

Overweight and obesity in learners residing in the Belhar, Delft and Mfuleni communities of Cape Town, Western Cape, South Africa

A SOMERS¹Mtech, MS HASSAN¹MPharm, E RUSFORD²Mphil, RT ERASMUS³MBBS, FMC.Path, DABCC (US), DHSM (Natal), FC.Path (SA)
 Department of Health & Wellness Sciences, Cape Peninsula University of Technology¹; Department of Applied Sciences, Cape Peninsula University of Technology²; Department of Chemical Pathology, University of Stellenbosch³

Correspondence:

Professor RT Erasmus
 Department of Chemical Pathology, Faculty of Health Sciences, University of Stellenbosch, Tygerberg, Cape Town, South Africa
 Email: rte@sun.ac.za · Fax: +27 21 938 4640 · Tel: +27 21 938 4107

ABSTRACT

Introduction: South Africa is a country in a state of transition with rapid urbanization occurring in all parts of the country. Recent reports have suggested high prevalence rates of obesity and overweight in almost all segments of the population.

Objectives: To determine the prevalence of overweight and obesity amongst 10-16 year old learners in an urban area of Cape Town, South Africa.

Methods: Data was collected from 338 randomly selected school children between the ages of 10-16 from the urban communities of Belhar, Delft and Mfuleni. Anthropometric measurements were performed using standard procedures. A structured questionnaire on physical activity was administered to all participants. Overweight and obesity were estimated according to the International Obesity Task Force (IOTF) criteria.

Results: 15.7% of the learners were overweight and 6.2% were obese. Though the prevalence rate of overweight was significantly higher in females (21.1%) than males (8.4%), no gender differences were observed with respect to obesity (4.2% vs. 7.7%) While overweight was significantly higher in African (21.8%) than Coloured learners (13.7%), obesity rates were similar between the two groups (5.8% vs. 6%). African females had significantly higher rates ($p < 0.05$) of overweight (30.8%) than Coloured females (17.6%) but no differences were observed between male learners. Nearly half of the African females by the age of 16 years were overweight. Physical inactivity including time spent on television viewing was not associated with either overweight or obesity.

Conclusion: A high prevalence rate of overweight was observed in Coloured and African learners. The highest rates were observed in African females above the age of 14 years. The high rates observed in children from these lower to middle income group families suggest the need for concerted preventive intervention.

INTRODUCTION

The incidence of obesity has assumed almost epidemic proportions in many developed and developing countries.^{1,2,3} According to Chopra *et al*,⁴ recent reviews have reported significant increases in the prevalence of overweight and obese individuals in developing countries.

Results of the South African National Demographic and Health Survey⁵ conducted in 1998 showed that 29.2% of South African men and 56.6% of females were overweight or obese. This survey reported that 9.2% of South African men and 42% of all women displayed abdominal obesity. Similarly, a recent study by the Medical Research Council⁶ found that approximately 45% of all South Africans were overweight. Of these, 25% were overweight with a body mass index (BMI) in excess of 25, while 20% were categorized as obese (BMI > 30). Probably more disturbing and more relevant to this study, is that 20% of all children under the age of 6 years were categorized as obese. The International Obesity Task Force⁷ reported that 25% of all South African girls aged 13 to 19 were overweight, with boys having a much lower prevalence rate of 7%.

Obesity can develop when an imbalance exists between energy intake and energy expenditure. Today's children expend much less energy on physical activity than their counterparts of a decade ago.⁸ The cross-sectional study done by Levitt *et al*,⁹ found that over forty percent of historically and socio-politically disadvantaged persons living in urban communities do not participate in any leisure or occupational activities. Since physical activity counts for approximately one-third of energy expenditure, a sedentary lifestyle may be a major contributor to their weight gain.⁹ Urbanization makes exercise less attractive. Private cars and public transport discourages cycling and walking activities. Furthermore, suburban houses have in some instances occupied fields that were used to play ball games and other recreational activities. The fear of crime also keeps children in their own homes, forcing children to resort to watching television and playing computer games.¹⁰ In South Africa, more and more time is spent watching television or surfing the internet while consuming an ever-growing volume of "junk-food", such as foods take-aways, deep fried foods, fizzy drinks etc. The collaborative study by the Sports Science Institute of South Africa (SSISA) and the Medical Research Council (MRC) found that there was an increased risk of obesity in children who spent more hours watching television.¹¹ Television viewing affects energy expenditure and more specifically energy intake by several mechanisms. Foods, and more often those that are calorie-dense such as chocolates, biscuits and fizzy soft drinks, are heavily advertised on children's television programmes. Young South African adults and children are thus more likely to become increasingly obese over time.

