

# **FOOD CONSUMPTION, LIFESTYLE PATTERNS AND BODY MASS INDEX OF A GROUP OF WHITE SOUTH AFRICAN STUDENTS**

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## **ABSTRACT**

There is worldwide concern that higher education students are increasingly engaging in unhealthy eating and lifestyle practices. A total of 488 white students participated in a study aimed at investigating the current food consumption and related lifestyle patterns of students at a South African residential university. The respondents' self-reported weight and height was used to calculate their body mass index (BMI). Closed and open-ended questions measured aspects of the respondents' usual eating patterns and lifestyles.

The meal patterns and composition confirmed Western-orientated food practices, as the majority consumed three meals a day, with in-between meal snacking, and a different meal pattern over weekends. Respondents' food intake was further characterised by a low intake of fruit, vegetables and dairy products and frequent consumption of foods high in fat, sugar and sodium. Although the majority (66.8%) of the study group were classified as normal weight according to their BMI, when comparing males and females, more males than females were overweight and obese. Only 54% of the males had a normal weight compared to 82% of the females. There was, however, no statistically significant difference ( $p = 0.149$ ) between how males and females in the different BMI groups felt about their weight.

The study also explored the relationships between the respondents' BMI, gender, food consumption patterns and type of residence. The features of the food consumption patterns were depicted according to whether breakfast was eaten or not; snacking activity between meals; the consumption of ready-prepared convenience meals, fast foods; home-cooked meals; and eating out. There were no statistical significant differences between the BMI categories of males and females regarding their habit to eat breakfast or not; and to snack between meals either during the morning, in the afternoon or after supper. Similarly, no

statistical significant differences were noted when relating the BMI categories of the gender groups to the frequency of consumption of ready-prepared, convenience type meals, fast foods and home-cooked meals. However, a statistical significant difference (p-value 0.006) was found between BMI categories per gender and general frequency of eating out. No statistical differences was noted between BMI categories, gender and place of residence irrespective of the type, whether the student lived with parents, independently in a flat or apartment, or a house with friends or a room, or in a university residence.

## **KEYWORDS**

Food consumption patterns, lifestyle, body mass index, students, food choice

## **INTRODUCTION**

The increasing incidence of overweight and obesity among young adults due to the nature of their eating patterns is a public health concern globally (Laska *et al.*, 2009a; Larson *et al.*, 2009; Deliens *et al.*, 2013; Kelly *et al.*, 2013; Peltzer *et al.*, 2014). Young adulthood, typically defined as between the ages of 18 and 25 years, is the transition phase from adolescence to adulthood. It is identified as a period when lifestyle changes in particular take place, especially the adoption of new eating patterns. It is the time when a young person usually leaves home to study or find employment or even does both. For many, it is characterised by becoming independent, enjoying and exploring, the freedom of making their own decisions about their lifestyle especially their food choices (Sharma *et al.*, 2010; Chourdakis *et al.*, 2011; Riddell *et al.*, 2011; De Backer, 2013; Kelly *et al.*, 2013). This life stage therefore has the propensity to be a high risk life stage for the development of obesity (Laska *et al.*, 2009a; El Ansari *et al.*, 2011; Larson *et al.*, 2011; Riddell *et al.*, 2011; Deliens *et al.*, 2013; Peltzer *et al.*, 2014). At the individual level, a lifestyle is grounded in habits and beliefs (Jensen, 2007; Von Normann, 2009). By implication, lifestyle can thus be regarded as habits stemming from rules and standards that influence the orientation of an individual's consumption behaviour.

