FOOD CHOICES, PHYSICAL ACTIVITY LEVELS AND OTHER FACTORS ASSOCIATED WITH WEIGHT GAIN IN PRIMARY SCHOOL EDUCATORS

Zibuyile Seme, Anniza de Villiers, Nelia P Steyn*, Marjanne Senekal

ABSTRACT

The aim of the study was to evaluate educators' health behaviours regarding dietary intake and physical activity (PA). A survey was undertaken in 517 educators at 83 primary schools in the Western Cape. Food choices (healthy vs. unhealthy), PA levels, and health knowledge were measured by questionnaire. The six most frequently consumed foods were sugar (0.68 times per day), margarine/butter (0.65 times per day), dairy (0.55 times per day), cooked starches (0.53 times per day), white bread and fruit juice (0.46 times per day). The combined data of fruit and vegetables (reflecting healthy choices) were consumed twice a day, while a high-fat food choice and an energy-dense choice was made between one and two times a day. The frequency of intake of high-fat foods, white bread and processed foods was significantly higher in males, while their frequency of vegetable intake was significantly lower than that of females. Snacks were eaten regularly by most (72.8%) of the educators. Females, and those older than 50 years were significantly more likely to have low PA levels. Activity spent at work was significantly higher than activity spent for transport and recreational activities.

— ***Ms Z Seme***
Division of Human Nutrition
Department of Human Biology
University of Cape Town
Cape Town
South Africa
Tel: +27 (0)76 958 9189
Fax: +27(0)21 448 7226
Email: seme.zibuyile@yahoo.com

— ***Dr A de Villiers***
Non-Communicable Diseases Research Unit
South African Medical Research Council
Cape Town
South Africa
Tel: +27 (0)21 938 0840
Fax: +27(0)21 933 5519
Email: Anniza.deVilliers@mrc.ac.za

— ***Prof NP Steyn****
Division of Human Nutrition
Department of Human Biology
University of Cape Town
Cape TownSouth Africa
Tel: +27 (0)21 650 1097
Fax: +27(0)21 448 7226
Email: nelia.steyn@uct.ac.za
*Corresponding author

— ***Prof M Senekal***
Division of Human Nutrition
Department of Human Biology
University of Cape Town
Cape Town
South Africa
Tel: +27 (0)21 406 6784
Fax: +27(0)21 448 7226
Email: marjanne.senekal@uct.ac.za

ARTICLE INFO

Article history
Received 6 July 2017
Revision 2 August 2017

Keywords
dietary pattern, educators, food choices, obesity; physical activity; South Africa

BACKGROUND

Globally, deaths from non-communicable diseases (NCDs) are predicted to increase by 17% over the next 10 years, with the greatest increase expected in the African region (24%). Overall, in low- and middle-income countries, 29% of deaths from NCDs occur in people younger than 60 years compared with 13% in high-income countries (World Health Organization 2014).

In South Africa, the first National Burden of Disease Study showed that 37% of deaths at that time were as a result of NCDs, with unhealthy diet and physical inactivity being associated with many of these (Bradshaw et al. 2000). Results from the second National Burden of Disease Study showed that in 2012, 43.4% of deaths in South Africa were attributed to non-communicable diseases (Pillay-van Wyk et al. 2016). The most recent national statistics, i.e. the South African Health and Nutrition Examination Study (SANHANES) showed that 64% of South African females and 30.6% of males are overweight or obese (body mass index (BMI) ≥25 kg/m2) (Shisana et al. 2013). The prevalence of obesity was found to be higher in urban areas, in females, and increased with age, with 51% of females having a waist circumference in the cardiovascular risk range. Since obesity is a risk factor for many NCDs, including diabetes and heart disease, this is a cause for great concern (Shisana et al. 2013).

Over many years, the nutrition transition which is characterised by an increase in individuals consuming a western diet that is typically energy -dense, high in saturated fat, trans fats, salt, and sugar, and low in fibre, has been taking place in South Africa (Viljoen, Botha & Boonzaaier 2005; Steyn et al. 2006; Vorster, Kruger & Margetts 2011; Statistics South Africa 2013; Shisana et al. 2013). This move towards a western diet has been fuelled by the rapid increase in urbanisation which occurred after the election of a democratic government in 1994 allowing people to move freely from rural to urban areas.

In the South African Demographic and Health Survey (SADHS), 48% of males and 63% of females were shown to be inactive, with only 24% of males and 8% of females being sufficiently active according to recommended guidelines (Department of Health, Medical Research Council & Orcmacro 2007). These lifestyle changes are associated with rapid urbanisation, with just as many South Africans now living in urban areas as in rural areas (Statistics South Africa 2013).

An intervention study (HealthKick) in the Western Cape was undertaken in primary schools in order to promote a healthy lifestyle in children, educators and their parents. At the baseline study principals reported that many educators had a poor diet, low levels of physical activity and were overweight (de Villiers et al. 2012). This served as a motivation for the present study where it was found that primary school educators had higher NCD risk factors than those reported for the general population of adults in the SANHANES (Shisana et al. 2013). Of the educators, 31% were overweight and 47% obese, with 67% of females having waist circumference measurements above the recommended 88 cm, while elevated blood pressure, blood glucose and blood cholesterol levels were found among 46%, 29% and 30% of the sample, respectively (Senekal et al. 2015). The finding that the mean age of the educators was 52 (SD 10) years may have contributed to this. Based on these findings it was regarded as important to also evaluate the dietary intake and physical activity levels of these educators.