Childhood overweight and obesity are known to have a significant impact

on both the physical and psychological aspects of health (wellness). Lauer¹² demonstrated that hyperlipidaemia, hypertension, type-2-diabetes and impaired glucose tolerance occur with increased frequency in obese children and adolescents. Overweight and obese children and adolescents are exposed to a 1.5 to 2 times higher risk of becoming obese adults and of experiencing the chronic health problems associated with adult obesity, such as cardiovascular disease, diabetes, joint and gallbladder disease and premature death.¹³ Obese children are often exposed to negative labeling, discrimination, social rejection and isolation, and can develop a distorted body image as early as six years of age.¹⁴ By adolescence, obesity can result in lower self-esteem, and increased rates of sadness, loneliness and nervousness.

There is limited data on the prevalence of overweight and obesity in South African children, particularly in previously disadvantaged population groups. The main aim of this study was to determine the prevalence of overweight and obesity amongst learners aged 10 – 16 years attending schools in the communities of Belhar, Delft and Mfuleni in the City of Cape Town, South Africa

MATERIALS AND METHODS

The study population consisted of learners aged 10 – 16 years who were recruited from public schools located in the Belhar, Delft and Mfuleni communities of Cape Town. The Belhar and Mfuleni areas consist of a predominantly Coloured (mixed ancestry) and African population respectively, while Delft has a heterogeneous population of both Coloured (mixed ancestry) and African individuals. Most of the households in these communities are in the lower to middle income bracket. The structure of the educational system in South Africa provides an almost ready-made sampling frame (age, gender, educational level, geographical area, etc.).¹⁵ In the light of this, it was appropriate to use schools for the sampling frame. The sample population was obtained through a Proportionally Stratified Multi-staged random sampling technique that was stratified according to the three different areas used for the study as well as gender. Schools that did not indicate definitely that they did not wish to participate were approached twice or thrice either personally or telephonically to obtain definite answers. Seventeen of the twenty-seven schools in the study location participated in the survey. Learners were excluded from the study if they were not residing in the identified areas or were outside the specified age range. The Research Ethics Committee of the Cape Peninsula University of Technology (previously Peninsula Technikon) approved the study. Written informed consent from parents as well as oral consent from learners was sought prior to any data collection by the field-workers. Permission was also obtained from the Western Cape Education Department, school governing bodies and principals at all schools included in the sample.

Field workers went through an intensive training programme prior to any data collection and performed all measurements in the study. All measurements (which were also validated) were performed using standardised anthropometric techniques. In order to enhance the quality of the study, proper calibration of all direct reading instruments was done on a regular basis as per manufacturers' specifications. All digital scales used in this study were calibrated before and after each set of ten measurements. In the case of the weight of the participants, initial calibration was done with the aid of a standard metal weight on a thread; thereafter the weight of the fieldworkers doing the measurement at the sample site was used to do the daily calibration.

Questionnaire

A qualitative questionnaire on physical activity modified for local conditions was administered to each participant. Based on a validated questionnaire developed by the Sports Science Institute of South Africa (SSISA), this questionnaire contained indicators of frequency and time spent on leisure and sporting activities. This questionnaire was validated on a random group of 22 school children and further tested on a subgroup (50%) a week later. The characteristics of the learners used in the pilot were similar to the sample population.

Anthropometric Measurements

Standing height was recorded in centimeters to one decimal place using a stadiometer with subjects standing on a flat surface at a right angle to the vertical board of the stadiometer. Prior to measurement, subjects were advised to keep their heels together and the scapula and buttocks in contact with the board. The head was positioned in the Frankfort plane with the angle of the eye and the opening of the external auditory meatus in a horizontal line. Subjects were asked to keep their weight evenly distributed with their hands at their side, feet flat on the ground and to inhale deeply, hold the breath, and maintain an erect position. Height measurements were recorded to one decimal place (the nearest 0.1 cm).