An investigation into the food consumption and lifestyle patterns of university students is feasible considering their stage of life. Many young adults experience this phase of tertiary education and preparation for a future career as marked by changes in lifestyle and stress (El Ansari *et al.*, 2011; Schnettler *et al.*, 2015). These often include having to take responsibility for their own food choices and meal patterns (Cluskey & Grobe, 2009; Sharma *et al.*, 2010; Chourdakis *et al.*, 2011; Riddell *et al.*, 2011; De Backer, 2013; Kelly *et al.*, 2013). This particular life stage is also viewed as critical in the development of eating habits, as these are likely to follow on into adulthood with implications for their own long-term health and well-being, and that of their future families (Cluskey & Grobe, 2009; Laska *et al.*, 2009b; Sharma

*et al.*, 2010; Casini *et al.*, 2013; Hartman *et al.*, 2013; Schnettler *et al.*, 2015). This study therefore investigated a group of students' food consumption patterns that included apart from the number and types of meals and snacking in-between meals, lifestyle patterns associated with food consumption such as the frequency of consumption of fast foods, home-cooked meals, ready-prepared / convenience meals and type of residence.

## **LITERATURE REVIEW**

Exercising freedom to make decisions about lifestyle and food choices is likely to mean the adoption of new eating behaviours (Sharma *et al.*, 2010; Chourdakis *et al.*, 2011; Riddell *et al.*, 2011; Janse van Rensburg *et al.*, 2013). There are studies that report that tertiary education students often engage in unhealthy lifestyle practices like irregular eating times; consuming poor quality diets; being less physically active; starting to smoke; and consuming alcoholic beverages and/or drugs (Papadaki *et al.*, 2007; Kourlaba *et al.*, 2009; Sharma *et al.*, 2010; Chourdakis *et al.*, 2011; El Ansari *et al.*, 2011; Li *et al.*, 2012; Hartman *et al.*, 2013; Janse van Rensburg *et al.*, 2013; Peltzer *et al.*, 2014). These practices are attributed to, amongst other issues, the adjustment to student life and a hectic social and study programme that contribute to perceived and real time constraints, and a limited budget. Food choices often have to be guided by budgetary and time constraints. Hence they inevitably are the affordable, energy dense food items that the student can consume when on the go. Although these provide the needed energy and satiety, they often have a low nutrient density. Such food choices, together with a decline in activity levels, are often associated with a lifestyle that results in overweight and ultimately obesity.

### **Concerns and consequences**

The link between developing non-communicable diseases (NCDs) as a result of overweight and obesity is well-documented (Low *et al.*, 2009; Chourdakis *et al.*, 2010; Abrahams *et al.*, 2011; Van den Berg *et al.*, 2013; Peltzer *et al.*, 2014; Steyn and Mchiza, 2014). Further concern is expressed about the increasing number of adults diagnosed with NCDs at an even younger age than previously (Low *et al.*, 2009; Chourdakis *et al.*, 2010; Riddell *et al.*, 2011; Steyn and Mchiza, 2014; WHO, 2015). This trend is not only observed in Western developed countries, but is also on the increase in developing and many sub-Saharan countries (Tibazwara *et al.*, 2009; Popkin *et al.*, 2012; Vasileška and Rechkoska, 2012; Steyn and Mchiza, 2014). Also noted is that more young adults are reported as becoming prone to being overweight and obese, and are at risk of developing NCDs in later life (Larson *et al.*, 2008; Gordon-Larsen *et al.*, 2004). The pandemic of overweight and obesity is also on the rise in South Africa (Rossouw *et al.*, 2012; Shisana *et al.*, 2014; Steyn & Mchiza, 2014; Van Niekerk

*et al.*, 2014; Sartorius *et al.*, 2015). It is known that lifestyles, together with food consumption patterns and composition, have changed over the past decades (Beasley *et al.*, 2004; Low *et al.*, 2009; Chourdakis *et al.*, 2010; Popkin *et al.*, 2012; Abrahams *et al.*, 2011; Casini *et al.*, 2013; Steyn and Mchiza, 2014). A consequence of this trend has not only led to changing eating habits but also to a simultaneous increase in the prevalence of overweight and obese people with NCDs. It can thus be assumed that the increase observed in recent overweight and obesity statistics reflects underlying changing food habits and lifestyles.