Educators play an important role in health promotion efforts aimed at learners through the school setting. They not only have the potential to create a supportive environment, but also serve as role models to the learners for healthy behaviours (intrapersonal level influences as defined in the socio-ecological approach to health interventions) (Weinstein & Rosen 2003; Rosário et al. 2012; Van der Schee & Gard 2014). According to the WHO School Policy Framework, educators need to be aware of, and responsible for, the messages they give to learners, as role models as well as programme implementers (WHO 1998).

Major modifiable risks for obesity development include high energy-dense food choices and low physical activity (PA) levels (WHO 2003). The high levels of overweight/obesity among the sample of educators investigated by Senekal et al. (2015) suggest the presence of such poor health behaviours in educators. Learners could emulate these behaviours, contributing to negative health promotion outcomes, especially in terms of obesity. Insights in the dietary intake, PA levels and associated factors are key to addressing the problem of obesity in educators, and thus, prevent the negative lifestyle role modelling effects they may have on learners. Hence, the aim of this research was to investigate these variables in the sample of educators in the Western Cape who participated in the formative assessment.

METHODS

Sample Area and Population

The sampling procedures have been described elsewhere in detail (Senekal et al. 2015). Briefly

summarised, the study population comprised Grade 4–6 primary school educators from 100 randomly selected schools in rural (50 schools) and urban areas (50 schools) in the Western Cape. In total, 83 schools participated in this research which took place between June and November 2007, with the final sample including 329 educators from the rural and 188 educators from urban settings, thus totalling 517 educators.

Research Questionnaire

Questions for the structured self-administered questionnaire were developed using relevant literature, text books, existing questionnaires and input from an expert panel which included three senior researchers with PhDs, and six post -graduate students (two studying at master's and four at honours level).

Socio-Demographic Variables and Weight-Loss Attempts

Socio-demographic variables assessed included gender, age and ethnicity. History of weight-loss attempts was assessed by asking whether the participant had ever tried to lose weight.

Assessment of Healthfulness of Dietary Intake

The above-mentioned expert panel considered various dietary intake methods for assessing the healthfulness of the dietary intake of educators. They considered the aim of the research, the literacy level (good) and access to educators in terms of time allocation (limited) and the respondent burden that needed to be low. The outcome was to use a non-quantified indicator food frequency questionnaire (IFFQ) that reflected the frequency of poor and healthy food choices in the past "days or weeks?" focusing specifically on foods/drinks/snacks associated with the development/prevention/management of obesity, diabetes and other non-communicable diseases (NCDs). The IFFQ comprised 36 food categories, for example red meat, processed meat, fresh fish, and participants were required to record the number of times they had consumed a category over the past week or month. From this a daily frequency was calculated for each category by dividing by 7 or by 28, respectively. The validity of frequency of estimation of food choice during the previous week was illustrated by Senekal, Steyn & Nel (2009). Results showed that associations were significant between the frequency of intake of 22 out of 30 items included on a micronutrient intake screening questionnaire and frequency of intake for the same item determined from a two-week food diary. In addition to the completion of the IFFQ, educators were also questioned on the frequency of consumption of breakfast, lunch, dinner, and snacks during the week and over weekends.

Perception of Healthy Eating and Sources, Nutrition Information and Weight-Loss Attempts

For the assessment of educators' perception of healthy eating, they were asked: "What do you think you need to eat to be healthy?" Responses were recorded according to the following categories (yes/no per category): fruit, vegetables, protein dairy, starches, fats, sugars, water, and other. The number of food categories mentioned was taken as an indication of perception/understanding of healthy eating. Educators were also asked to indicate their source of nutrition information and whether they had ever tried to lose weight (yes/no).

Physical Activity

The Global Physical Activity Questionnaire (GPAQ) was deemed the most appropriate instrument to investigate PA levels of educators. This instrument was developed by WHO for the quantification of energy expenditure in subjects in developing countries (Armstrong & Bull 2006; Bull, Maslin & Armstrong 2009) and has been validated in nine countries including South Africa (WHO 2005). The GPAQ focuses on PA which takes place in three settings (activity at work; travelling to and from places and recreational activities) as well as on sedentary behaviour. The instrument allows for the classification of PA as high, moderate and low and quantification in terms of metabolic equivalents (METs) per week.

Perceptions of Educators on Causes of Weight-Gain Factors That Influence Food Choices and Physical Activity Levels in Learners

Educators were asked to indicate their perception of the most important reason why people gain weight (how they eat; how much exercise they do; and lack of knowledge). They were also asked which factors they thought

strongly influences what a learner eats and what influences a learner's level of PA.

Pilot Study

The questionnaire was pilot tested on ten Grade 4–6 school educators in three different schools in the Cape Metropole North district. The proposed self-administration procedure was implemented in the pilot survey to assess the feasibility of this procedure. Appropriate revisions were made after this pilot study to improve question clarity.

Ethics

Ethical approval for the study was obtained from the University of Cape Town's Faculty of Health Sciences Human Research Ethics Committee (REC REF: 486/2005). Permission to conduct the study at the schools was obtained from the Western Cape Department of Basic Education. School principals were subsequently approached with a letter that included information on the study, inviting them (educators) to participate. Informed written consent was obtained from each educator before assessments commenced.

Data Analyses

Descriptive statistics included frequencies for categorical variables and mean ±SD for normally distributed data and median (Interquartile Range) for non-normally distributed data, using the Shapiro-Wilk test to test for normality. Associations between BMI, gender, age, origin (rural or urban) and food choices, sources of nutrition information, prior weight-loss efforts, PA, and perceptions of factors that influence eating and PA in educators were assessed using Pearson's chi-square test for categorical comparisons and ANOVA (normally distributed data) or Kruskal-Wallis (non-normally distributed data) for continuous variables. Analyses were not adjusted for the cluster sampling frame.