Weight Measurements

Weight was determined on a good-quality Sunbeam® EB710 digital bathroom scale, which was initially calibrated and standardised using a weight of known mass. Weight measurements were recorded to the nearest 0.1 kilograms and taken with each subject in light clothing, without shoes and socks. Subjects were positioned in the center of the scale with the weight evenly distributed on both feet.

Waist (Abdominal) measurements

The waist measurement was taken with the subject in the erect position, abdomen relaxed, arms at their sides and feet together. The natural waist was defined as the measurement at the mid-point between the lower costal border (ribs) and the iliac crest. Subjects were asked to breathe normally, and to breathe out gently at the time of the measurement to prevent them from contracting their muscles or from holding their breath. Using a fiberglass measuring tape, measurements were performed at the end of a normal expiration (exhalation). Measurements were taken to the nearest 0.1 cm.

Hip circumference measurement

Subjects were asked to assume a relaxed stand with the gluteal muscles (buttocks) relaxed, arms folded across the thorax, and feet together. The hip or girth was considered as the widest part of the thighs and the greatest posterior protuberance (apex) of the buttocks. Measurements were taken to the nearest 0.1 cm using a fiberglass measuring tape.

Waist Hip Ratio

The waist-hip ratio (WHR) was calculated by dividing the waist circumference by the hip circumference measurement.

Body Mass Index

Body Mass Index (BMI) was calculated for each subject as weight (kg)/height²(m). BMI was analyzed using the international reference provided by the International Obesity Task Force.¹⁶

Overweight and Obesity – was defined based on the age and gender-specific BMI cut-off points as developed by Cole *et al.*^{16,17}

Physical Inactivity

A structured pre-validated questionnaire with indicators for type, duration and frequency habitual and leisure time physical activity, which had been modified for local conditions, was administered to each participant. For the purpose of this study, subjects were classified as physically inactive if the individual did not participate in sports, had no household chores, exercised once or less per week and watched television for more than 4 hours per day.

STATISTICAL ANALYSIS

Statistical analyses were performed using the statistical package Intercooled STATA version 7[®].¹⁸ Pearson Chi-square statistics and Fisher's exact statis-

tics were computed to determine the associations between respective categorical outcome and predictor variables. Simple logistic regression, multiple logistic regression and stepwise variable selection techniques were employed to determine the individual and combination of variables that predicted categorical outcomes of this study. To further strengthen the outcome of the results in the study advanced statistical modeling, i.e. survey estimation: multiple logistic regression analysis was employed on the data. Group means and medians were compared using ANOVA, Kruskal-Wallis tests, t-test or Mann-Whitney ranksum tests where applicable. All the statistical tests were performed at a 5% level of significance.

RESULTS

Participation rates for schools and learners were 62.96% and 50.13% respectively. A final proportionally representative sample of four hundred and one (401) learners (randomly selected children and adolescents attending primary and secondary schools) was obtained. A total of 63 subjects were excluded for not meeting the inclusion criteria. The remaining 338 subjects comprised of 195 (57.7%) females and of 143 (42.3%) males residing in Belhar (47.6%), Delft (37.3%) and Mfuleni (15.1%). 73.7% of the learners classified themselves as Coloured and 25.7% as African (Table 1). The characteristics of the learners in this study with respect to racial groups, gender, age distribution and area of location are presented in Table 1. The mean age of the learners was 12.7 ± 1.9 years, with no gender difference being found. At 26.6%, learners within the age group 10-11 years of age constituted the largest proportion of the sample population. There were more females than males in all of the age groups.

Anthropometric Measurements

Female subjects exhibited higher body mass and BMI than male subjects (Table 1) and were significantly taller only in the 10-11 and 12-13 year age groups ($p < 0.05$). While no racial difference was seen in the body height of learners, African subjects, particularly in the 16 year age group, were significantly heavier ($p = 0.0012$) than Coloured subjects. African learners in the 14-16 year age groups had significantly higher waist ($p = 0.0007$) and hip ($p = 0.0119$) circumferences compared to Coloured learners (Table 2).

Prevalence of Overweight and Obesity

Overall 15.7% of the learners were overweight and 6.2% were obese. Significantly higher ($p = 0.002$) prevalence rates of overweight were observed in females (21.1%) than males (8.4%). In contrast, no significant gender differences ($p = 0.188$) were observed in the prevalence rates of obesity (Table 3).

