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HOW WELL ARE ADOLESCENTS IN THE GOUDA DISTRICT OF WESTERN CAPE MEETING THE SOUTH AFRICAN FOOD-BASED DIETARY GUIDELINES FOR FAT, SUGAR AND SODIUM?

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ABSTRACT

This study aimed to determine whether the dietary intake of primary school learners in a rural area of the Western Cape was in line with three of the South African food-based dietary guidelines: "Use fats sparingly, choose vegetable oils rather than hard fats", "use sugar and foods and drinks high in sugar sparingly", and "use salt and food high in salt sparingly".

A cross-sectional study was undertaken at two primary schools in low socioeconomic settings. Participants were grades five, six and seven learners (10-13 years old) at two schools in the Gouda District of the Western Cape (n=161). The learner's sociodemographic status was determined by means of a questionnaire. Weight, height and mid-upper arm circumference were measured to assess the nutritional status of each learner. Dietary intake was measured by means of a 24-hour recall and an indicator food frequency questionnaire (FFQ). Results showed that 11.8% of learners were overweight and 5.6% were obese (17.4% BMI ≥ +1SD). Of the 161 participants, 30.4% of learners were above the recommended range of intakes for dietary fat intake, 54.7% of learners were above the recommended range for added sugar intake, and 51.6% of learners were above the recommended range for sodium intake.

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INTRODUCTION

Adolecents are a nutritionally vulnerable population. Nutrient requirements during this life stage are at their highest for many nutrients due to rapid growth and physical development (Otuneye et al. 2017). Unfortunately, adolescents frequently tend to make poor food choices since they spend a large portion of their time at school where they may be exposed to energy-dense foods frequently sold at school tuck-shops and informal vendors (Steyn et al. 2016). Children living in disadvantaged communities by virtue of high unemployment and low socio-economic status, are even more at risk, as their parents are less likely to have control over their food choices owing to cost and availability issues (Abrahams *et al*. 2011). As a result of a poor quality diet, adolescents may be exposed to both over- and undernutrition, and are at risk of various health complications which may affect growth and nutritional status (Steyn *et al*. 2016). The South African Food Based Dietary Guidelines (FBDGs) state that processed foods high in sugar, fat and salt should be limited (Vorster *et al*. 2013). Despite this, the intake of sugar and fatty foods have been increasing particularly as children approach adolescence (Temple & Steyn 2013). In the National Food Consumption Survey (NFCS) (Labadarios 2000) seven to nine year olds in the Western Cape Province were found to have the highest mean added sugar intake of all nine provinces (at 60g per day) and the highest mean fat intake (57g per day). Excessive intakes of fats and sugar can increase the risk of childhood obesity, as well as non- communicable diseases, such as type 2 diabetes and cardiovascular disease, later in life (Muthuri *et al*. 2014). Furthermore, while diseases associated with high sodium consumption (such as high blood pressure and cardiovascular disease) typically present in adults, these health risks often originate in childhood (Chen & Wang 2008).

Due to the various health risks posed by high sugar, fat and sodium intakes, the World Health Organisation (WHO 2013) recommend that sugar intake should not exceed 10% of daily energy intake, and ideally less than 25g in women and 37.5g in men (Johnson *et al*. 2009). The recommended amount of fat is 25-35% of daily energy intake (Food and Nutrition Board 2004). The maximum level of daily sodium intake for children aged 9-13 years is 2.2 g/day, which is equivalent to 5.5g or 1 teaspoon of table salt Institute of Medicine 2005). These recommendations are in line with the South African FBDGs which are promoted by the Department of Health and state: “use fats sparingly; choose vegetable oils rather than hard fats”; “use sugar and foods and drinks high in sugar sparingly”; and “use salt and foods high in salt sparingly (Vorster *et al*. 2013).” The present study aimed to determine whether adolescents at two schools in rural areas of Gouda District were compliant with these guidelines.

MATERIALS AND METHODS

Participants

The sample comprised learners in grades five to seven (10-13 years). Based on a 10% level of stunting in children aged 10-13 years in South Africa; a precision of 0.05 and a confidence interval of 95%, the projected sample was 140. An extra 20% were included to allow for spoiled questionnaires.

