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The impact of dietary habits and practices during adolescence on the risk of obesity: the birth to twenty cohort

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Fast-food consumption among 17-year-olds in the Birth to Twenty cohort

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Abstract

Objectives: Assessment of fast-food consumption in urban black adolescents.

Design: The current research was a descriptive cross-sectional study.

Setting: Subjects attending the Birth to Twenty (Bt20) research facility at the Chris Hani Baragwanath Hospital in Soweto, Johannesburg between September 2007 and May 2008 were enrolled.

Subjects: 655 black subjects (51.1% females) were consecutively selected to participate from the larger cohort of Bt20.

Outcome measures: Fast-food item consumption and frequency of fast-food outlet visits were assessed by interviewer-administered questionnaire.

Results: Over a 7-day assessment period, participants consumed 5 026 fast-food items, with the most popular food item being an item known colloquially as a 'quarter'. There were no gender differences in terms of preferences. Mean fast-food intake was 8.1 (4.6) items and 7.2 (4.7) items per week for males and females respectively ($\rho = 0.01$).

A typical 'quarter' consists of a quarter-loaf of white bread, chips, a slice of cheese and any number of delicatessen meats and sauces. A macronutrient comparison between a 'quarter' and three commercially available fast-food meals was undertaken, with the 'quarter' providing the most energy (5 970 kJ) and being the least expensive (mean cost = R9.16).

Conclusion: The average estimated daily energy requirement for a 17-year-old is approximately 10 000 kJ, thus the 'quarter' may make a significant contribution to daily energy intake. Further research assessing the role of fast-foods in the provision of total energy and nutrient intakes in adolescents is required.

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Introduction

Fast foods can be defined as convenience foods obtained in self-service or 'take-away' eateries with minimal waiting and are usually characterised as energy dense, low in micronutrients and fibre, high in simple sugars and salt, generally larger in portion size than conventional home-cooked or restaurant foods[1,2] and highly palatable.[3] Research indicates that fast-food consumption can displace healthier food options and is associated with poor diet quality,[4] decreased intake of fruit,[4] and lower micronutrient intake, including calcium, vitamin C and folate. In children and adolescents, Lin et al[5] found that foods prepared away from home were higher in total and saturated fatty acids and lower in calcium, iron and fibre than foods prepared in the home. In the Eating Among Teens (EAT) study undertaken in the USA, adolescents who reported eating fast food three or more times in the previous week had a 38.5% higher energy intake than those who did not consume fast foods.[6]

Fast-food consumption has been linked to increased total energy intake.[4] However, the association with increased weight gain is inconsistent, largely due to cross-sectional study designs.[7,8] However, a 15-year longitudinal study undertaken in adults showed that fast-food consumption had a strong positive association with increased weight; frequent consumers (two or more times per week) gained an extra 4.5 kg compared with those who ate fast foods once or less per week.[1] One proposed mechanism by which fast foods may contribute to obesity risk is via energy density. Energy density, expressed as kJ 100 g^{-1}, is defined as the energy content per unit weight of foods, meals or diets, usually minus beverages, since beverages have a differing effect on satiety.[9] Energy-dense foods are likely to disrupt normal appetite control systems and the hypothesised mechanism involved relates to passive over-consumption, whereby the body cannot down regulate intake after consumption of an energy-dense meal.[9]

With South Africa mirroring worldwide obesity and nutrition-related chronic disease trends,[10] it is important to assess changing dietary habits and eating practices,[11,12] with specific emphasis on fast-food consumption. Children and adolescents living in urban areas (townships, settlements, towns and cities) are increasingly exposed to the influences of the Western lifestyle, and therefore to foods that are relatively high in fat, carbohydrates and salt and low in fibre.

Townships (historically disadvantaged areas in South Africa) such as Soweto, have a wide selection of food vendors, both commercial and informal (street vendors and tuck shops) that sell fast-food items, including vetkoek (fried fat cakes), fried chicken, deep-fried fish, fried chips and fried meats, including processed sausages.