The highest prevalence rate (30.8%) for overweight was observed in African females, with particularly high values (58.8%) being observed in 16-year-old females (Table 4). In contrast to Coloured females, African females tended to become overweight between the ages of 14-15 years, whilst the prevalence of obesity was generally similar through the various age groups. 8.4% of the Coloured males and 8.6% of the African males were overweight (Table 3) with significant gender differences being observed in both African ($p = 0.014$), and Coloured learners ($p = 0.041$) (Table 4).

The prevalence rate of obesity was similar between African and Coloured learners (5.8% and 6.0% respectively) (Table 3). The highest rates were observed amongst 12-13 year old learners from each of the racial groups (Table 4).

Physical Inactivity

In general, male learners participated more in sporting activities than females with no significant differences being observed between the two racial groups. However, significant differences were observed (Table 5) between African and Coloured females with respect to physical inactivity ($p = 0.011$), their participation in sports ($p = 0.015$), exercising patterns ($p = 0.001$). Whilst no gender differences were observed in Coloured learners, significant differences were found between African males and females ($p < 0.05$).

Though non-overweight males and females spent more hours watching TV per day than overweight males or females, these differences were not significant (Table 6). Amongst males, overweight individuals spent less time exercising than non-overweight individuals, while non-overweight females exercised less than overweight females. More non-overweight males and females reported that they had no household chores than those that were overweight.

Obese males spent more time on television viewing than normal weight males (Table 6). In contrast, obese females spent less time watching TV than non-obese females. Whilst physical inactivity was more prevalent amongst obese females than non-obese ones, this pattern was not observed in obese males. None of these respective differences were statistically significant.

Using survey multiple logistic regression techniques, gender and waist circumference were the major risk factors predicting overweight (Table 7). Being female was associated with more than a three fold risk (OR = 3.3, 95% CI = 1.24 – 8.80, $p = 0.018$) whilst waist circumference was associated with a 20% risk of being overweight (OR = 1.20, 95% CI = 1.08 – 1.23, $p = 0.000$). Hip circumference was the only risk factor predicting obesity (Table 8). An increased hip circumference was associated with a 20% risk (OR = 1.20, 95% CI = 1.12 – 1.29, $p = 0.000$).

DISCUSSION

South Africa is a multiracial and multicultural society in transition since becoming a democratic state in 1994.¹⁹ Few studies from South Africa have reported on the prevalence of overweight and obesity particularly in the 10-16 year age range²⁰ and have furthermore not concentrated on children from the lower-to-middle income groups. In this study a high prevalence of overweight was observed in both African and Coloured females with significantly higher values being observed in African girls. Indeed by the age of 16 years nearly half of African females were overweight. Comparatively, much lower rates were observed in males. In contrast, obesity rates were much lower in both racial groups with no gender differences being observed in either group. Our results imply an increase in adiposity in African females from the age of 14 years (Table 1). These figures are similar to those reported from the Northern Province of South Africa²⁰. However, this study examined a different age group and used different reference criteria. The published data by Flegal *et al*²¹ allow a comparison between our study and those reported in American, British and French children. Using the IOTF criteria, overweight including obesity was 12.5% in boys in the NHANES II data set 1976-1980 and 18.3% in boys in the NHANES III study (1988-1994). The estimations for obesity were 3.4 and 7.7 % respectively. In the UK, the prevalence of overweight including obesity was 9.0% in 7-8 year old boys and 12.5% in girls of the same age in 1994 whilst in France 17.9% were overweight and 3.9% obese. Though our results are not comparable (different age group and criteria used) they indicate that similar trends are being observed in a third world country such as South Africa.

Consistent positive correlation between childhood obesity with adult obesity has been reported²² and the results obtained in this study underscore the observations made in the most recent Demographic and Health Survey of South Africa which reported that among women between 15-95 years, the prevalence of obesity was 32% in black Africans and 26.3% in those of mixed ancestry (Coloured).²³ Our results also highlight the fact that childhood obesity and overweight are being observed in the lower income groups in South Africa. This trend is also seen in other sub-Saharan countries where the few studies that have explored overweight and obesity indicate that obesity is now emerging as a public health concern despite the poor socioeconomic status prevailing in sub-Saharan Africa.²⁴

A rising trend in the prevalence of obesity in childhood and adolescence has been noted in several studies from other developing countries. In low income Mexican Americans, the prevalence of overweight in adolescence was 40.1%. Ramachandran *et al*²⁵ reported an age-adjusted prevalence of 17.8% for boys and 15.8% for girls in urban children from India.