RESULTS

The sample included 196 (38%) male and 321 (72%) female educators. Their mean age was 52±10.1 years, with males (58±14.8 years) being significantly older than the females (48±5.6) (ANOVA p-value: 0.036). The largest percentage of educators was of mixed ancestry (87%), with 11% being white and 2% black. The majority (64%) came from urban areas vs. 36% from rural areas. As mentioned earlier, 31% of educators were overweight and 46.6% were obese; 67% had a BMI ≥25 kg/m2 (detail regarding the anthropometric profile of the educators was published elsewhere (Senekal et al. 2015).

TABLE 1: FREQUENCY (TIMES PER DAY) OF CONSUMPTION OF INDICATOR FOODS BY THE EDUCATORS IN DESCENDING ORDER

Food item	Mean ± SD	Food item	Mean ± SD
Sugar	0.68±0.40	Processed meats	0.19±0.20
Margarine/butter	0.65±0.37	Fried foods e.g. chicken	0.18±0.19
Milk/sour milk, yogurt	0.55±0.38	Sweet drinks	0.17±0.26
Rice, maize porridge, pasta, samp, potatoes	0.53±0.33	Oranges and naartjies	0.17±0.23
Bread, white	0.46±0.39	Peanut butter/peanuts	0.16±0.21
Juice, fruit	0.46± 0.34	Crisps, e.g. papas, pretzels	0.14±0.21
Breakfast cereals	0.41±0.39	Chocolate	0.13±0.20
Bread, brown	0.33±0.36	Fried potatoes	0.13±0.17
Apple, banana, pears	0.32±0.29	Jam, syrup, honey	0.13±0.21
Tomato (raw, cooked)	0.31±0.27	Oats	0.13±0.25
Orange or yellow vegetables	0.27±0.23	Fish, fresh	0.11±0.12
Green vegetables, e.g. spinach,	0.27±0.25	Cakes, biscuits, doughnuts	0.11±0.16
Yellow cheese	0.27±0.24	Legumes e.g. dry beans	0.10±0.16
Mixed vegetables	0.26±0.24	Fish, tinned or smoked	0.08±0.13
Red meat	0.26±0.22	Take outs, e.g. KFC, Steers	0.08±0.14
Cabbage, cauliflower,	0.25±0.25	Pies, sausage rolls	0.06±0.11
Eggs	0.22±0.21	Organ meats, e.g. liver	0.04±0.09
Chicken with skin	0.22±0.21	Tinned meat	0.03±0.09
Sweets	0.22±0.30		

TABLE 2: FREQUENCY (TIMES/DAY) OF INTAKE OF INDICATOR FOOD CATEGORIES FOR THE TOTAL GROUP BY GENDER

Gender	n	Mean SD	Median IQR	Mean SD	Median IQR	Mean SD	Median IQR
Category		**Fruit & vegetables**		**High fat foods**		**Energy-dense snacks**	
Male	196	1.7 ±1.1	2(1;2)	2.1 ±1.0	2(2;3)	1.4 ±0.9	1(1;2)
Female	321	2.0 ±1.2	2(1;3)	1.8 ±0.9	2(1;2)	1.4 ±0.9	1(1;2)
p-value*			0.000**		0.000**		0.799
Total	517	1.9 ±1.2	2(1;3)	1.9 ±1.0	2(1;2)	1.4 ±0.9	1(1;2)
Category		**White bread**		**Cereals & legumes**		**Processed (high salt) foods**	
Male	196	0.6±0.4	0.7(0.1;0.8)	0.98 ±0.8	1(0;1)	2.8 ±1.1	3(2;4)
Female	321	0.4±0.4	0.3(0;0.7)	0.99 ±0.74	1(0;1)	2.5 ±1.2	3(2;3)
p-value*			0.000**		0.151		0.000**
Total	517	0.5±0.4	0.4(0;0.9)	0.98 ±0.76	1(0;1)	2.7±1.2	3(2;3)

*Kruskal Wallis test, ** significant at p<0.001

TABLE 3: CONSUMPTION OF MEALS BY THE EDUCATORS BY GENDER AND BMI (N=517)

Category	n (%)	Week days			Weekends		
		Breakfast	Lunch	Dinner	Breakfast	Lunch	Dinner
Gender		%	%	%	%	%	%
Male	196	68.0	73.2	97.9	78.8	85.5	97.9
Female	321	72.1	72.9	95.2	80.4	84.9	89,7
p-value+		0.323	0.948	0.119	0.530	0.845	0.001**
BMI		%	%	%	%	%	%
Normal	110 (21.3)	69.4	74.6	96.4	75.5	84.6	94.4
Overweight	158 (30.5)	72.5	71.1	96.3	87.3	85.6	94.3
Obese	241 (46.6)	69.9	73.6	96.2	76.4	85.0	91.1
p-value*		0.811	0.785	0.997	0.014**	0.969	0.382
Total	517	70.6	73.0	96.3	79.6	85.1	92.8

*Pearson's chi-square test, **significant at p<0.05

Results on ever having tried to lose weight were as follows: of the total group (n=510), which varied because of missing values, 52.6% reported having tried to lose weight in the past. Female educators were significantly more likely to have tried losing weight (64.7%) than the male educators (32.1%) (Pearson's chi-squared test p-value: 0.000). Educators with normal weight were the least likely to have tried losing weight (23.4%), followed by those who were overweight (45.3%). Obese educators were the most likely to have tried to lose weight (Pearson's chi-squared test p 0.000). Younger educators (<30 years) tended to be the least likely to have tried losing weight (30.0%). They were followed by 30-49-year-olds (50.6%), with those 50 years and older being the most likely to have tried losing weight (58.9%) (Pearson's chi-squared test p value: 0.096). These data are not shown.

