fries, fried chicken, hot dogs and hamburgers	0.28 ± 0.72	1.18 ± 1.83*
Snacks	Local high-fat snacks: *Vetkoek* and samosas	0.29 ± 0.88	0.85 ± 1.48*
	Potato chips (crisps)	0.60 ± 1.21	1.30 ± 1.89
Drinks	Soft fizzy drinks	1.22 ± 2.03	1.27 ± 1.90
	Milkshakes	0.50 ± 1.29	1.08 ± 1.64*

Q: quintile
Rows with the symbol * or ** differ significantly between the urban and the peri-urban groups for the same foods
*p-value < 0.05
**p-value < 0.01

Learners from the peri-urban school reportedly consumed more foods prepared outside of the home (0.88 ± 1.69 vs. 0.31 ± 0.83, p-value < 0.01). Learners from the urban school consumed more fresh fruit than the peri-urban school learners (1.81 ± 1.88 vs. 1.64 ± 2.28, p-value < 0.05).

Grade 9 learners from the urban school consumed more fresh fruit than the grade 9 peri-urban school learners (2.15 ± 1.94 vs. 1.76 ± 2.39, p-value < 0.05). In grade 10, the urban school learners reportedly consumed more whole grain breakfast cereals (1.66 ± 2.21 vs. 0.56 ± 1.18, p-value < 0.01), red meat with visible fat (beef, mutton and pork) (1.43 ± 2 vs. 0.32 ± 0.63, p-value < 0.01), processed meats (1.12 ± 2.02 vs. 0.56 ± 0.92, p-value < 0.01), and fizzy drinks (1.56 ± 2.27 vs. 0.70 ± 1.28, p-value < 0.01), than the peri-urban school learners. Grade 10 learners from the peri-urban school reportedly consumed more fast food than the urban school learners, including pies (0.93 ± 1.66 vs. 0.37 ± 1.04, p-value < 0.05), fried chicken, fried fish, "bunny chow" and hot dogs (0.57 ± 1.79 vs. 0.213 ± 1.26, p-value < 0.01). Learners from the peri-urban school also reportedly consumed more local high-fat snacks (*vetkoeks* and samosas) (0.97 ± 1.76 vs. 0.31 ± 0.99, p-value < 0.01).

Grade 11 peri-urban school learners had a similar diet to the grade 10 and grade 9 learners, but consumed some healthier foods more than the urban school, including mixed salad (1.28 ± 2.04 vs. 0.69 ± 0.92, p-value < 0.01), fresh fruit (1.77 ± 2.25 vs. 1.21 ± 1.03, p-value < 0.01), and whole wheat bread (0.85 ± 1.40 vs. 0.37 ± 0.94, p-value < 0.05). Grade 11 learners from the urban school were reported to consume more white and brown bread (1.99 ± 1.61 vs. 1.89 ± 2.30, p-value < 0.05) than the peri-urban school learners.

Gender differences

Varied consumption patterns were observed between the boys and the girls. For the entire group, significance pointed towards the boys having higher food consumption frequency for several food items.

At the urban school, boys significantly ate more chicken without skin (0.89 ± 1.77 vs. 0.45 ± 1.04, p-value < 0.01), fast foods (0.44 ± 1.20 vs. 0.26 ± 0.45, p-value < 0.05), and chocolate (1 ± 1.88 vs. 0.75 ± 1.11, p-value < 0.05) than the girls. Girls reportedly consumed more refined breakfast cereals than the boys (1.19 ± 1.91 vs. 0.67 ± 1.22, p-value < 0.01), and were more likely to bring food from home to consume during the day (1.48 ± 2.04 vs. 1.13 ± 1.52, p-value < 0.05). Of the peri-urban school participants, significant differences in consumption frequency between the boys and girls were observed.