It is extensively acknowledged that physical inactivity is a strong predictor for obesity amongst school children.^{26,27,28} This has been attributed to the limited opportunities for physical activity in lower income families in developing countries where lack of parks, lack of sports and exercise equipment at schools and the fear of crime in these areas makes exercising difficult. We were unable to confirm this in our study. However, more than 40% of children in this study, particularly Coloured female learners had not participated in any form of sporting activity or exercise. Similar observations have been made in the Thusa Bana Study²⁹ from the North West Province of South Africa in which no significant association was observed between physical activity and BMI or percentage body fat in African children. In that study, age and urbanization were found to significantly influence measures of obesity independent of physical activity. The reasons for this lack of association between physical inactivity and overweight or obesity in our study are not clear. Under-reporting of physical activity patterns by the children, racial differences and a relatively small sample size may be some of the reasons for lack of association. Though increased sedentary recreation such as watching television has been strongly associated with the risk of being overweight or obese^{30,31}, this association was not observed in our study population. However, in our study, obese children tended to spend more time on television viewing.

Racial differences have been reported between the association between television watching and being overweight.³² Maree *et al*³³ found that that television-viewing time was significantly associated with increasing body fatness in 10-11 year old diversely ethnic males from Cape Town (n=2000). Data from other developing countries such as India have shown overweight to be associated with a lower physical activity score.²⁵ These findings suggest cultural factors should be considered when developing interventions to promote physical activity, healthy eating habits and healthy weight control measures through reduced television viewing.³⁴

Similar to observations reported in other studies, obesity and overweight in the present study increased with age and females were at greater risk of becoming overweight. Indeed our study found age and gender to be two of the most important risk factors for being overweight.

Females in the present study had a three fold risk of being overweight (Table 7). Both waist and hip circumferences were found to predict overweight and obesity and thus could be used as simple tools to track children.

In conclusion, this study has highlighted a high prevalence of overweight in previously disadvantaged urban children from South Africa with significant racial differences being observed. Though the overall rates for overweight and obesity are much lower than those reported in the developed countries, the high prevalence rates observed in the African learners is worri-

some and may perhaps be a pointer towards greater morbidity from diseases of lifestyle, such as diabetes and hypertension. This is already being witnessed among the emerging middle class African population where the prevalence of diabetes mellitus has almost tripled in the last two decades.³⁵ Greater attention to the types of food, the frequency and quantities of food consumed and participation in physical activity will have to be introduced in schools to halt the tracking of childhood obesity into adolescent and adult obesity. This may also lessen the economic burden of obesity with respect to obesity associated hospital costs.³⁶ In order to assist in establishing specific guidelines for public health policy in South Africa, an accurate estimate of the prevalence and the risk factors associated with childhood overweight and obesity is critical. Studying a similar group of Swiss children, Zimmerman *et al*³⁷ suggested that nutrition education and physical activity health programmes targeted at primary and secondary school children could address the concerns of overweight and obesity. Results of the study suggest that sample size was the major limitation having an affect on the power of associations. Despite this, the study did manage to demonstrate some important trends and forms the basis of the current, more focused study to improve on these limitations (larger sample size, refined and focussed tools) and gain even more accurate estimates and correlations.

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TABLE 1: Characteristics of Learners Stratified by Age, & Gender (n=338)