During pilot studies undertaken with adolescents and fieldworkers in Soweto, it became apparent that a fast-food item called the 'quarter' was popular and consumed regularly. Few studies assessing the frequency of fast-food consumption in children and adolescents[3,5–7,13–15] were found, with most studies based on US populations and none having been conducted, so far, in South Africa. Thus, the aims of this study were: 1) to determine the frequency of fast-food intake; 2) to assess the frequency of fast-food outlet visits; 3) to assess the association between body mass index (BMI) and fast-food intake; 4) to investigate the hypothesis that a local fast-food, known as the 'quarter', was the most popular among the 17-year-old participants in this study; and 5) to investigate the cost and macronutrient composition of the 'quarter' and compare it to three commercially available fast-food meals.

Methods

Study participants

Birth to Twenty (Bt20) is a birth longitudinal study that was planned to track the growth, health, well-being and educational progress of urban children across the first two decades of their life and includes research relating to the risks associated with lifestyle. Enrolment took place between 23 April and 8 June 1990, and included singleton births of infants born in the Soweto-Johannesburg Metropole who resided in the catchment area for at least six months after birth.[16] The current study consisted of a cross-sectional survey, which included a sample of 655 black subjects (51.1% females) from the larger cohort of Bt20. The Bt20 participants were consecutively assigned a date for their annual data collection at one of the Bt20 sites. The first 655 participants visiting the Chris Hani Baragwanath facility between September 2007 and May 2008, for whom complete data were available, were included in the analysis.

Study protocol

Participants had their heights and weights measured (to determine BMI, using International Obesity Task Force cut-offs for 17.5-year-olds).[17] Height was measured to the last completed 1 mm using a wall-mounted stadiometer (Holtain, UK) and weight to the nearest completed 0.1 kg, using a digital instrument (Dismed, USA). Participants completed an interviewer-assisted questionnaire on fast-food item intake and fast-food outlet visits. The questionnaire was designed to include specific questions on the number of fast-food items consumed in the preceding seven days, as well as how often, in the preceding seven days, a fast-food outlet had been visited. Fast-food outlets included in the questionnaire were well-known commercial outlets, including international vendors (McDonald's, Kentucky Fried Chicken [KFC], Wimpy) and local national vendors (Nando's, Spur, Steers). A space was provided for 'other', so that those outlets unknown to the researchers could also be captured. Fast-food item intake was defined as single items consumed, such as one burger or one portion of chips. Whether participants were interviewed during the school term or during the holiday period was noted. Ethics clearance was obtained from the Witwatersrand University Committee for Research on Human Subjects, protocol number: M080320.

'Quarter' sample collection and evaluation

Sixteen 'quarter' (also known as 'kota') samples were purchased from different outlets in Soweto, mainly in the Klipspruit, Orlando and Diepkloof areas. Vendors were approached and asked whether they would answer questions on the food they sold before a sample of their 'best seller' or 'most popular quarter' was purchased. Questions posed to the vendors related to the composition of their most popular 'quarters'. A short semi-structured interview was also conducted concerning the origins of the 'quarter'.

The components of an average 'quarter' comprise a quarter-loaf of white bread, fried chips, processed cheese, any number of processed meats or sausages, a fried egg and sauces. Each component of the 'quarter' was inventoried and weighed, using kitchen weighing scales, to the nearest gram. However, many of the samples contained sauces which were blended with fat and other ingredients, so that they could not be thoroughly extracted, thus their weights were estimated. Nutrient composition (energy, protein, total fat, saturated fatty acids, carbohydrate, fibre and sodium) was estimated, using FoodFinder3, nutrient analysis software based on the South African Medical Research Council (MRC) food composition tables (1991). Finally, the mean nutrient breakdown of the 16 samples was used for comparative purposes.