Boys significantly consumed more white/brown bread (1.67 ± 2.31 vs. 1.11 ± 1.77, p-value < 0.01), pasta (0.89 ± 1.52 vs. 0.46 ± 0.98), mixed salad (1.40 ± 2.01 vs. 0.76 ± 1.60, p-value < 0.01), fresh fruit (1.80 ± 2.47 vs. 1.41 ± 2, p-value < 0.01), processed meat (1.26 ± 1.86 vs. 0.82 ± 1.43, p-value < 0.01) and tinned fish (1.08 ± 1.88 vs. 0.75 ± 1.28, p-value < 0.01). Also, peri-urban school boys consumed more food prepared outside the home than the peri-urban school girls (1.10 ± 1.97 vs. 0.62 ± 1.20, p-value < 0.01) (Table III).

Socio-demographic information

Parental education levels were higher in the urban school than in the peri-urban school, particularly with respect to grade 11 pupils, where 56.5% of the mothers of the learners in the urban school had obtained a tertiary education, compared to 3% of those in the peri-urban school. A similar gap was observed with regard to the fathers' education levels, in which tertiary education was approximately nine times higher for grade 11 urban school learners than their peri-urban school counterparts (Table IV). The mothers' education had a strong negative correlation with the consumption of any type of fast food in learners (p-value < 0.01, r = –0.269). A negative correlation was also observed between the mothers' education and the consumption of sausages (p-value < 0.01, r = –0.257), processed meats (p-value < 0.05, r = –0.187), refined cereals (p-value < 0.05, r = –0.152) and local high-fat snacks (p-value < 0.05, r = –0.162). In addition, the mothers' education correlated negatively with the consumption by the learners of fizzy drinks (p-value < 0.05, r = –0.167) and milkshakes (p-value < 0.01, r = –0.220), with eating outside of the home (p-value < 0.05, r = –0.178) and buying food to eat during the day (p-value < 0.01, r = –0.249). The same negative correlation was noted between the fathers' education level and the consumption of fast food (p-value < 0.01, r = –0.217), milkshakes (p-value < 0.05, r = –0.167) and eating out (p-value < 0.05, r = –0.177).

Table III: The mean food frequency of the boys as opposed to that for the girls at each school

Food groups	Foods	Urban (Q5)		Peri-urban (Q1)	
		Boys	Girls	Boys	Girls
Starches	Cooked potatoes without fat	0.83 ± 1.44	0.58 ± 0.95	1.10 ± 1.81*	0.53 ± 0.67
	Whole grain breakfast cereals	1.06 ± 1.51	1.36 ± 1.87	1.27 ± 2.01*	0.64 ± 1.06
	Refined breakfast cereals	0.67 ± 1.22	1.19 ± 1.91*	1.31 ± 2.02	1.36 ± 1.99
	Whole wheat and low GI bread	0.50 ± 0.91	0.60 ± 1.06	1.27 ± 2*	0.63 ± 1.12
	White or brown bread	2.08 ± 1.96	1.46 ± 1.77	1.67 ± 2.31**	1.11 ± 1.77
	Pasta (macaroni and spaghetti)	0.67 ± 1.27	0.78 ± 1.22	0.89 ± 1.52**	0.46 ± 0.98
Vegetables	Cooked vegetables with sugar or fat	0.90 ± 1.64	0.59 ± 1.09	1.44 ± 1.96*	0.66 ± 1.02
	Mixed salad (lettuce and cucumber)	0.86 ± 1.33	1.01 ± 1.52	1.40 ± 2.01**	0.76 ± 1.60
Fruit	Fresh fruit	1.87 ± 1.99	1.74 ± 1.75	1.80 ± 2.47**	1.41 ± 2
Dairy	Full-cream milk	1.58 ± 2.11	1.57 ± 1.97	1.66 ± 2.28*	1.10 ± 1.72
Meats	Sausages (Vienna and Russian)	0.40 ± 0.67	0.54 ± 1.13**	1.45 ± 2.08	0.69 ± 1.21
	Processed meat (polony and bacon)	0.70 ± 1.46	0.76 ± 1.58**	1.26 ± 1.86**	0.82 ± 1.43
	Tinned fish (sardines and pilchards)	0.33 ± 1.04	0.33 ± 0.96	1.08 ± 1.88**	0.75 ± 1.28
	Chicken without skin	0.89 ± 1.77*	0.45 ± 1.04	0.91 ± 1.82	1.07 ± 1.58
Fast food	Pizza, pies, French fries and fried chicken	0.44 ± 1.20**	0.26 ± 0.45	1.22 ± 1.95*	0.96 ± 1.39
Snacks	Chocolate	1 ± 1.88**	0.75 ± 1.11	1.13 ± 1.97	1.88 ± 2.23
Drinks	Fizzy soft drinks	1.17 ± 1.94	1.29 ± 2.17	1.41 ± 2.15**	1.10 ± 1.53
	Milkshakes	0.58 ± 1.47	0.38 ± 1	1.41 ± 1.97*	0.66 ± 0.95