Characteristic	10 - 11 Years		12 - 13 Years		14 – 15 Years		16 Years	
	Male	Female	Male	Female	Male	Female	Male	Female
Total = 338	40 (11.8%)	50 (14.7%)	39 (11.5%)	43 (12.7%)	32 (9.5%)	51 (15.1%)	32 (9.5%)	51 (15.1%)
Race								
African 87(25.7%)	3 (7.5%)	16 (32%)	11 (28.2%)	7 (16.3%)	8 (25%)	12 (23.5%)	13 (40.6%)	17 (33.3%)
Coloured 249(73.7%)	36 (90%)	34 (68%)	28 (71.8%)	36 (83.7%)	24 (75%)	39 (76.5%)	19 (59.4%)	33 (64.7%)
Other 2(0.6%)	1 (2.5%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	1 (2%)
Area of Location								
Belhar 161(47.6%)	28(70%)	28 (56%)	19 (48.7%)	20 (46.5%)	15 (46.9%)	20 (39.2%)	13 (40.6%)	18 (35.3%)
Delft 126(37.3%)	12 (30%)	14 (28%)	13 (33.3%)	18 (41.9%)	14 (43.8%)	23 (45.1%)	11 (34.4%)	21 (41.2%)
Mfuleni 51(15.1%)	0 (0%)	8 (16%)	7 (18%)	5 (11.6%)	3 (9.4%)	8 (15.7%)	8 (25%)	12 (23.5%)
Body Weight (kg)	30.6 (5.8)*	33.3 (12.4)	34.2 (10.0)	41.2 (13.0)	41.5 (13.6)	45.2 (18.0)	50.2 ± 8.25	52.76 (11.05)
Body Height (m)	1.37 (0.08)	1.4 (0.04)	1.42 (0.08)	1.48 (0.09)	1.53 (0.08)	1.52 (0.09)	1.61 (0.08)	1.57 (0.05)
BMI (kg/m²)	16.15 (2.55)*	17.2 (4.2)	17.1 (3.9)	18.4 (5.3)	18.15 (3.7)	19.2 (7.2)	18.7 (1.85)	21.39 (3.79)

*Medians & Interquartile Ranges

TABLE 3: Prevalence of Overweight and Obesity amongst male and female learners stratified by race and gender (n=338)

Group	Overweight			Chi2	Obese			Chi2
	Total	Male	Female		Total	Male	Female	
Overall Prevalence	53 (15.7%)	12 (8.4%)	41 (21.1%)	0.002	21 (6.2%)	6 (4.2%)	15 (7.7%)	0.188
African Learners	19 (21.8%)	3 (8.6%)	16 (30.8%)	0.014	5 (5.8%)	1 (2.9%)	4 (7.7%)	0.644*
Coloured Learners	34 (13.7%)	9 (8.4%)	25 (17.6%)	0.041*	15 (6.0%)	4 (3.7%)	11 (7.8%)	0.188

*Fisher's Exact

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TABLE 2: Anthropometric Characteristics of Learners Stratified by Age, & Race (n=338)

Variability	Obs	African		Coloured		p-value
		Location Statistic	Variability	Location Statistic	Variability	
Waist Circumference (cm)	338					
10-11 years	90	60.33	6.67	58.28	6.53	0.0488
12-13 years	82	62.48	7.13	61.3	11.5	0.5231
14-15 years	83	67.97	13.78	62.47	9.50	0.0181
16 years	83	70.87	±5.97	64.22	3.67	0.0007
Hip Circumference (cm)	338					
10-11 years	90	75.13	10.8	72.43	10.23	0.1218
12-13 years	82	77.50	12.07	77.32	14.07	0.6260
14-15 years	83	88.30	±10.38	80.43	10.10	0.0573
16 years	83	91.78	±8.71	85.96	±7.00	*0.0119
Waist Hip Ratio	338					
10-11 years	90	0.81	±0.05	0.81	±0.04	*0.2623
12-13 years	82	0.80	±0.05	0.79	0.06	0.7453
14-15 years	83	0.79	±0.05	0.77	0.06	0.4062
16 years	83	0.77	±0.05	0.77	0.05	0.5377
Body Weight (Kg)	338					
10-11 years	90	32.4	6.6	31.9	10.2	0.1192
12-13 years	82	35.6	11.2	37.2	15	1.000
14-15 years	83	49.6	±12.12	41.6	13.8	0.1067
16 years	83	56.7	±8.97	47.8	10.2	0.0012
Body Height (m)	338					
10-11 years	90	1.37	±0.07	1.39	0.11	0.2423
12-13 years	82	1.45	±0.06	1.45	±0.09	0.6460
14-15 years	83	1.48	7	1.52	±0.09	1.1033
16 years	83	1.60	±0.07	1.58	±0.07	0.3147