Data on the daily frequency of consumption of indicator foods (Table 1) show that the six most frequently consumed items (in descending order) were sugar (0.68 times/day), margarine/ butter (0.65 times/day), milk/sour milk/yoghurt (0.55 times/day), rice/pap/samp/pasta/potato (0.53 times/day), and white bread and fruit juice (both 0.46 times/day).

In Table 2, results of the frequency of intake of indicator food categories for the total group by gender and BMI groups are presented. Fruit and vegetables (reflecting healthy food choices) were consumed about twice a day, cereal fibre-rich foods and legumes combined once a day. A high-fat food choice was made twice a day and an energy-dense snack choice between one and two times a day (both reflecting poor food choices). Processed foods (reflecting poor food choices in terms of sodium intake) were consumed approximately three times a day. The only significant associations were found for gender. Males had a significantly higher frequency of consumption of high-fat foods, white bread and processed foods, while the

TABLE 4: PERCEPTION OF FOOD GROUPS THAT NEED TO BE EATEN TO BE HEALTHY BY GENDER AND AGE (N=517)

Category	n	Dairy	Protein	Starch	Fruits	Vegetables	Fats
		%	%	%	%	%	%
Gender							
Male	196	8.8	23.7	5.2	39.7	49.5	10.8
Female	321	6.9	31.8	5.9	48.1	57.2	11.6
p-value*		0.445	0.051	0.697	0.063	0.090	0.779
Age categories							
<30 years	10	20.0	30.0	20.0	30.0	60.0	30.0
30-49 years	366	5.3	28.5	4.9	44.5	54.7	11.3
≥50 years	130	10.9	29.5	6.2	47.3	52.7	9.3
p-value*		0.027*	0.973	0.117	0.543	0.867	0.133
Total	517	10.4	28.7	8.4	41.9	54.8	14.6

* Pearson's chi-square; significant at p<0.05

TABLE 5: PHYSICAL ACTIVITY LEVELS FOR THE TOTAL GROUP OF EDUCATORS AND BY GENDER AND AGE

Category	n	METs/week mean ± SD	Work mean ± SD	Transport mean ± SD	Recreation mean ± SD	Low	Moderate
Gender							
Male	196	6429±10073	1379±2629	281±1137	214±500	8.7	91.3
Female	321	5609±9472	1273±1998	188±833	89±220	17.8	82.2
p-value		0.351	0.604	0.289		0.0001*	0.004**
Age categories							
<30	10	6048±3688	1395±1070	159±269	210±298	0.0	100.0
30-49	366	6108±9643	1392±2508	241±1073	149±367	12.0	87.9
>50	130	5499±10503	1103±1508	196±644	96±343	20.8	79.2
p-value		0.8301	0.4601	0.882		0.287	0.021**
Total	517	5920±9703	1313±2257	224±960	137±259	14.3	85.7

*ANOVA significant at p<0.001; **Pearson's chi-square test; significant at p<0.05

frequency of their vegetable intake was significantly lower.

Evidently, more than two-thirds of the educators ate breakfast, lunch and dinner, with the prevalence of all meals increasing over the weekend (Table 3). Dinner was the most commonly consumed meal during the week and weekends (percentage). Males were significantly more likely to eat dinner during weekends than females, while the overweight group was significantly more likely to eat breakfast during weekends than the normal weight and obese groups (percentages and p-value). Snacks were eaten regularly by most (72.8%) of the total group of educators (n=517). Female educators were significantly more likely to snack than male educators (79.0% and 62.7%, respectively; Pearson's chi-square test; p=0.000).

Responses to the question on what needs to be eaten to be healthy are presented in Table 4. The most frequently mentioned groups were vegetables (54%) and fruits (41.9%) followed by proteins (29%), fats (14.6%), dairy (8%) and finally starches (6%). Females tended to be more likely to mention proteins than males, while those younger than 30 years were significantly more likely to mention dairy items.

The most commonly reported source of nutrition information by the total group (n=517) was newspapers (53%), followed by television (25%), pharmacies (6%), radio stations and other (4% each), and the Internet (1%). Educators younger than 30 years old were more likely to mention the Internet (10%) vs. 1% by 30 -49-year-olds and 0% by ≥50-year-olds, and pharmacies (30%, 6% and 6%, respectively). These younger educators were less likely to mention newspapers compared to the older

groups (30%, 54% and 53%, respectively) (Pearson's chi-square test; p=0.02).

The results in Table 5 indicate that the largest percentage of educators could be classified as being moderately physically active and there were no participants in the high category. However, females and those older than 50 years were significantly more likely to be classified as having low PA levels. The results show that METS spent at work was significantly higher than METS spent for transport and recreational activities by the total group as well as for the groups by age and gender. In addition, male educators spent more than double the amount of METS (highly significant) on recreational activities than female educators.

The most important reason reported by all the educators (n=517) as to why people gain weight was how they eat (72%), followed by how much exercise they do (11%), that it runs in the family (8.4%), and because of a lack of knowledge (8.4%). There were no significant differences between any of the groups for this variable.

The five factors mentioned by most educators regarding those which strongly influence what a learner eats were parents/caregivers' working hours (80.9%), followed by the learner's body image perception (77%), what the educator eats (77%), advertisements (73%), and the other people living with a learner (65%) (Table 6). Males and educators from urban settings were significantly more likely to mention advertisements (p=0.030; p=0.023, respectively), while the obese were significantly more likely to indicate parents' working hours (p=0.021). The normal weight group was significantly less likely to indicate a learner's friend as an influencing factor than the overweight and obese groups (p=0.004).