Comparison of a 'quarter' with commercial fast foods

Public domain data on the macronutrient composition of fast-food meals available from three well-known commercial fast food outlets (McDonald's, KFC and Steers) were surveyed from the company websites.[18–20] Since food is usually eaten in standard measures or portion sizes, in accordance with the outlet's standards, the fast-food data were presented according to those portion sizes. Thus, for comparative purposes, and as with the commercial meals, a soft drink was also included with the 'quarter' meal. The macronutrient composition and (calculated) energy density of the commercial meals were compared with those of the 'quarter' samples. Cost was also compared as well as energy (kJ) per Rand spent.

Data analysis

Descriptive statistics (using SPSS v16), including the calculation of means, standard deviations, ranges and means of frequency of intake for each participant for fast-food item consumption and fast-food outlet visits, were used. Chi-square tests were employed to assess the gender differences of fast-food item consumption and the frequency of fast-food outlet visits. Student's t-tests were undertaken to assess whether those participants interviewed during the school term, versus those interviewed during the school holidays, differed in terms of the number of fast-food items consumed, or in their frequency of visits to fast-food outlets. Linear regression was employed to assess the association between the BMI (with $\log^e$ transformed, to reduce skewness) and the number of fast-food items.

Results

Descriptive characteristics of the 655 adolescents (mean age 17.7 [SD 0.04] years old, 51% female) included in the study are listed in Table I. In males, 25.6% were underweight (BMI < 18.5), with 13.1% of females being underweight.

Of the females, 21% and 6.3% and of the males, 4.1% and 2.5% were found to be overweight or obese, respectively. There was no correlation between the BMI and the number of fast-food items (0.0042) so that linear regression did not show an association between BMI and the number of fast-food items ($\rho = 0.136$).

Table I: Characteristics of participants

	Males (n = 320) mean (SD)		Females (n = 335) mean (SD)
Age	17.71 (0.04)	**Age**	17.72 (0.04)
Weight (kg)	59.3 (9.87)	**Weight (kg)**	57.8 (10.80)
Height (m)[1]	1.71 (6.65)	**Height (m)[1]**	1.59 (10.1)
BMI categories[2]	***Total (%)***	***BMI Categories[2]***	***Total (%)***
Underweight (< 18.5)	85 (26.6)	**Underweight (< 18.5)**	44 (13.1)
Normal weight (18.5–24.72)	213 (66.6)	**Normal weight (18.5–24.8)**	200 (59.7)
Overweight (24.73–29.6)	14 (4.4)	**Overweight (24.85–29.83)**	70 (20.9)
Obese (> 29.7)	8 (2.5)	**Obese (> 29.84)**	21 (6.3)

[1] $\rho < 0.001$
[2] $\chi^2 = 56.51$, $\rho < 0.01$

Fast-food item intake over seven days for the group ranged widely, varying from 0 to 23 times a week. The mean fast-food item intake for the males was significantly higher (8.1 (4.6)) than for the females (7.2 (4.7)); ($\rho < 0.01$), though the average number of fast-food outlet visits per week was significantly less for males (3.4 (3.5)) than for females (4 (3.4) times per week), ($\rho < 0.05$), with a range of 0 to 15 times per week for both genders. Student's t-test showed no difference in the number of fast-food item intake or fast-food outlet visits during term-time or the school holidays ($\rho > 0.05$).

Almost all participants ate more than one fast-food item per week (95% and 92.2% for males and females, respectively), with more than 50% of males and 38% of females eating more than eight fast-food items per week (see Table II). Out of a mean frequency of 5 026 fast-food items consumed, the three most frequently consumed fast-food items for both genders consisted of 'quarters' (30.7%) (see Figure 1), followed by chips (21.8%) and vetkoek (12%). The other items consumed consisted of pies and sausage rolls (6.8%); boerewors rolls (6.7%); fried fish (5.6%); hotdogs (4.8%); pizzas (4%); hamburgers (3.9%); chicken burgers (1.5%); samoosas (1.4%); and pitta (0.8%).