### **Contributing factors**

A complex matrix of factors that are subject to change over time influence food consumption patterns (Sobal *et al.*, 2006; Brunt and Rhee, 2008; Casini *et al.*, 2013; Sobal and Hanson, 2014). In recent times, the structure of food consumption patterns has changed significantly globally as it has been driven by modernisation, urbanisation, globalisation, technological advancements and social transformations (Popkin *et al.*, 2012; Igumbor *et al.*, 2012; Stucker and Nestle, 2012; Casini *et al.*, 2013). The manner in which eating patterns have evolved and changed in terms both of quantity and quality of food consumed characterises the nutrition transition (Vasileska & Rechkoska, 2012; Casini *et al.*, 2013). This situation has arisen as more processed foods have become available at affordable prices leading ultimately to an increased intake of fat, protein and sugars (Popkin *et al.*, 2012; Igumbor *et al.*, 2012; Vasileska and Rechkoska, 2012; Ronquest-Ross *et al.*, 2015; Scrinis, 2015). A decline in food containing complex carbohydrates and dietary fibre together with a lower intake of legumes, fruit and vegetables and calcium rich foods complements this trend (Popkin *et al.*, 2012; Vasileska and Rechkoska, 2012). A scarcity of time, real or perceived, drives the development of such changes in food consumption patterns. This can, in turn, be attributed to social change. Induced by modernisation, technological advancement and urbanisation, change has not only led to a faster pace of life but, unfortunately, also to physical inactivity or a sedentary lifestyle (Popkin *et al.*, 2012).

### **Students' food consumption patterns**

There is worldwide concern that higher education students are increasingly engaging in unhealthy eating and lifestyle patterns. Several recent studies in the United States of America and European countries have investigated the food choice and consumption patterns of young adults in relation to body mass index (BMI) and various lifestyle factors to gain insight into their food consumption behaviour (Beasley *et al.*, 2004; Bryant and Dundes, 2008; Larson *et al.*, 2009; Sharma *et al.*, 2010; Brittin and Obeidat, 2011; Chourdakis *et al.*, 2011; Riddell *et al.*, 2011; Casini *et al.*, 2013; Deliens *et al.*, 2013; Hartmann *et al.*, 2013; Poinhos *et al.*, 2013). The intention was to develop intervention strategies to enhance healthy eating through being

aware of this group's living arrangements, fast food consumption, time constraints and their use of ready-prepared and other convenience foods. Studies on the food consumption patterns of South Africans, however, remain scarce (Van Heerden and Schönfeldt, 2011).

Lately a number of South African researchers have dealt with several aspects relating to the food adolescents and young adults tend to consume (Van Zyl *et al.*, 2010; Kroone and Alant, 2012; Van den Berg *et al.*, 2012; Van den Berg *et al.*, 2013; Audian *et al.*, 2014; Sedibe *et al.*, 2014; Gresse *et al.*, 2015). The connection between food intake and lifestyle behaviour of South African student groups in specific regions of the country is another topic of interest (Gresse *et al.*, 2015; Van den Berg *et al.*, 2013; Janse van Rensburg *et al.*, 2013; Van den Berg *et al.*, 2012). Another study specifically compared the eating and drinking behaviour of Health Science students, who are supposed to be more knowledgeable, with those of other students at the Nelson Mandela Metropolitan University in Port Elizabeth (Gresse *et al.*, 2015). In two separate studies, Van den Berg and co-workers reported on body weight, eating practices and the nutritional knowledge of a predominantly black group of nursing students in the Eastern Cape in 2012; and the nutritional status of undergraduate health care students at the University of the Free State in 2013. The study of Janse van Rensburg *et al.* (2013) with university students from three universities in Gauteng, South Africa, focused on gender differences in students' health and lifestyles habits, with limited questions on food practices as part of lifestyle habits. The study by Van Zyl *et al.* (2010) into the fast food consumption patterns of young adults in Johannesburg according to socio-economic grouping considering factors that influence fast food intake. However, it did not report on other aspects of food consumption.