According to educators, the factor that most strongly influences how much PA a learner undertakes is whether sport is offered at the school (88.1%) where the learner studies (Table 7). This was closely followed by the availability of playgrounds (84.7%), how active the educator is (83.6%), and how much time a learner has available for doing PA (83.3%). Males were significantly more likely to think of sport available at the school; how much time a learner

TABLE 6: PERCEPTIONS OF EDUCATORS ON FACTORS THAT STRONGLY INFLUENCE WHAT A LEARNER EATS

Category	n	Learner's knowledge	Learner's body image	Learner's lunch	People	Teacher	Learner's friends	Adverts	School Shop	Parents' working hours+
		%	%	%	%	%	%	%	%	%
Gender										
Male	171	3.0	77.0	58.0	66.0	80.0	45.0	78.7	90.1	84.9
Female	281	5.0	77.0	49.0	65.0	76.0	45.0	69.8	77.9	78.4
p-value*		0.290	0.864	0.051	0.834	0.349	0.968	0.030*	0.000**	0.072
Origin										
Rural	280	5.0	76.0	52.0	68.0	75.0	45.0	69.8	80.5	78.1
Urban	171	4.0	79.0	55.0	61.0	80.0	46.0	79.0	86.0	85.6
p-value*		0.561	0.464	0.499	0.940	0.148	0.768	0.023*	0.113	0.040*
Age categories										
<30	10	10.0	90.0	80.0	80.0	90.0	30.0	77.8	80.0	90.0
30-49	326	5.0	78.0	52.0	66.0	78.0	46.0	72.7	83.3	80.9
>50	108	3.0	73.0	52.0	63.0	75.0	44.0	76.0	79.3	79.2
p-value*		0.478	0.274	0.216	0.565	0.517	0.610	0.738	0.666	0.690
BMI										
Normal	95	6.0	78.0	51.0	63.0	71.0	31.0	66.9	76.2	74.3
Overweight	145	5.0	76.0	51.0	65.0	76.0	51.0	74.1	84.2	77.9
Obese	212	3.0	77.0	55.0	66.0	81.0	48.0	75.5	84.4	85.9
p-value*		0.335	0.930	0.777	0.854	0.074	0.004**	0.239	0.139	0.021
Total	517	4.0	77.0	53.0	65.0	77.0	45.0	73.2	52.5	80.9

* Pearson's chi-square test;p significant at p<0.05; ** significant at p<0.01

TABLE 7: PERCEPTIONS OF EDUCATORS ON FACTORS THAT STRONGLY INFLUENCE HOW MUCH PHYSICAL ACTIVITY A LEARNER DOES

Factor	Males n=196	Females n=321	Total n=517	p-value*
Safety of environment	71.7	71.3	71.5	0.916
Availability of playgrounds and sports fields	85.9	83.7	84.7	0.552
Availability of sport at the school	93.8	84.6	88.1	0.002
Time a learner should do sport	91.7	82.9	83.3	0.006
The sport that a learner's friends do	79.3	70.3	73.8	0.026
How much it cost to do sport	69.3	55.5	60.8	0.002
Having friends to play games that involve running	65.9	60.8	62.8	0.242
How much time a learner should play games that involve running	81.8	72.0	75.8	0.013
How active the people are who live with the learner	72.4	63.3	66.8	0.036
How active the educators are	86.9	81.5	83.6	0.105

*Pearson's chi-square test

has available to do sport; sport done by a learner's friends; and the cost of sport as strongly influencing how much PA a learner does, than female educators.

DISCUSSION

The prevalence of overweight and obesity in this sample of educators was alarming, as it was when described and discussed in the paper by Senekal et al. (2015). Therefore, it does not come as a surprise that half the sample had attempted weight loss prior to the study albeit, for many, seemingly without a successful outcome.

These results reflect the need for targeted weight management intervention for educators to ensure that weight-loss attempts are successful. The fact that only 11% of the study participants thought the amount of PA one does is associated with weight gain, with 72% being aware that how one eats plays a role, emphasises the need to include a strong focus on promoting increased PA along with healthy eating in such interventions.

A recent study found that educators in Cape Town have a poor knowledge of nutrition and PA (Dalais et al. 2014). Sixty-nine percent of educators incorrectly believed that eating starchy foods causes weight gain, while only 15% knew that one should eat five or more fruit and/or vegetables per day. Misconceptions regarding actual body weight status, poor nutritional knowledge, and challenges in changing health behaviours were regarded as issues which need to be addressed among educators.

The South African food-based dietary guidelines recommend that food intake should be spread throughout the day, with recommendations for regular small meals (5-6) being made (Vorster, Badham & Venter 2013). When the results on the meal pattern of the educators are considered, it could be argued that they seem to be meeting this recommendation/guideline for healthy eating. Breakfast, lunch, supper and regular snacks were consumed by at least two-thirds of the educators, reflecting a regular meal pattern. Supper was the most frequently consumed meal, with the frequency of breakfast and lunch consumption being similar and females being significantly more likely to snack than males (79% and 62.7%, respectively). Regular meals are recommended as these ensure controlling glucose levels throughout the day and prevent feelings of dizziness, restlessness and poor concentration (Vorster et al. 2013).