GI: glycaemic index, Q: quintile
Rows with the symbol * or ** differ significantly between the boys and the girls in the same school for the same food
*p-value < 0.05
**p-value < 0.01

Table IV: Parental education according to grade in the urban and peri-urban school

Mother's education	Grade 9 urban (n = 36)	Grade 9 peri-urban (n = 26)	Grade 10 urban (n = 38)	Grade 10 peri-urban (n = 41)	Grade 11 urban (n = 23)	Grade 11 peri-urban (n = 30)
Primary	2.7%	15.4%	0%	12.2%	0%	13.3%
Secondary	25%	61.5%	13.2%	70.7%	43.5%	83.3%
Tertiary	72.2%	23.1%	86.8%	17.1%	56.5%	3.3%
Father's education	**Grade 9 urban (n = 32)**	**Grade 9 peri-urban (n = 25)**	**Grade 10 urban (n = 37)**	**Grade 10 peri-urban (n = 38)**	**Grade 11 urban (n = 23)**	**Grade 11 peri-urban (n = 27)**
Primary	0%	12%	0%	15.8%	0%	7.4%
Secondary	15.6%	44%	21.6%	44.7%	30.4%	85.2%
Tertiary	84.4%	44%	78.4%	39.5%	69.6%	7.4%

Table V: Parental employment according to grade in the urban and peri-urban school

Mother's employment	Grade 9 urban (n = 34)	Grade 9 peri-urban (n = 27)	Grade 10 urban (n = 38)	Grade 10 peri-urban (n = 35)	Grade 11 urban (n = 22)	Grade 11 peri-urban (n = 29)
Full-time	70.6%	63%	68.4%	45.7%	68.2%	55.2%
Part-time	20.6%	14.8%	21.1%	28.6%	13.6%	13.8%
Unemployed	0%	7.4%	10.5%	14.3%	18.2%	20.7%
Disabled	0%	11.1%	0%	8.6%	0%	0%
Retired	8.8%	3.7%	0%	2.9%	0%	10.3%
Father's employment	**Grade 9 urban (n = 29)**	**Grade 9 peri-urban (n = 25)**	**Grade 10 urban (n = 35)**	**Grade 10 peri-urban (n = 32)**	**Grade 11 urban (n = 23)**	**Grade 11 peri-urban (n = 25)**
Full-time	89.7%	72%	85.7%	46.9%	87%	68%
Part-time	6.9%	8%	5.7%	18.8%	8.7%	12%
Unemployed	0%	8%	8.6%	12.5%	4.3%	16%
Disabled	0%	8%	0%	6.3%	0%	0%
Retired	3.4%	4%	0%	15.6%	0%	4%