Table II: Fast-food item consumption during the previous seven days

Fast-food item consumption during the previous week*	Males (n = 320)	Females (n = 335)	Total
0–1[1]	16 (5%)	26 (7.8%)	42 (6.4%)
2–4	54 (16.9%)	78 (23.3%)	132 (20.2%)
5–7	91 (28.4%)	104 (31%)	195 (29.8%)
> 8	159 (49.7%)	127 (38%)	286 (43.7%)

[1] $\chi^2 = 10.854$, $\rho < 0.05$; refers to gender difference for all categories
* 0 and 1 times per week combined, due to the low numbers found



Figure 1: Example of an average Sowetan 'quarter'

More males (23%) than females (14%) stated that they did not frequent fast-food outlets during an average week (see Table III). Of the group, 40% stated they frequented a fast-food outlet between one to three times a week, while 39% of females and 31% of males frequented fast-food outlets between four to ten times a week. Out of a mean frequency of 2 430, the three most frequented fast-food outlets for the sample were KFC (16.8%), McDonald's (13.7%) and 'other' (12.8%), of which the latter included both commercial and informal outlets not listed in the questionnaire. Three other fast-food outlets that primarily sell chicken accounted for 17.5%, with the remainder of the outlets (Spur, Steers, Anat, Somethin' Fishy, Romans, Debonairs, Wimpy and Chinese takeaways) accounted for the remaining 39.2%.

Table III: Frequency of fast-food outlet visits in an average week

Fast-food outlet visits per week[1]	Males (n = 320)	Females (n = 335)	Total
0	74 (23.1%)	46 (13.7%)	120 (18.3%)
1–3	129 (40.3%)	135 (40.3%)	264 (40.3%)
4–10	100 (31.3%)	131 (39.1%)	231 (35.3%)
> 11	17 (5.3%)	23 (6.9%)	40 (6.1%)

[1] $\chi^2 = 11.392$, $\rho < 0.05$

As a result of conducting semi-structured interviews with eight of the 16 Sowetan vendors contacted, some anecdotal evidence emerged to suggest that the 'quarter' evolved from the 'bunny chow'* during the late 1970s to the early 1980s, though, initially, the former was composed of bread, mashed potato, mincemeat, and atchar, often accompanied by a cooked chicken's foot. This version is still available in Soweto, but is more popular among the older generation than with young people. Most of the vendors spoke of first seeing fried chips in the 'quarter' around the late 1980s, and from that point onwards, other

* A 'bunny chow' is a popular dish, originating in Durban, which usually comprises a quarter or half loaf of white bread, with the inner, soft part of the bread removed and filled with meat or vegetable curry. The removed bread is used for dipping in the curry sauce.

food items were gradually introduced. Thus, though the ingredients of a 'quarter' are not necessarily standardised, there are some key attributes that make it a 'quarter': a quarter-loaf of white bread; a portion of fried chips; a slice of processed cheese; any number of processed meats, including, though not exclusively, polony, Russian sausage, vienna, *mangola,* white liver, and special (the latter three are fatty processed meats); a fried egg, and sauces, including tomato sauce, mustard, chilli sauce, and atchar. Occasionally lettuce, fresh tomato and/or chakalaka (a spicy vegetable relish) are added.

Table IV shows the nutrient breakdown of the 16 'quarter' samples, with the energy content ranging between 3 093 kJ and 8 015 kJ; the total protein ranging between 26 g and 62 g; the total fat ranging between 15.1 g and 88.1 g; saturated fatty acids (SFA) ranging between 5.3 g and 22.2 g; total carbohydrates ranging between 102 g and 202 g; total dietary fibre ranging between 6.8 g and 15.2 g; and the sodium content ranging between 1 108 mg and 4 402 mg. Table IV also shows the cost of the 'quarter' samples bought, with the mean cost being R9.16 (SD 2.89), ranging from R5.00 to R15.00.