These results show that healthy food choices and perceptions about what healthy entails are a concern in the sample of educators we investigated. Four of the six most frequently consumed items were energy-dense and/or in the form of refined carbohydrates, i.e. sugar, margarine/butter, rice/maize porridge/maize kernels/pasta/potato, and white bread. Grouping indicator foods as healthy or poor food choices showed that educators made fruit and vegetable (healthy) choices twice a day and cereal fibre/ legumes (healthy) once a day, equating to three healthy choices a day. High-fat, energy-dense

snacks (poor), and processed (poor) food choices were made about twice a day, respectively, equating to approximately 6.5 poor food choices a day if the daily frequency of sugar intake of 0.5 times per day is also considered. The frequency of intake of high-fat food choices was significantly higher in males. These results reflect the possibility that poor food choices (energy-dense, high in fat, sugar and salt and refined carbohydrates) and low intake of fruit and vegetables and cereal/legume fibre, may be common among educators, especially males. This eating pattern is in line with the westernised pattern found to be common among urbanised South Africans (Vorster et al. 2005; Steyn et al. 2006; Steyn et al. 2012).

The intake of fruit and vegetables twice a day is less than the recommended intake of five or more servings a day if it is assumed that a portion of fruit/vegetable is consumed per eating occasion. These findings are clearly reflected in results reported by other researchers for South Africans (Senekal et al. 2009). The low fruit and vegetable intake may be the result of a lack of knowledge, problems with access (financial and location), preferences as well as negative beliefs and perceptions regarding fruit and vegetable intake. The possible lack of knowledge relating to the importance of fruit and vegetable intake is reflected in the fact that only 44.9% of the educators mentioned one should eat fruit, and 54% vegetables, to be healthy. This lack of knowledge about healthy eating is further reflected by the fact that the proportions of educators who mentioned the other food groups were very low, ranging from only 5.66% (starch) to 28% (protein).

Oldewage-Theron & Egal (2012: 86) also found that the nutrition knowledge of public school educators in South Africa was average to poor. Only 33.3% of the educators who participated in their study indicated that they had received training on nutrition concepts while studying for their qualification and 26.7% as part of in-service learning. Oldewage-Theron & Egal (2012: 85) indicated that television and magazines were among the most available sources of nutrition information to educators. Our research supports this notion, with 53% of the educators indicating that they used newspaper/magazines and 25% television. As can be expected, younger educators were more likely to access the Internet and less likely to use newspapers/magazines for nutrition information.

A well-established fact is that good nutrition knowledge is not necessarily associated with healthy eating (Beydoun & Wang 2008). For example, our results show that although almost half of the educators were aware of the importance of fruit and vegetables for health, the median combined intake was only twice a day. De Bourdeaudhuij et al. (2002) suggest that this discrepancy may also be the result of lack of awareness of personal intake, with the person thus not necessarily realising the need to change his/her behaviour.

The daily choice of processed foods (reflective of non-discretionary salt intake) is a concern, especially considering the recognised association between high salt intake and high blood pressure as well as the high prevalence of hypertension among educators who participated in this study (Senekal et al. 2015). A similar concern was raised in the SADHS, specifically regarding processed meat and salty snack intake (DOH et al. 2007).

The propensity to frequent intake of high-fat foods and fat-containing energy-dense snacks in our sample of educators is in line with findings of other South African studies (Senekal et al. 2009; Senekal, Mchiza & Booley 2009; Oldewage-Theron & Egal, 2012). Although we did not find an association between frequency of intake of high-fat foods and BMI, the frequent intake of high-fat foods and energy-dense snacks may be contributing to the problem of weight gain/ obesity in educators. The preference for such foods/snacks may be explained by the fact that fat plays an important role in the sensory acceptability of foods (Tepper 2015), which may be one of the reasons why attempts to change behaviours relating to fat intake seem to be challenging.

The same sentiment is clearly reflected in the conclusion made by Dunn et al. (2012: 352) that fast-food consumption is influenced by a general demand for meals that are tasty, satisfying and convenient. Food choices by our sample of educators that reflect fast-food intake (take-outs, pies, sausage rolls, samosas, fried foods and French fries) were made approximately every second day.

The results regarding sugar intake as well as the intake of sugar-containing foods/drinks are in

line with the findings of several other South African studies (Steyn, Myburgh & Nel 2002; Reddy et al. 2003; Reddy et al. 2010; Senekal et al. 2015) Preference for sweet taste is innate (Trivedi 2012). Thus, it can be argued that strong preference for sweet taste may result in high intake of sweet snack foods and drinks, which in turn may result in a positive energy balance and weight gain.

The need to emphasise low sugar intakes in interventions targeted at educators is emphasized by the results of the meta-analysis by Te Morenga, Mallard & Mann (2012). These researchers concluded that: "among free living people involving ad libitum diets, intake of free sugars or sugar sweetened beverages is a determinant of body weight." Research in a sample of 29,103 middle-aged Japanese males and females supports this possibility (Matsushita et al. 2009). Preference for sweet taste was significantly associated with weight gain from age 20 years to middle age, the baseline age of the study sample. Further weight gain over the 10-year follow-up of the cohort from baseline (middle age) was also significantly associated with a preference for sweet tastes.

We posit that weight management interventions targeted at educators should include a strong focus on creating a supporting food environment in schools. Since they spend a large part of their day in this environment this will enable them to make healthy food choices. A situational analysis at the schools included in this research supports the need for this action, as mainly sweets, chocolates, cold drinks and crisps were found to be sold at tuckshops. Healthy food choices such as fruits and vegetables were generally not available (De Villiers et al. 2012).