In this cross-sectional, quantitative study, participants were recruited at two schools in the Gouda district. This district lies about 100 km north east of Cape Town. The population are predominantly of mixed ancestry and are regarded as being of low socio-economic status with many being children of farm workers. A trained field worker called the children from their classes starting with grade five children who lined up outside the rooms dedicated to the research activities. Children were then brought into the study area a few at a time. Once the target sample size was reached, sampling was discontinued. Learners between 10 and 13 years were only included in the study if they had parental consent and were willing to participate.

Socio-demographic information

A socio-demographic questionnaire was used to determine learners age, the type of house in

which they lived, number in the household, whether they had water and electricity inside the house and the number of people earning an income in the house.

Anthropometric measurements

All subjects were weighed in light clothes without shoes on a portable digital calibrated electronic scale. Height was measured using an upright stadiometer placed against a perpendicular wall at each school. All values were recorded on coded data input sheets to maintain anonymity. BMI was derived using the following equation: weight (kilograms) / height 2 (metres) and BMI values were divided into four categories, thin BMI<-2SD, normal BMI ≥ -2SD - ≤ +1SD, overweight BMI ≥1SD and obese BMI ≥2SD.

24 Hour recall

A 24 hour recall using the multiple pass method (Conway *et al*. 2003) was used as a dietary assessment tool to estimate nutrient intake of learners. A face-to-face interview with each individual learner was carried out during which the learner was asked to recall the food and drinks and the amounts consumed during the past 24 hours. Three trained field workers conducted the interviews using life size photographs of the items (Senekal & Steyn 2004).

Food frequency questionnaire

A quantified food frequency questionnaire (QFFQ) adapted from the South African National Health and Nutrition Survey (SANHANES) questionnaire on fat, sugar and salt intake was administered (Shisana *et al*. 2013). Thirty-two different food items were included on the QFFQ. Pictures of foods and beverages (food cards) were shown to children who selected the foods they had eaten in the past week. Options for frequency included 0 times per week; 1 – 3 times per week; 4-6 times per week, or every day.

Data analyses

The dietary data was tested for normality using the Shapiro-Wilks test. The dietary data was not normally distributed while the anthropometry was. The percentage of learners whose dietary intake fell above the recommended intake for fat, added sugar and sodium was calculated using the South African food composition tables. Charlton *et al*. (2005) found that salt added to food at the table and in cooking (ie. discretionary salt intake) makes up 32.8% of total sodium intake. Therefore an equivalent of 32.8% of sodium intake was added to the dietary intake data in order to reflect the estimated sodium intake of the learners.

Ethical approval

The study was approved by the Human Research Ethics Committee of the University of Cape Town (REF: 156/2017) and the Department of Basic Education. Parents/ caregivers gave written informed consent for children to participate in the study. During data collection, the children that were elligble to participate also gave formal written assent. There were no invasive procedures in the study, and all measurements were kept confidential by means of coded participant forms.

RESULTS

The sample (n=161) comprised 47.8% boys and 52.2% girls (Table 1). The majority live in brick homes (72%) with 98% having electricity and running water (89%). Nearly 94% participated in the government feeding scheme which provides a lunch to needy learners and 44.7% participated in the breakfast program. Overall, 11.8% of the adolescents were overweight (9.1% of males, and 14.3% of females) and 5.6% of the group were obese (6.4 % of males, and 4.8% of females)(Table 2). The prevalence of overweight and obesity combined was greater (17.4%) compared with thinness/underweight (13.6%).