To implement successful interventions to improve the food consumption practices of young South African adults that could curb the rising pandemic of overweight and obesity first requires a thorough understanding of the food choices and food consumption patterns of young adults, in this transitional life stage. However, a paucity of data on the food intake of young adults from the country's various population groups of South Africa persists. Studies on white rural and urban populations specifically have decreased in the past 30 years (Van Heerden and Schönfeldt, 2011; Mchiza *et al.*, 2015). The first South African Health and Nutrition Examination Survey, 2012 (SANHANES-1) did investigate certain aspects of the health and nutritional status of South Africans of all age groups concerning the prevalence of NCDs and various associated risk factors. Although dietary intake and behaviour were measured, it did not report on the food choice and consumption patterns of the study group (Shisana *et al.*, 2014). Thus, except for the study by Van den Berg *et al.*, (2013), no recent study on the food intake of the young urban white adult population could be found. The aim of

this present study focused on the food consumption and related lifestyle patterns of a group of white students at a residential South African university who voluntarily gave information about their weight and height. This afforded an opportunity to explore the relationship between students' BMI categories and their selected food consumption and lifestyle patterns that relate to food such as the frequency of consumption of fast foods, home-cooked meals, ready-prepared / convenience meals, eating out and type of residence. How respondents' felt about their current weight was also determined; as recent South African studies revealed that many young adults engage in unhealthy weight control practices to meet their perceived ideal body image (Gitau *et al.*, 2014). In addition the SANHANES-1 study (Shisana *et al.*, 2014:200) pointed out that South Africans do not seem to understand what is meant by 'normal weight' as only a small minority of the participants were able to identify the normal weight silhouette as ideal weight to strive for.

## **METHODOLOGY**

This study formed part of a larger study on the food practices of students on the main campus of a residential university in Pretoria, South Africa. The Faculty's Ethics Committee granted ethical approval and students who responded were assured of anonymity and confidentiality. Similar to other studies (Riddell *et al.*, 2011; Poinhos *et al.*, 2013), convenience sampling was used and students from all racial groups (black African, coloured, Indian and white) were approached on campus and invited to participate in the study. A total of 488 white students, gave their informed consent to participate in the study and rendered self-reported information on their own weight and height, needed to calculate their BMI,. Although self-reported height and weight information might have included reporting bias, it is a method that is used frequently (Sobal and Hanson, 2011; Worsley *et al.*, 2012; Poinhos *et al.*, 2013; Sobal and Hanson, 2014). Height and weight were used to construct a continuous measure of BMI as kg/m<sup>2</sup>. The BMI was used to create dichotomous indicators of underweight (BMI <18.5), normal weight (BMI 18.5 - <25), overweight (BMI ≥ 25) and obesity (BMI ≥30) (WHO 2015).

### ***Data collection***

A paper-based survey questionnaire applied and validated in previous research on young adults in the South African context was used to collect data on the food choice and other food-related behaviours of the study group (Fisher *et al.*, 2016). Questionnaires were distributed by using the drop-off, collect later method to allow respondents to complete the questionnaire in their own time without any direct assistance or intervention from the researcher. The questionnaire consisted of three sections, namely a section on the socio-demographic information, followed by a section on the usual eating patterns and lifestyle with the third