Table VI: Household Food Insecurity Access Scale scores and related conditions

HFIAS	Grade 9 urban (n = 34)	Grade 9 peri-urban (n = 30)	Grade 10 urban (n = 33)	Grade 10 peri-urban (n = 40)	Grade 11 urban (n = 23)	Grade 11 peri-urban (n = 35)
Average HFIAS score	2.09	6.37	0.70	7	0.17	5
Households responding "yes" to Q3* (%)	14.71	40	9.09	45	4.35	37.14
Households responding "often" to Q3* (%)	0	10	3.03	12.50	0	5.71
Households responding "yes" to Q7** (%)	11.76	33.33	9.09	50	0	31.43
Households responding "often" to Q7** (%)	0	3.33	0	5.00	0	2.86

HFIAS: Household Food Insecurity Access Scale, Q: quintile
*Q3: In the past four weeks, did you have to eat a limited variety of foods due to a lack of money?
**Q4: In the past four weeks, was there ever no food to eat of any kind in your household because of lack of money to obtain food?

Parental employment followed a similar pattern. Higher rates of unemployment were observed with respect to the parents of learners from the peri-urban school than those of the urban school, particularly for fathers (Table V).

A positive correlation was observed between participants with mothers in full-time employment and the consumption of healthier options, such as legumes (baked beans, lentils, dahl, harricot beans, split peas, broad beans, kidney beans and sugar beans) (p-value < 0.05, $r = 0.171$) and steamed or grilled fish (p-value $< 0.0.05$, $r = 0.156$).

A positive correlation was also observed between learners with fathers in full-time employment and the consumption of French fries (p-value < 0.05, $r = 0.194$), fried chicken (p-value < 0.01, $r = 0.231$), "bunny chow" (p-value < 0.01, $r = 0.244$) and hot dogs (p-value < 0.05, $r = 0.195$). The same was observed for the consumption of locally available high-fat snacks, such as *vetkoek* and samosas (deep-fried pastries) (p-value < 0.05, $r = 0.180$). There was a positive correlation between learners with fathers who worked full-time and with eating out at restaurants and/or consuming takeaway or prepared meals (p-value < 0.0, $r = 0.200$). There was a negative correlation between learners with fathers who worked part-time and with tinned fish (p-value < 0.01, $r = -0.227$), ice cream (p-value < 0.05, $r = -0.188$), and eating out at restaurants and/or consuming takeaway or prepared meals (p-value < 0.01, $r = -0.211$).

Household food insecurity

The household food insecurity of the learners was assessed using the HFIAS questionnaire. The HFIAS score and the HFIAS-related conditions were calculated using the collected data. The calculated HFIAS scores and HFIAS-related conditions, including frequency, are shown in Table VI. The data revealed a markedly higher level of household food insecurity in peri-urban school learners than in urban school learners. This contrast was particularly noticeable in grade 10 learners. Forty-five per cent of peri-urban school learners reported having to eat a limited variety of foods owing to a lack of money. 12.5% reported that this occurred often over the four weeks prior to data collection. Also, 50% of the grade 10 peri-urban school learners reported having no food to eat of any kind in the household, with 5% stating that it occurred often (Table VI).

Discussion

This study provides insight into the food frequency of South African adolescent learners according to socio-economic status and gender, on which little research has been conducted to date. While it must be acknowledged that the results were not fully representative of the adolescents' actual daily diet, they indicated their dietary preferences and showed what they would most likely consume with increased purchasing power.

In the peri-urban school, the shift in dietary preference from the consumption of more traditional foods (mealie, samp and *phutu*) by the urban school learners in grade nine, to the consumption of more globalised foods (refined breakfast cereals, high-fat snacks, milkshakes and fast food) by learners in the older grades, is indicative of a nutrition transition in South Africa.[1] It is possible that as adolescents grow older and gain more dietary independence from their parents, they make unhealthy food choices based on taste, desire and peer influence,[2] whereas younger adolescents are more likely consume the food prepared at home. Food preparation may also be in transition as the peri-urban school learners reported consuming more vegetables prepared with sugar and/or fat. This may suggest a lack of knowledge of healthy cooking habits, and/or an inability to afford meat on a regular basis, hence vegetables were cooked differently to convey a more "meaty" taste or to be tastier.