Table 3 presents data on fat, sugar and sodium intakes. For fat intake, 30.4% of learners fell above the range of recommended intake (Food and Nutrition Board 2004), 54.7% of learners fell above the recommended daily sugar intake ((WHO 2003) and 51.6% of learners fell above the recommended daily intake of sodium (Institute of Medicine 2005). The learners were

TABLE 1: SOCIO-DEMOGRAPHIC CHARACTERISTICS OF THE ADOLESCENTS (N = 161)

Variables	N (%)	Variables	N (%)
Age (years)		**Number adults in HH**	
10	21 (13.0%)	0	0 (0%)
11	38 (23.6%)	1	14 (8.7%)
12	55 (34.2%)	2	61 (37.9%)
13	47 (29.2%)	3	39 (24.2%)
Sex		>3	45 (28.0%)
Male	77 (47.8%)	Learner unsure	2 (1.2%)
Female	84 (52.2%)	**Number children in HH**	
Grade in School		1	14 (8.7%)
R-5	57 (35.4%)	2	37 (23.0%)
R-6	48 (29.8%)	3	54 (33.5%)
R-7	56 (34.8%)	4	29 (18.0%)
Type of house		>4	27 (16.8%)
Brick house	116 (72.0%)	**Running water**	
Informal structure	4 (2.5%)	Yes	144 (89.4%)
Wendy house	24 (14.9%)	No	17 (10.6%)
Flat	14 (8.7%)	**Electricity**	
Servant's quarters	1 (0.6%)	Yes	158 (98.1%)
Learner unsure	2 (1.2%)	No	2 (1.2%)
Number of adults in HH with an income		Learner unsure	1 (0.6%)
None	4 (2.5%)	**Participation in BP**	
One	32 (19.9%)	Yes	72 (44.7%)
Two	82 (50.9%)	No	89 (55.3%)
>Two	43 (26.7%)	**Participation in NSNP**	
		Yes	151 (93.8%)
		No	10 (6.2%)

NSNP: National school nutrition program; BP: Breakfast program; HH:household

TABLE 2: BODY MASS INDEX (BMI) STATUS OF CHILDREN AT TWO SCHOOLS IN GOUDA AREA

	Boys n(%)	Girls n(%)	Total n(%)
BMI <-2SD (thin/underweight)	17 (22.1)	5 (6.0)	22 (13.6)
BMI ≥ -2SD - BMI ≤ +1SD (normal)	48 (62.3)	63 (75.0)	111 (68.9)
BMI ≥ 1SD –BMI ≤ 2SD (overweight)	7 (9.1)	12 (14.3)	19 (11.8)
BMI ≥ 2SD (obese)	5 (6.4)	4 (4.8)	9 (5.6)
BMI ≥ 1SD and ≥2 SD overweight and obese	12 (15.5)	16 (19.1)	28 (17.4)

consuming a median intake of 60.3g added sugar, which equates to about 15 teaspoons of added sugar (Table 4). The median fat intake was 54.8g and the median sodium intake was 2.3g. Fried potato chips were the most popular fatty item purchased. In terms of added sugar, sugar -sweetened beverages were the most popular followed by cordial (sweet cold drink made by adding water to a concentrate), sugar, cake and sweetened fruit juice. Crisps, take-outs, polonies, margarine and pies contributed most to the sodium intake.

DISCUSSION

Overall, the dietary intake of learners in the Gouda District of the Western Cape is not in line with the South African FBDGs for fat, added sugar and sodium. This pattern of dietary intake is regarded as being conducive for the development of non-communicable diseases since a diet high in saturated fat, sugar and salt, plays an important role in this regard (WHO 2003).

TABLE 3: PERCENT OF LEARNERS AT TWO SCHOOLS IN THE GOUDA DISTRICT FALLING ABOVE OR BELOW THE SPECIFIED DIETARY REFERENCE INTAKES

	% Learners above range	% Learners within range	% Learners below range
% Protein TE (10 - 30%)†	0.6	66.5	33.0
% Carbohydrate TE (45-65%)†	23.0	62.7	14.3
% Added Sugar TE (<10%)‡	54.7	45.3	NA
% Fat TE (25-35%)†	30.4	39.1	30.4
% SFA TE (<10%)‡	39.8	60.2	NA
% PUFA TE (5-10%)†	28.8	31.7	43.5
Sodium (< 2.2g)$	51.6	48.4	NA