section containing the food frequency questionnaire (FFQ). The selected socio-demographic variables for the questionnaire concerned age, gender, racial group, type of residence, the respondent's own height and weight and their satisfaction with their current weight by indicating whether they were satisfied with their own weight or needed to gain or lose weight. Closed and open-ended questions measured aspects of each respondent's usual eating patterns and lifestyles. Respondents were asked for information, with an accompanying reason, about the number of meals eaten each day and whether they had breakfast or not; the frequency of consumption of home-cooked meals, fast foods, ready-prepared, convenience type of meals; and eating out. Respondents were required to report directly on the questionnaire, what they usually (3-4 times a week) ate as meals and snacks at specific times during the day on weekdays. They also had to indicate if it was a regular practice or not. In addition, a closed question referred to their weekend eating patterns and enquired whether these tended to differ from weekday routines, and if so, to describe how. Respondents were only required to describe what they consumed as the questionnaire did not ask about quantities of food eaten like portion sizes or number consumed. The non-quantitative food frequency questionnaire (the third section of the survey questionnaire) yielded additional food consumption information and served as a crosscheck for the food intake data obtained. In the food frequency questionnaire 85 food items were grouped into twelve sub-groups. The sub-groups were; bread and bread-like products, spreads or accompaniments to bread, cereals, vegetables, fruit, meat and meat products, fish and seafood, other protein foods, milk and dairy products, sweets and confectionary, beverages and snack foods. Respondents had to indicate how often they consumed each food item according the following scale; daily, 3-4 times per week, once a week, 1-3 times per month and never. The non-quantitative food frequency questionnaire served as check and triangulation of the reported usual eating patterns and provided a meaningful overview of the food consumption patterns of the study group. A question on the frequency of participation in sport or physical activity was part of the section on lifestyle measures.

### ***Data analysis***

The statistical analysis came from IBM© SPSS© version 23 software and a normality test for BMI, the dependent variable, from a one-sample Kolmogorov–Smirnov test. The sample mean is asymptotically, approximately normally, distributed and parametric tests were used as the sample was large. All p-values were two-sided and differences were considered significant in cases where the p-value was less than 0.05. For comparison of categorical data, the chi-square ( $X^2$ ) or Fisher's exact test for 2x2 data tables was used.

**TABLE 1** Characteristics of respondents (N = 488)

	<i>n</i>	%
<i>Age</i>		
18	25	5.20
19	129	26.82
20	86	17.88
21	97	20.17
22	88	18.30
23	37	7.69
24 and older	19	3.95
<i>Gender</i>		
Male	268	55.37
Female	216	44.63
<i>Home language</i>		
Afrikaans	340	73.43
English	116	25.05
Other	7	1.51
<i>Type of residence</i>		
Live with parents	133	27.48
Live independently	148	30.58
Residence	200	41.32
<i>Participation frequency in sport or physical activity</i>		
Daily	113	23.40
3–4 times a week	189	39.13
Once a week	101	20.91
2–3 times a month	49	10.14
Never	31	6.42
Missing values = 5		
<i>Body mass index</i>		
Underweight	31	6.40
Normal weight	326	66.80
Overweight	107	21.92
Obese	22	4.50



## RESULTS

### *Characteristics of the sample*

Table 1 provides information on the demographic profile, the place of residence, BMI categories and participation frequency in sport or physical activity of the respondents. The majority fell within the age group of 19-22 years old, the typical age range of tertiary students in South Africa. Although females were well-represented in the sample (44.63%), male respondents (55.37%) were slightly more dominant. This could probably be because males are not as sensitive as females about self-reporting their own weight. The home language of the majority (73.43%) was Afrikaans. Many stayed in the university residence (41.32%) whereas 30.58% lived independently in a flat, a room or shared a house with friends and 27.48% still lived with their parents. Some respondents frequently participated in sport or engaged in physical activity, with 23.40% doing so daily and 39.13% who did so 3-4 times a week. However, just over a third of the study group could be described as being inactive as they participated in sport or physical activity only once a week, 2-3 times a month or never.