The PA level of most educators (85.7%) was classified as moderate and 14.3% as low using the GPAQ questionnaire. These results indicate that educators in our research may have been more active than the sample of 2014 South Africans who participated in a WHO survey, in which the International Physical Activity Questionnaire (IPAQ) was used to assess PA levels (WHO 2005). Less than a third of the participants in the latter study met the American College of Sports Medicine's and Centre for Disease Control's recommendations for health-enhancing PA, i.e. to accumulate 30 minutes of moderate activity on most days of the week (≥3000 MET minutes/week), with nearly half being inactive (<600 MET min/week) (WHO 2005). Low levels of PA were also found in the 2002 SADHS, with 48% males and 63% females reporting being inactive (DOH et al. 2007). Our results show that female and older educators were significantly more likely to fall in the low PA category.

In our sample of educators, it needs to be noted that the major contributor to METs was activity during work time (1313 METs at work vs. 224 METs for transport and 137 METs for recreation activity during leisure time for the total group). Males spent significantly more leisure physical activity time than females. However, time spent walking while teaching may have been overestimated, since it has been estimated that males with a tertiary education typically spend 120 METs and females 205 METs during work time, which is not very high (DOH et al. 2007).

Educators in the study areas seemed to be aware that they influence the lifestyle of learners. When asked, what they thought influenced a learner's eating behaviour, the most commonly mentioned factor was the school shop (82.5%), followed by the parents' working hours (80.9%), and the educator, and the learner's body image (both 77%). Interesting to note is that only 45% assumed what a learner eats is influenced by friends.

When asked about the most important factors that influence how much PA a learner does, the educator also came up as the third most mentioned influence factor (83.6%). Whether a sport is offered at school was mentioned most (88.1%), followed by the availability of a playground (84.7%) and the amount of time available (83.3%) as factors influencing learners' PA levels. No comparative literature could be found on this aspect of our study, with our results thus providing novel insights in educators' perceptions on the modelling role they play in terms of learners' dietary intake and PA levels.

Limitations of this research include the self-reported nature of the data, possible overestimation of PA (GPAQ) as well as the fact that the IFFQ provides information on the frequency of intake of indicator foods, without reflecting 24-hour intakes or portion sizes. However, the thorough process that was undertaken to develop the IFFQ supports the possibility that the outcomes provide a reasonable estimate of the risk of poor food choices. A more in-depth dietary intake

assessment may be necessary to provide more insights between fat intake and BMI in educators.

CONCLUSIONS

Even considering these limitations, the results of our cross-sectional study demonstrate that educators commonly attempted weight loss but not successfully, as reflected in the high prevalence of overweight/obesity. Additionally, this study population is at risk of making poor food choices, with males potentially more at risk. Furthermore, they have a poor understanding of healthy eating, may not have received appropriate nutrition education and may be at risk of not being sufficiently physically active, with females potentially more at risk. Adoption of poor food and lifestyle choices by pupils might logically be a consequence of the beliefs and behaviours of teachers. Therefore, it is essential to expose educators to lifestyle interventions to improve and manage weight gain and NCD risks.

Acknowledgements: Our thanks to all the educators who participated in the study.

REFERENCES

Armstrong, T. & Bull, F., 2006, Development of the World Health Organization Global Physical Activity Questionnaire (GPAQ). Journal of Public Health 14, 66-70.

Beydoun, M.A. & Wang, Y., 2008, Do nutrition knowledge and beliefs modify the association of socio-economic factors and diet quality among US adults? Preventative Medicine 46,145-153.

Bradshaw, D. Groenewald, P. Laubscher, R. Nannan, N. Nojilana, B. Norman, R. Pieterse, D. Schneider, M. Bourne, D.E.. Timaeus, I.E. Dorrington, R. Johnson, L., 2003, Initial burden of disease estimates for South Africa. South African Medical Journal 93(9), 682-688.

Bull, F.C. Maslin, T.S. & Armstrong, T., 2009, Global Physical Activity Questionnaire (GPAQ): Nine Country Reliability and Validity Study. Journal of Physical Activity and Health 6,790-804.

Dalais, L. Abrahams, Z. Steyn, N.P. de Villiers, A. Fourie, J. Hill, J. Lambert, E.V. & Draper, C., 2014, The association between nutrition and physical activity knowledge and weight status of primary school educators. South African Journal of Education 34(3), S13-S17.

De Bourdeaudhuij, I. Brug, J. Vandelanotte, C. & van Oost, P., 2002, Differences in impact between a family- versus an individual-based tailored intervention to reduce fat intake. Health and Education Research 17,435-449.

Department of Health, Medical Research Council, & Orcmacro., 2007, South African Demographic and Health Survey 2003. Pretoria: Department of Health.

De Villiers, A. Steyn, N.P. Draper, C. Fourie, J. Barkhuizen, G. Lombard, C.J. Dalais, L. Abrahams, Z. & Lambert, E.V., 2012, "HealthKick": Formative assessment of the health environment in low-resource primary schools in the Western Cape Province of South Africa. BMC Public Health 12(1), 794-99.

Dunn, K.I. Mohr, P. Wilson, C.J. & Wittert, G.A., 2012, Determinants of fast-food consumption. An application of the Theory of Planned Behaviour. Appetite 57(2),349-357.

Matsushita, Y. Mizoue, T. Takahashi, Y. Isogawa, A. Kato, M. Inoue, M. Noda, M. Tsugane, S. & JPHC Study Group., 2009, Taste preferences and body weight change in Japanese adults: the JPHC Study. International Journal of Obesity 33(10), 1191-1197.

Oldewage-Theron, W. & Egal, A., 2012, Impact of nutrition education on nutrition knowledge of public school educators in South Africa: A pilot study. South African Journal of Health 17 (1), 80 -88.

Pillay-van Wyk, V. Msemburi, W. Laubscher, R. Dorrington, R. Groenewald, P. Matzopoulos, R. Prinsloo, M. Nojilana B. Nannan, N. Gwebushe, N., 2016, Mortality trends and differentials in South Africa from 1997 to 2012:second National Burden of Disease Study. Lancet Global Health 381,S113.