In general, nutrient-dense foods are more costly than energy-dense foods.[2] In South Africa, a typical healthier diet (that would replace full-cream milk with fat-free milk, or white bread with whole wheat bread, for example) can be up to 69% more expensive, depending on individual food choices.[2] A survey conducted on tuck shop managers in South Africa revealed the general opinion that it was not cost-effective to stock healthier items, such as canned fruit beverages, as opposed to carbonated or fizzy beverages as the latter were available at a cheaper wholesale price.[27] Thus, cost is a significant factor in the formation of dietary habits, and the high consumption of locally available, high-fat snacks, such as *voetkoeks* and samosas (deep-

fried pastries), by the peri-urban school learners was indicative of this. Yet a high socio-economic status did not necessarily translate into better dietary habits, as higher income levels can increase access to more expensive but less healthy foods, such as fatty red meat and processed meats, as observed in the grade 10 learners at the urban school.

The gender difference in peri-urban school learners was pronounced, and it appeared that in general, the boys consumed more food than the girls. This may indicate a level of disparity between the diet of adolescent boys and that of girls from a lower socio-economic status. Gender disparities in eating habits in food-insecure households in middle- and high-income countries have not been largely reported. However, in poorer countries, such as Ethiopia, adolescent food insecurity varies according to gender, as girls are more likely to be food insecure than boys, despite there being no differences in household food insecurity.[28]

A high level of household food insecurity in peri-urban school learners coincides with lower levels of parental education and employment, and is reflective of a lower socio-economic status. This may relate to the high consumption of local high-fat snacks which are energy dense and may thus satisfy hunger, albeit not nutrient requirements.[2]

Given the role of the adolescent period in human development,[7] and the media influence on fast food purchases,[4] adolescents are increasingly likely to adopt a globalised diet that may increase the risk of nutritional complications. Data from the Transition and Health during Urbanisation in South Africans (THUSA) study, involving 1 257 South African adolescents stratified for gender, type of school and ethnic group, revealed micronutrient intake (vitamin A, folate, ascorbic acid, calcium and iron and zinc) of less than 67% of the recommended dietary allowance for their age group and gender.[29] In addition, rural adolescents reported an even lower micronutrient intake than the urban adolescents.[29]

The negative Pearson product-moment correlation coefficient observed between mothers' education level and the frequency of several unhealthy foods revealed that it was more likely that mothers, rather than fathers, were in control of both the food preparation and dietary education in the household.[30] Parental employment may affect the financial allowance that adolescents receive to spend on food.

Previous data from the Healthy Lifestyle in Europe by Nutrition in Adolescence (HELENA) study indicated a positive correlation between diet quality and both maternal and paternal education and occupation.[31] In addition, it has been shown that the negative impact of fast foods on diet quality was more pronounced in adolescents from low-income households.[32]

Conclusion

Poor dietary habits in general in adolescents were observed in this study, although food sources varied between the urban and peri-urban learners, possibly owing to differences in the cost and availability of food items. A lower socio-economic status was an underlying factor for the consumption of energy-dense foods by peri-urban adolescents, while a higher socio-economic status was associated with the consumption of more expensive fatty foods by urban adolescents. Thus, the risk of obesity and subsequent susceptibility to NCDs may increase in both groups as a result. It is suggested that dietary recommendations that target low-income groups should factor in the affordability of, and access to, high-quality, nutrient-dense foods. At country level, the importance of a balanced, diverse diet should be promoted via media coverage, including television and radio programmes. At community level, nutrition education and self-sustaining, income-generating programmes, such as school gardens for the benefit of learners and their families, must be encouraged. Larger sample sizes are warranted in order to yield results that are more representative of the entire adolescent population.

References available on request