Although nearly two-thirds (66.8%) of the study group, a sizeable proportion, were classified as having a normal weight according to their BMI (Table 1). When comparing males and females, more males than females were overweight and obese. Only 54% of the males had a normal weight compared to 82% of the females (Table 2). Thirty-five per cent of males were overweight and 7% obese in comparison to 6% of the females who were overweight and 1.4% who were obese. Only 3% males compared to 10% of the females were underweight. One-way analysis of variance (Anova) indicated a statistically significant difference between the mean BMI of male and female students ( $p = 0.00$ ). Table 3 presents the respondents' feelings about their current weight, measured as either satisfied or need to lose or gain weight. Although the majority who felt satisfied had a normal weight, more normal weight females (84.5%) felt they had to lose weight in comparison to the 18.2% normal weight males who felt they had to lose weight. For those who felt they needed to gain weight the majority were males (72.1%) of normal weight. There were, however, no statistically significant differences ( $p = 0.149$ ) between how males and females in the different BMI groups felt about their weight.

### *Meal patterns*

Slightly more than half of the respondents (58.8%) reported eating three meals a day with in-between meal snacking. About two-thirds (65.98%) consumed something small mid-mornings and just more than half did so mid-afternoons (53.07%) and after supper (50.20%). The majority (81.60%) enjoyed breakfast and gave positive reasons for doing so. These included statements such as that it is essential to eat breakfast (36.57%); or they regarded it as the

**TABLE 2** BMI categories of the study group (N = 484)

	Males (n = 268)				Females (n = 216)			
	n	%	Mean	SD	n	%	Mean	SD
Underweight	9	3.4	17.5	1.02	22	10.2	17.7	0.78
Normal weight	144	54.1	22.5	1.47	178	82.4	21.4	1.60
Overweight	94	35.3	27.0	1.40	13	6.0	26.3	1.24
Obese	19	7.1	33.6	5.72	3	1.4	35.7	5.97

Note. One-way ANOVA  $p = 0.00$ .

BMI = weight (kg)/height (m<sup>2</sup>); Underweight—BMI < 18.5; Normal weight—BMI 18.5–<25; Overweight—BMI = 25; Obese—BMI = 30 (WHO, 2015).