Reddy, S.P. James, S. Sewpaul, R. Koopman, F. Funani, N.I. Sifunda, S. Josie, J. Masuka, P. Kambaran, N.S. & Omardien, R.G., 2010, Umthente Uhlaba Usamila – The South African Youth Risk Behaviour Survey 2008. Cape Town: South African Medical Research Council.

Reddy, S.P. Panday, S. Swart, D. Jinabhai, C.C. Amosun, S.L. James, S. Monyeki, K.D. Stevens, G. Morejele, N. Kambaran, N.S. Omardien, R.G. & Van den Borne, H.W., 2003, Umthenthe Uhlaba Usamila – The South African Youth Risk Behaviour Survey 2002. Cape Town: South African Medical Research Council.

Rosário, R. Oliveira, B. Araújo, A. Lopes, O. Padrão, P. Moreira, A. Teixeira, V. Barros, R. Pereira, B. & Moreira, P., 2012, The impact of an intervention taught by trained teachers on childhood overweight. International Journal of Environmental Research and Public Health 9,1355-1367.

Senekal, M. Mchiza, Z. & Booley, S., 2009, Nutrition for adults. In NP Steyn & N Temple

(eds). Community Nutrition Textbook for South Africa: A Rights-based Approach. Cape Town: South African Medical Research Council.

Senekal, M. Seme, Z. de Villiers, A. & Steyn, N.P., 2015, Health status of primary school educators in low socio-economic areas in South Africa. BMC Public Health 15,186. DOI: 10.1186/s12889-015-1531-x

Senekal, M. Steyn, N.P. & Nel, J., 2009, A questionnaire for screening the micronutrient intake of economically active South African adults. Public Health Nutrition 12(11),2159-2167 (http://www.ncbi.nlm.nih.gov/pubmed/19323861)

Shisana, O. Labadarios, D. Rehle, T. Simbayi, L. Zuma, K. Dhansay, A. Reddy, P. Parker, W. Hoosain, E. Naidoo, P. Hongoro, C. Mchiza, Z. Steyn, N.P. Dwane, N. Makoae, M. Maluleke, T. Ramlagan, S. Zungu, N. Evans, M.G. Jacobs, L. Faber, M. & SANHANES team., 2013, South African National Health and Nutrition Examination Survey (SANHANES 1). Cape Town: HSRC Press.

Statistics South Africa., 2013, Census 2011 (Statistical Release Revised). Available at http:// www.statssa.gov.za/Publications/P03014/ P030142011.pdf acc. Accessed 22 February 2017.

Steyn, N.P. Bradshaw, D. Norman, R. Joubert, J.D. Schneider, M. & Steyn, K., 2006, Dietary Changes and the Health Transition in South Africa: Implications for Health Policy. Cape Town: South African Medical Research Council.

Steyn, N.P. Myburgh, N.G. & Nel, J.H., 2002, Evidence to support a food-based dietary guideline on sugar consumption in South Africa: policy and practice, Bulletin of the WHO 81,599-608.

Steyn, N.P. Nel, J.H. Parker, W. Ayah, R. & Mbithe, D., 2012, Urbanisation and the nutrition transition: A comparison of diet and weight status of South African and Kenyan women. Scandinavian Journal of Public Health 40, 229-238.

Te Morenga, L. Mallard, S. & Mann, J., 2012, Dietary sugars and body weight: systematic review and meta-analyses of randomised controlled trials and cohort studies. British Medical Journal 346, 7492.

Tepper, B.J., 2015, The taste for fat: new discoveries on the role of fat in sensory perception, metabolism, sensory pleasure, and beyond. Journal of Food Science 77(3), 6.

Trivedi, B.P., 2012, Hardwired for taste. Nature 486:S7-9.

Van der Schee, C. & Gard, M., 2014, Healthy, happy and ready to teach, or why kids can't learn from fat teachers: the discursive politics of school reform and teacher health. Critical Public Health 24(2),210-225.

Viljoen, A.T. Botha, P. & Boonzaaier, C.C., 2005, Factors contributing to changes in food practices of a black South African community. Journal of Family Ecology and Consumer Science 33,46-62.

Vorster, H.H. Badham, J. & Venter, C., 2013, An introduction to the revised food-based dietary guidelines for South Africa. South African Journal of Clinical Nutrition 26(3),S5-12.

Vorster, H.H. Kruger, A.M. & Margetts, B.M., 2011, The nutrition transition in Africa: Can It be steered into a more positive direction? Nutrients 3(4),429-441.

Vorster, H.H. Venter, C.S. Wissing, M.P. & Margetts, B.M., 2005, The health and nutrition transition in the North West Province of South Africa: a review of the THUSA (Transition and Health during Urbanisation of South Africans) study. Public Health Nutrition 8(5), 480-490.

Weinstein, E. & Rosen, E., 2003. Teaching Children about Health: A Multidisciplinary Approach. Belmont, CA: Wadsworth/Thomson Learning.

World Health Organization., 1998, WHO's Global School Health Initiative. Geneva: WHO.

World Health Organization., 2003, Diet, Nutrition and the Prevention of Chronic Diseases. Geneva: WHO.

World Health Organization., 2005, Preliminary Results of the World Health Survey, 2002-2003; International Physical Activity Data, South African Results. Geneva: WHO.

World Health Organization., 2008, 2008-2013 Action Plan for the Global Strategy for the Prevention and Control of Non-Communicable Diseases. Geneva: WHO.

World Health Organization., 2014, Global Status Report on Non-Communicable Diseases. Geneva: WHO.