NA=Not applicable
†AMDR = Adequate macronutrient distribution range, reference 11;
‡ % TE for sugar, reference 9; $ Estimated average requirement, reference 12
TE = Total energy; SFA = Saturated fatty acids; PUFA = Polyunsaturated fatty acid

TABLE 3: MEDIAN/MEAN INTAKE OF FAT, ADDED SUGAR, AND SODIUM

	Males	Females	Total	Main sources median (g) intake / day
Mean fat (g)	65.51 (39.09)	59.63 (38.60)	62.44 (38.75)	Fried potato chips (89.5g), Crisps (75.5g), chicken (37g), whole milk (32.5g), pork (30g), chocolate (27.5g), red meat (25g), polony(20.5g), fat cakes & doughnuts (15g)
Median fat (g)	58.50	50.00	54.80	
IQR	39.10 -83.10	34.45 – 71.70	12.60 – 75.10	
Mean sugar (g)	87.94 (71.28)	66.47 (51.45)	76.74 (62.47)	Sugar sweetened cold drinks (268g), cordi-al* (250g), sugar (89.5g), Sweets (62.5g), Cakes (53,g), Sweetened Fruit Juice (43g)
Median sugar (g)	68.60	53.45	60.30	
IQR	46.1 – 106.00	37.08 – 78.38	3.70 - 89.90	
Sugar % > 25g	99.21%	88.1%	90.1%	
Mean sodium (g)	2.62 (1.12)	2.52 (1.08)	2.57 (1.10)	Crisps (75.5g), takeouts (26.5g), polony (20.5g), margarine (7g), pies (5g)
Median sodium (g)	2.19	2.29	2.26	
IQR	1.64 – 3.17	1.65-3.14	1.64 - 3.14	

IQR= interquartile range * cordial is a sugar flavoured concentrate to which water is added

Smuts and Wolmarans (2013) found that in six out of nine provinces in South Africa participants had a relatively low mean percentage of energy from total fat (20-22%). However, the Western Cape showed a higher mean percentage of energy from fat at 30%. This was also reflected in the current study, where 39.1% of learners were within the recommended range for fat intake (25-35%) and 30.4% of learners were above the recommended range for their age group. Of concern was the finding that a high percent of learners in the present study had a saturated fat intake which exceeded 10% of energy intake (WHO 2003). It is interesting to note that 30.4% of learners in the present study fell below the recommended range for fat intake. This is of concern, specifically in children and adolescents, because nutrient requirements during this time are at their highest for many nutrients, including essential fatty acids (Otuneye *et al*. 2017).

In the present study, the mean intake of sugar was 76.7g per day with more than half of children having an intake of >10% energy intake. This is lower than a study of adolescents in Gauteng who had a mean intake of 102g per day at age 13 years (20% energy) which is double the recommended sugar intake (MacKeown *et al*. 2007). However, it is higher than the mean sugar intake of the NFCS of 7-9 year olds in the Western Cape who had a mean intake of 60g. The intake of sugar sweetened beverages (SSBs) in the present study was very high, with a median intake of 518ml per day (268ml soda plus 250ml cordial). One of the few studies undertaken on the intake of SSBs in South Africa was done in children in Cape Town in adolescents in grades four and seven