**TABLE 3** Relationship BMI, gender and feelings about current weight

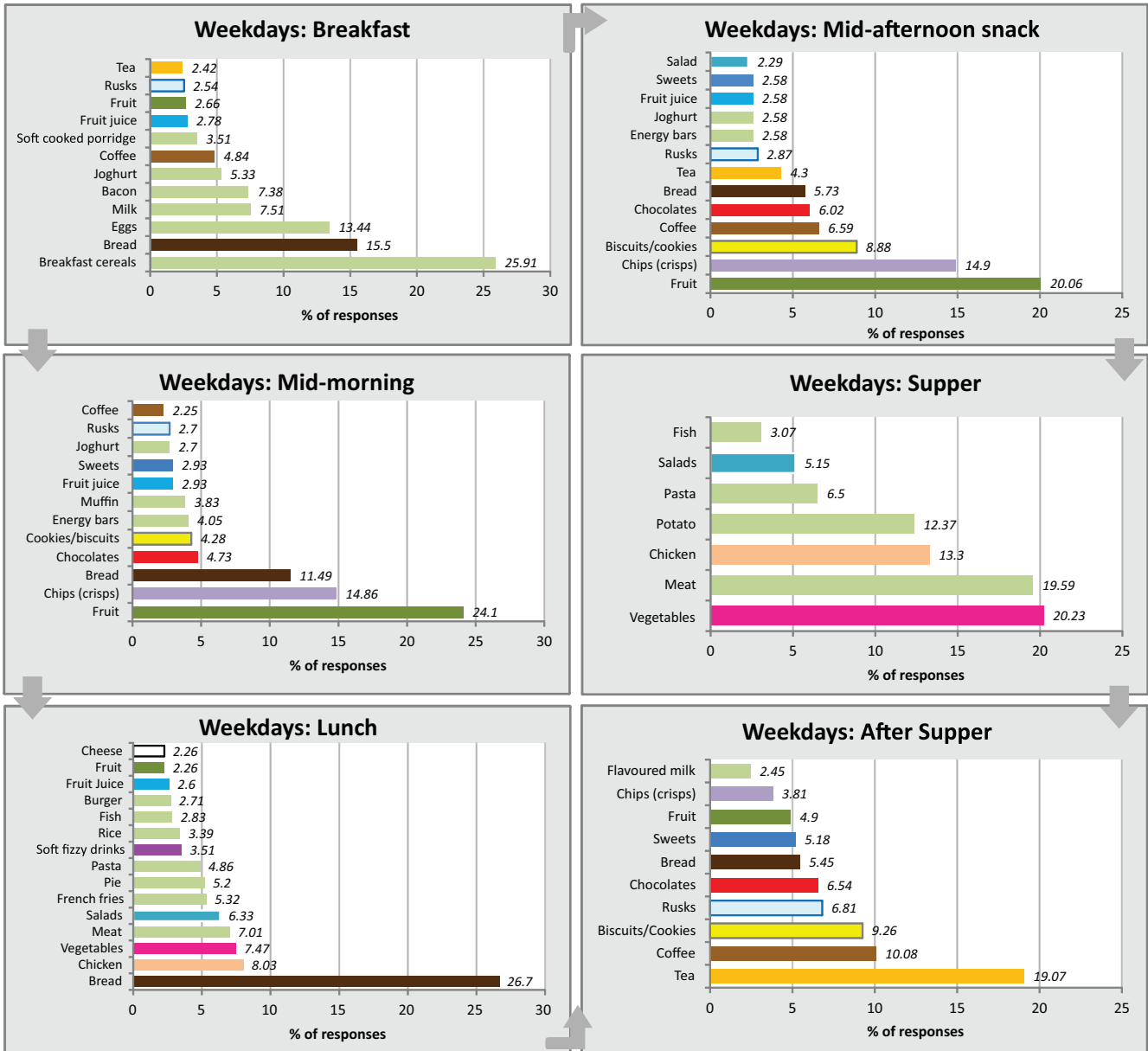
		Males				Females				Sign diff	
		Underweight	Normal weight	Overweight	Obese	Underweight	Normal weight	Overweight	Obese		
Feelings about current weight	Satisfied	Count	4	99	44	8	16	79	1	0	0.149
		% within BMI categories	2.6	63.9	28.4	5.2	16.7	82.3	1.0	0.0	
	Need to lose weight	Count	0	12	43	10	2	93	12	3	
		% within BMI categories	0.0	18.5	66.2	15.4	1.8	84.5	10.9	2.7	
	Need to gain weight	Count	5	31	6	1	3	2	0	0	
		% within BMI categories	11.6	72.1	14.0	2.3	60.0	40.0	0.0	0.0	

most important meal of the day; or had the view that that it provided energy or strength for the day. These were followed by those who gave reasons like feeling hungry and/or they need food (31.71%). Those who did not eat breakfast (19%) gave reasons related to time constraints: they did not have time to eat or prepare breakfast; or they slept too late; or were either not hungry; or cannot eat early in the morning. Weekend meal patterns differed from those on weekdays, although only slightly - 58.2% Saturdays and 55.9% on Sundays. Reasons given in an open-ended question for the differences mainly related to the type and quantities of food consumed. Thirty-three per cent of the responses indicated that more snack and take-away foods were consumed on Saturdays because of having a *braai* (barbeque) (11.26%), a bigger breakfast (9.89%) or simply eating more (7.97%). A small number (6.87%) indicated that more home-cooked food was eaten. The differences for Sundays were due to a home-cooked Sunday midday meal being enjoyed by 32.92%; while 13.85% revealed that more take-away foods were bought; or *braaivleis* (barbeque) fare (5.23%) was enjoyed; and some eat less (8.31%) and some more (6.15%).