° Mann-Whitney Ranksun Test Probability Values

*T-test Probability Values

Obs = Observations

TABLE 4: Prevalence of Overweight and Obesity by Age, Gender and Race

Characteristic	Obs	Male		Obs	Female	
		Coloured	African		Coloured	African
Overweight						
10 –11years	6 (15.4%)	5 (13.9%)	1 (33.3%)	9 (18%)	8 (23.5%)	1 (6.3%)
12 -13 years	1 (2.6%)	1 (3.6%)	0 (0%)	5 (11.6%)	5 (13.9%)	0 (0.0%)
14 -15 years	4 (12.5%)	2 (8.3%)	2 (25%)	11 (21.6%)	6 (15.4%)	5 (41.7%)
16 years	1 (3.1%)	1 (5.3%)	0 (0%)	16 (32%)	6 (18.2%)	10 (58.8%)
Obesity						
10 –11years	0 (0%)	0 (0%)	0 (0%)	3 (6%)	1 (2.9%)	2 (12.5%)
12 -13 years	3 (7.7%)	2 (7.1%)	1 (9.1%)	7 (16.3%)	6 (16.7%)	1 (14.3%)
14 -15 years	2 (6.3%)	2 (8.3%)	0 (0%)	4 (7.9%)	3 (7.7%)	1 (8.3%)
16 years	0 (0%)	0 (0%)	0 (0%)	1 (2%)	1 (3%)	0 (0%)

Obs= Number of Observations

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TABLE 5: Physical Activity and Physical Inactivity of Learners in Belhar, Delft and Mfuleni

	Males (n = 143)		P-value	Females (n = 194)		P-value
	African	Coloured		African	Coloured	
TV (>4 hrs/d)	6 (17.1%)	16 (15%)	0.466	8 (15.4%)	24 (17.9%)	0.174
Physical Inactivity	14 (40%)	41 (39.4%)	0.952	24 (46.2%)	91 (66.4%)	0.011
No sports	14 (40%)	37 (37%)	0.753	24 (46.2%)	88 (65.7%)	0.015
Exercise (>1/never)	6 (17.1%)	41 (38.3%)	0.000	21 (40.4%)	91 (64.1%)	0.001
Chores (none)	7 (20%)	21 (21%)	0.900	1 (1.9%)	10 (7.5%)	0.151

TABLE 6: Physical Activity and Physical Inactivity in Overweight, Obese, Non-overweight and Non-obese Learners

	Males (n = 143)		P - value	Females (n = 194)		p - value	Males (n = 143)		p - value	Females (n = 194)		p - value
	Over-weight (n = 12)	Non-Over-weight (n = 131)		Over-weight (n = 41)	Non-Over-weight (n = 154)		Obese (n = 6)	Non-Obese (n = 137)		Obese (n = 15)	Non-Obese (n = 180)	
TV Viewing (>4 hrs/d)*	1 (8.3%)	22 (16.8%)	1.000	5 (12.2%)	22 (14.3%)	0.623	2 (33.3%)	21 (15.3%)	1.000	2 (13.3%)	30 (16.7%)	1.000
Physical Inactivity	4 (33.3%)	52 (40.6%)	0.763	21 (51.2%)	95 (63.8%)	0.145	2 (33.3%)	54 (40.3%)	1.000	12 (85.7%)	104 (59.1%)	0.084
No sports	4 (33.3%)	48 (38.7%)	1.000	20 (50%)	93 (63.3%)	0.128	1 (20%)	51 (38.9%)	0.649	12 (85.7%)	101 (58.4%)	0.050
Exercise (>1/never)	5 (41.7%)	43 (32.8%)	0.803	21 (51.2%)	91 (59.1%)	0.560	3 (50%)	45 (32.9%)	0.433	12 (80%)	100 (55.6%)	0.212
Chores (none)	2 (16.67%)	26 (21%)	1.000	1 (2.5%)	10 (6.8%)	0.462	0 (0%)	28 (21.4%)	0.583	1 (7.1%)	10 (5.8%)	0.586

TABLE 7: Survey Multiple Logistic Regression for the predicting factors of Overweight, Adjusted for Age (n=338)

Risk Factor	Prevalence Odds Ratio	Confidence Interval	p-value
Waist Circumference	1.2	1.08 - 1.23	0.000
Gender	3.3	1.24 - 8.80	0.018

TABLE 8: Survey Multiple Logistic Regression for the predicting factors of Obesity, Adjusted for Age (n=338)

Risk Factor	Prevalence Odds Ratio	Confidence Interval	p-value
Hip Circumference	1.2	1.12 - 1.29	0.000
TV Viewing	1.4	0.94 - 2.07	0.095