Table IV: Energy and nutrient breakdown of 'quarter' samples

Sample	Energy (kJ)	Total protein (g)	Total fat (g)	SFA[1] (g)	Total CHO[2] (g)	Total dietary fibre (g)	Na (mg)	Price (R)
1	3093	38.7	15.1	5.3	103.6	6.8	1108	6.00
2	3838	46.3	32.7	9.5	102.2	6.1	1586	13.00
3	4606	41.2	43.7	10.6	125.2	9.4	1463	15.00
4	4701	30.8	39.3	7.8	148.8	11.3	1600	5.00
5	4704	26.2	36	6.3	159.8	12.4	1532	6.00
6	4933	44	42.4	10	143.1	10.8	1430	10.00
7	4966	31.7	45.3	11.7	150.3	11.4	2011	9.00
8	5128	34.5	51.6	13	144.1	10.6	2453	7.00
9	5208	42.1	48.4	12.2	147.2	11.7	1443	6.50
10	5210	33.3	49.1	10.9	154.2	12	2089	9.50
11	5449	47.1	63.1	18.7	127	9.1	3338	8.00
12	5892	50.1	65.7	20	143.2	10.3	3499	8.50
13	6341	36.3	59.9	11.8	191.2	15	2097	10.00
14	6490	40.5	65.4	15.7	184.4	14.5	2611	8.00
15	7329	52.6	77.7	20.3	194.9	14.4	3812	12.00
16	8015	62.2	88.1	22.2	202.3	15.2	4402	13.00
Mean	**5369**	**41.1**	**51.5**	**12.9**	**151.3**	**11.3**	**2279.6**	**9.16**

[1] Saturated fatty acids
[2] Carbohydrates

A nutrient and price comparison of the 'quarter' and the three popular meals from the commercial fast-food outlets was undertaken (see Table V); a medium-sized 'Big Mac Meal' from McDonald's, a 'Dagwood Burger Meal' from Steers and a 'Street Wise II' from KFC. For comparative purposes, and since a soft drink is usually included in a commercially available fast-food meal, a 340 mL Coke was also regarded as part of the 'quarter' meal. The 'quarter' meal was found to contain the most energy and carbohydrates (5 970 kJ and 188.1 g, respectively). However, the Steers meal contained the highest fat, SFA and protein content (54.5 g, 18.7 g and 44.5 g, respectively). The highest amount of total dietary fibre was found in the 'quarter' meal (11.3 g), and sodium was highest in the Steers meal (2 771 mg).

The price of the different meal combinations was also compared (see Table V), with the 'quarter' meal being found to be by far the cheapest (R16.66), followed by the KFC meal (R24.40), and the McDonald's meal (R26.95), and the most expensive being the meal from Steers (R48.85). In terms of the amount of energy obtained per rand spent, the 'quarter' meal yielded 358 kJ, the KFC meal 151 kJ, the McDonald's meal 150 kJ, and the Steers meal only 100 kJ, per R1 spent.

Table V: Nutrient comparison between the average 'quarter' and 3 popular commercial fast-food meals and their prices