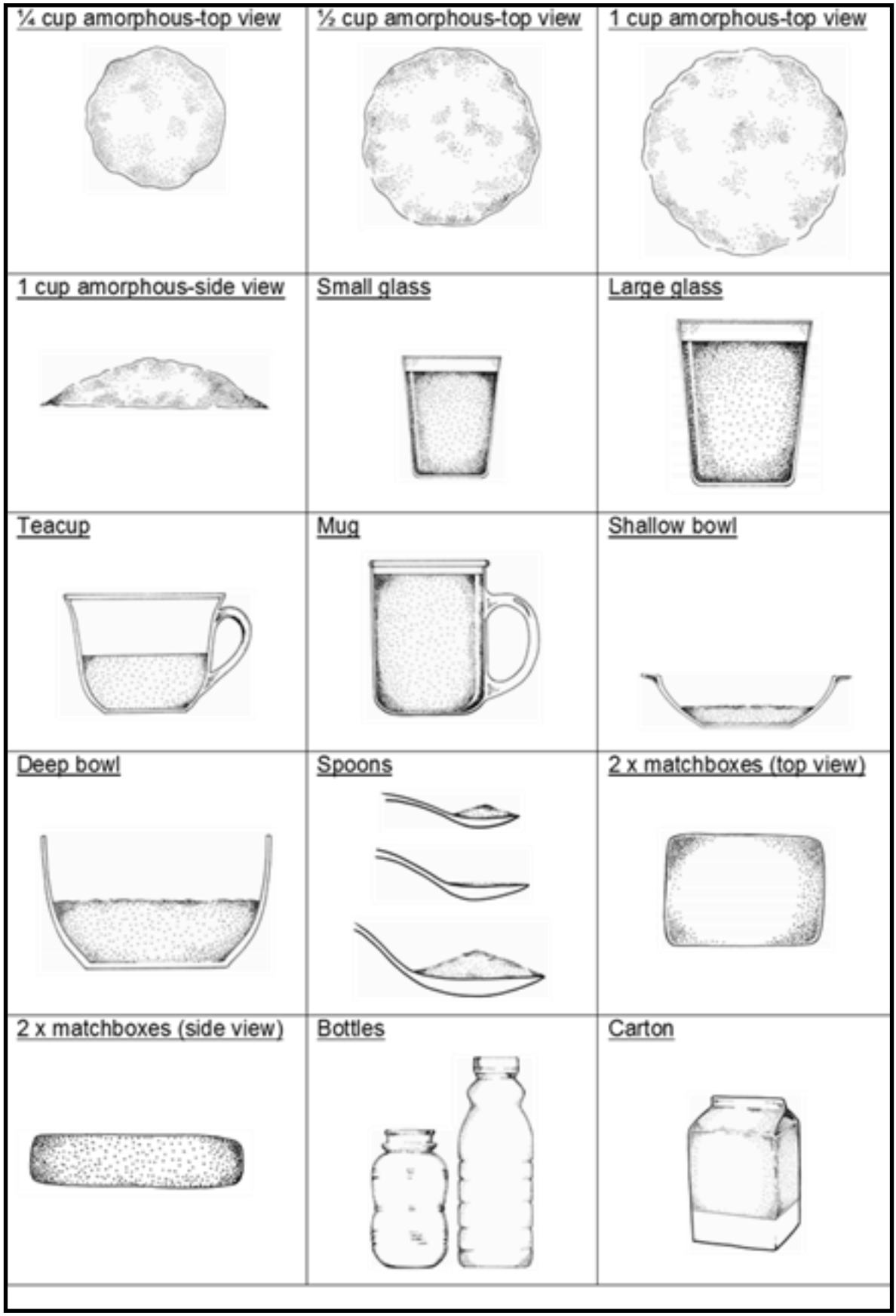

FIGURE 1: EXAMPLES OF SKETCHES AND MEASURES USED IN THE STUDY

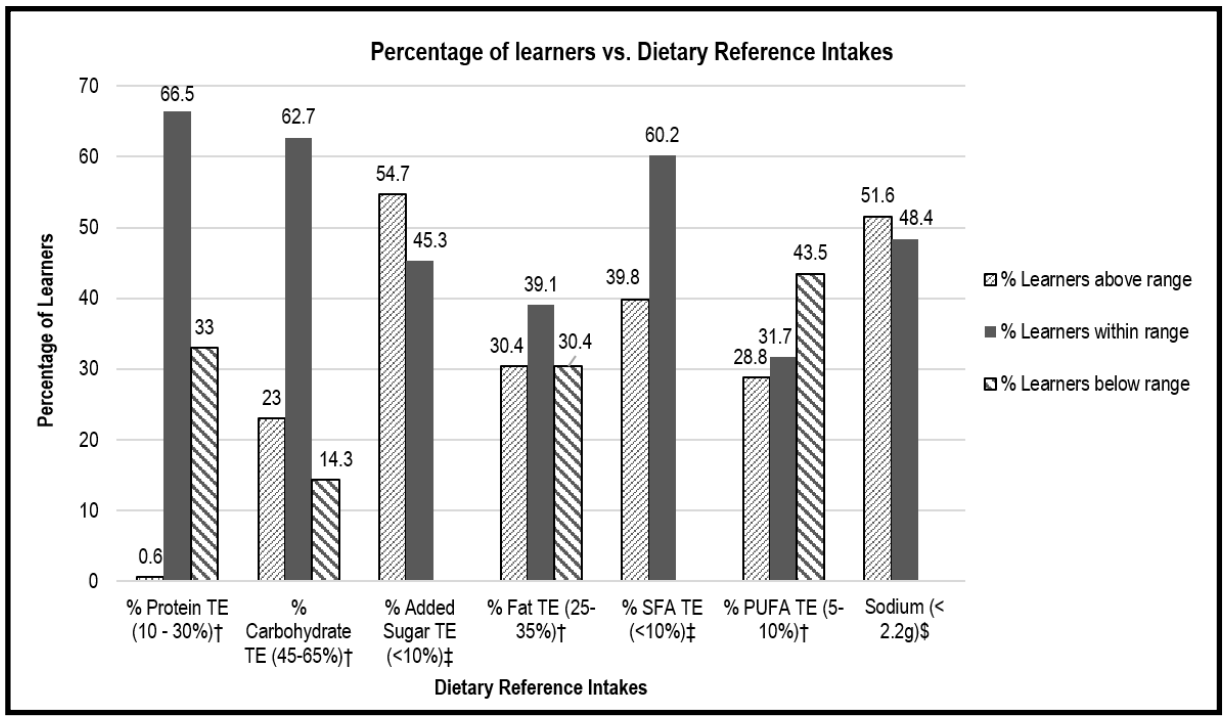

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FIGURE 2: PERCENT OF LEARNERS AT TWO SCHOOLS IN THE GOUDA DISTRICT FALLING ABOVE OR BELOW THE SPECIFIED DIETARY REFERENCE INTAKES

(Louwrens *et al*. 2012). Seventy-four percent of learners had two or more servings of 340ml per day. Excessive intake of SSBs has been associated obesity, hypertension, type 2 diabetes, and cardiovascular disease (Dhingra *et al*. 2007; Fung *et al*. 2009; Malik *et al*. 2010; Te Morenga *et al*. 2010).

Several studies have demonstrated that salt is a major determinant of fluid intake and sugar sweetened beverage consumption during childhood. Findings suggest that a reduction in salt intake would reduce the consumption of sugar sweetened beverages (He *et al*. 2008; Grimes *et al*. 2013). A meta-analyses of randomised controlled trials have indicated that sodium intake in children contribute to the development of hypertension later in life and furthermore a high salt intake is associated with children preferring saltier foods in adulthood (He *et al*. 2006). In the current study nearly half of the children had a sodium intake greater than 2.2g per day.

As with all dietary assessments, there are various limitations when using a 24-hour recall. Such investigations not only require accurate quantifiable dietary recall, which may be challenging in children, but also accurate analysis of food content. Furthermore, the 24-hour dietary recall may be a poor indicator of an individual's usual nutrient intake because of day-to-day intra-individual variability. However in this regard the QFFQ was used to provide a broader assessment of usual intake.

CONCLUSION

While the South African FBDGs specifically mention recommendations on the dietary intake of fat, added sugar and sodium, the majority of learners in the Gouda District of the Western Cape are not compliant with the recommendations. Due to the myriad of health risks associated with the consumption of these food items, the dietary pattern of these children places them at risk of obesity and non-

communicable diseases. The school environment and the food choices available at the school tuckshop could be changed to provide healthier options.

CONFLICT OF INTEREST, SOURCE OF FUNDING AND AUTHORSHIP

This research project received funding from Acciona, a company working in conjunction with the Tiger Brands Foundation to fund the in-school breakfast program at one of the schools from which the participants were recruited. The authors declare no conflict of interest.

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