	Portion	Energy (kJ)	Protein (g)	Fat (g)	SFA[1] (g)	CHO[2] (g)	Dietary fibre (g)	Na (mg)	Price (R)
'Quarter'	462 g	5368.0	41.1	51.5	12.9	151.3	11.3	2279.6	9.16
Coke	330 mL	598.0	0.0	0.0	0.0	36.8	0.0	4.0	7.50
Combination		**5967**	**41.1**	**51.5**	**12.9**	**188.1**	**11.3**	**2283.6**	**16.66**
McDonald's Big Mac meal									
Big Mac Burger	214 g	2340	27.7	24.9	9.2	49.3	4.6	801.9	16.95
Fried chips	117 g	1100	4.0	10.7	2.5	41.3	5.0	44.5	9.95
Coke	350 mL	598	0.0	0.0	0.0	36.8	0.0	4.0	8.00
Combination		**4038**	**31.7**	**35.6**	**11.7**	**127.4**	**9.6**	**850.4**	**26.95**
Steers									
Dagwood burger	297 g	2949	39.1	41.8	15.2	45.7	0.6	2261.5	28.95
Fried chips	150 g	1341	5.5	12.7	3.6	48.5	0.1	505.7	11.95
Coke	330 mL	598	0.0	0.0	0.0	9.6	0.0	4.0	7.95
Combination		**4888**	**44.5**	**54.5**	**18.7**	**103.7**	**0.8**	**2771.2**	**48.85**
KFC Street Wise II									
Chicken wing	52 g	711	12.0	11.0	2.5	8.0	1.0	15.0	9.50
Chicken drumstick	60 g	669	12.0	10.0	2.0	6.0	0.0	15.0	9.50
Fried chips	135 g	1724	5.8	20.0	–	47.4	4.7	–	8.90
Coke	330 mL	581	0.0	0.0	0.0	10.9	0.0	4.0	7.50
Combination		**3686**	**29.8**	**41.0**	**4.5**	**72.3**	**5.7**	**34.0**	**24.40**

[1] Saturated fatty acids
[2] Carbohydrate

The energy density for each meal, excluding beverages, was also calculated. It was found that, per 100 g, the KFC meal contained 1 257 kJ, the 'quarter' 1 162 kJ, the McDonald's meal 1 039 kJ, and the Steers meal 960 kJ.

Discussion

The degree of underweight in the group was higher in males than in females. Combined overweight and obesity in males was 6.9% and in females was 27.2%. For females, the percentage is 5% higher than the national average.[21] Though no association was found between BMI and fast-food item intake, the study was only cross-sectional and the assessment of fast-food intake only presents part of the total picture. Estimating the total dietary intake and energy expenditure would allow the proportion of energy that fast food contributes to total energy intake to be determined. An assessment of these results would more clearly indicate the risk of overweight and obesity in this population group.

When compared with other studies, this study found that the mean fast-food item intake and frequenting of fast-food outlets was high

in this group. For example, in the USA, Larson and colleagues[15] found that only 23% of adolescents (mean age 15.9 years) had consumed fast-food items on three or more occasions in the previous week, with 75% eating fast foods once a week. In another study, the Continuing Survey of Food Intakes of Individuals (CSFII, 1989–1991), on average, 11- to 18-year-olds were found to visit fast-food outlets twice a week.[5] In the present study, the number of fast-food outlet visits was nearly double that of the US teenage group surveyed.[15] In a later CSFII, 38.5% of 14- to 18-year-olds reported eating fast foods during the recall period of three days.[7] In China, 10% of 12- to 14-year-old males from a higher socio-economic group stated that they ate hamburgers on a daily basis, compared to only 2.8% of boys from a lower socio-economic group. For girls, the figures were 5.7% and 3.8%, respectively.[14] Possible reasons for the differences between this study and the others may relate to the concept of a fast-food outlet. In developed countries such as the USA, these are commercial (usually franchised) outlets whereas in South Africa fast-food outlets include both commercial and informal outlets, such as street vendors and tuck shops, either in the community or at school.

The nutrition transition may give some insight into why this South African group of adolescents consumes more fast food than their American counterparts. The nutrition transition relates to the large shifts in dietary patterns with a substantial increase in the consumption of fat, sugar and refined foods.[22] Popkin[23] has proposed that, although different countries are at different stages of transition, there is evidence to suggest that developing countries, such as South Africa, have been undergoing transition at a much faster rate over the last decade or so, than has occurred in higher income countries, which underwent such a transition over many decades or even hundreds of years. Key features of the transition now occurring in developing countries include: rapid urbanisation, with increasing numbers of people living in urban areas, who have a greater disposable income and also greater access to food; this has been shown to occur much sooner during economic growth than was faced by higher income countries in the past.[23] It has also been shown that decisions around food purchases have also changed in that, for the same income level, the patterns of demand have shifted dramatically from earlier times.[23] For example, in China, it was found that those in lower socio-economic groups spent their disposable income on foods higher in fat than those in higher socio-economic groups.[24] Thus, a possible explanation as to why this population consumes more fast food than their American peers may be that they spend their income differently and, as a result, purchase more fast-food.

A key finding of this study relates to the most popular fast-food item consumed by this group; a local item, known colloquially as the 'quarter'. There are no documented data on this food, in terms of either its origins or its nutrient profile, which are both described in the current study. The 'quarter' is said to have its origins in Durban evolving further in Soweto, its popularity spanning all age groups, possibly due to price (mean R9.16). It is widely available, in that it can be purchased from an array of informal food vendors, known as tuck shops. The mean nutrient analysis of the 'quarter' samples showed that they were high in energy, fat, carbohydrates, protein and sodium. The average daily energy requirement of a 17-year-old is 10 000 kJ[25] and the average 'quarter' meal (with or without a soft drink) supplied more than half of the requirement, namely 60% and 54%, respectively.

As stated earlier, the energy density of fast foods is one proposed mechanism by which they may contribute to obesity, especially in regular consumers, such as in this population. A traditional West African rural diet contains an energy density of 450 kJ $100g^{-1}$, with the amount of food required to achieve the recommended daily energy intake being 2 000 g. A typical female British diet, minus beverages, has an energy density of 670 kJ $100g^{-1}$, with about 1 300 g of solid food being required to meet daily energy requirements, while if a 'quarter' is ingested only 800 g would be required. It has been hypothesised that, as a result of evolutionary conditions, humans tend to consume the same amount of 'bulk', regardless of its energy density. Therefore, down regulation of intake with energy-dense foods does not occur.

In this study, the energy density of the fast-food meals (minus beverages) ranged from 1.8 to 2.4 times higher than the healthy recommendation of 525 kJ $100g^{-1}$.[9] This would imply that consumers of these meals are required to adjust the remainder of their energy intake to compensate for this one meal. However this is unlikely, since this population has a propensity to consumer other energy-dense foods, including snacks, such as chocolates and crisps, pap and meat dishes with rich gravy and very few vegetables (personal observation).

Three key limitations on the current study are as follows. Firstly, it is a descriptive cross-sectional study, with no exploration of total energy intake or energy expenditure, though these data are currently being collected in a follow-up study. Secondly, the measurement of the consumption of fast-food items and the frequency of visits to fast-food outlets was assessed as separate questions. As a result, a discrepancy was found between those reporting to eat fast-food items 0 times per week (1.9%, data not shown) and those reporting not having visited a fast-food outlet in the previous week (18.3%). Thirdly, the fast-food questionnaire did not contain an exhaustive list of items. Even though an 'other' option was provided, the questionnaire did not list all possible chicken fast-food items, such as fried chicken pieces. Consequently, given the community being researched, fast-food item intake may have been underestimated in this study.

This study is the first to address the dearth of nutrient data on the 'quarter'. In an area such as Soweto, which is undergoing a rapid economic transition, it is likely that fast food contributes significantly to the amount of energy intake.[26] South Africa is showing signs of an obesity epidemic, particularly among those in socio-economic groups who have increasing disposable incomes and greater access to food. The 2003 South Africa Demographic and Health Survey[27] found that 32% of men and 50% of women were either overweight or obese. In young people, the averages were 13.3% and 22.3% in males and females, respectively. Therefore, further research should focus on behaviours around food choices among those experiencing rapid urbanisation, so that the government can intervene with appropriate public health messages and policies to address the necessary environmental changes.

To conclude, fast-food item consumption and visits to fast-food outlets were found to be high in the population studied, especially

when compared to their contemporaries in the USA. The contribution of an average 'quarter' to total energy intake is potentially very high, contributing more than 50% of the total energy needs required by 17-year-olds. However, an assessment of the total energy intake will help to put into context the energy contribution of this meal and thus allow us to understand its public health significance.

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