### ***Meal composition***

Respondents reported what they usually eat or drink at specific times on weekdays (3-4 times a week) in an open-ended question. These times were grouped as breakfast (between 6h00 and 9h00), mid-morning (between 9h00 and 12h00), Lunch (between 12h00 and 15h00), mid-afternoon (between 15h00 and 17h00) and supper (between 17h00 and 20h00) and after supper (after 20h00). Figure 1 portrays the 2% or more responses for food and beverage items reported as part of the meal and snack composition. Breakfast cereals (25.91%), and/or bread (15.5%) was mainly consumed for breakfast although eggs (13.44%), bacon (7.38%) and dairy products such as milk (7.51%) and yoghurt (5.33%) were also on the menu. Fewer than 5% of the reported responses, revealed that coffee (4.84%), soft cooked porridge (3.51%), fruit (2.66%) or fruit juice (2.78%) and tea (2.42%) were enjoyed at this meal. For lunch, about a quarter of the responses (26.7%) showed that sandwiches or some form of bread were a common choice thus this midday meal can be described as bread-based. This is followed by chicken (8.03%), meat (7.01%), French fries (5.32%), and pies (5.2%). Vegetables (7.47%) and fruit (6.33%) were included as part of lunch. For supper, the main meal of the day, 19.5% indicated meat and 13.3% chicken as protein sources, followed by 20.23% who had vegetables, 12.37% mentioning potatoes, 6.5% pasta and 5.15% salads as important items.

The majority of the students (65%) enjoyed a mid-morning snack that comprised fruit for nearly a quarter of the sample (24.1%); 14.86% snacked on potato crisps; and a noticeable number (11.49%) consumed sandwiches or bread. A smaller number nearly 4% of all the responses had snack items such as biscuits or cookies (4.28%), muffins (3.83%), chocolates (4.73%)



**FIGURE 1** Food usually consumed (3-4 times a week)

**TABLE 4** Frequency of consumption of vegetables, fruit, dairy products, and snack foods

Food group	Daily		3–4 times a week		Once a week		1–3 times a month		Never	
	n	%	n	%	n	%	n	%	n	%
<i>Vegetables</i>										
Green vegetables (broccoli, green beans, cabbage, peas, spinach)	118	24.58	233	48.51	61	12.71	35	7.29	33	6.88
Yellow vegetables (butternut, carrots, pumpkin)	87	18.13	225	46.8	92	19.17	48	10.0	28	5.83
Other vegetables (potato, cauliflower, mushroom, onions, sweet potato, mealies)	104	21.67	274	57.08	72	15.0	20	4.17	10	2.08
Salads (beetroot, lettuce, cucumber, tomatoes, sweet pepper)	103	21.55	237	49.58	67	14.02	41	8.58	30	6.28
<i>Fruit</i>										
Citrus fruit (oranges, naartjie, lemons)	55	11.48	164	34.24	112	23.38	103	21.5	45	9.39
Vit A rich fruit (yellow peaches, mangoes, paw paw)	23	4.82	107	22.43	107	22.43	133	27.88	107	22.43
Other fruit (grapes, bananas, apples, pears)	84	17.50	176	36.67	109	22.71	76	15.83	35	7.29
<i>Dairy products</i>										
Milk	284	59.66	113	23.70	30	6.30	24	5.04	25	5.25
Yoghurt	76	16.0	136	28.63	96	20.21	88	18.53	79	16.63
Cheese	109	23.14	197	41.83	80	16.99	34	7.22	51	10.83
<i>Snack foods</i>										
Sweets	32	6.85	108	23.13	117	25.06	106	22.7	104	22.27
Chocolates	34	7.16	124	26.11	118	24.84	117	24.63	82	17.26
Chips (crisps)	18	3.81	138	29.18	145	30.66	111	23.47	61	12.9
Sugar-sweetened beverages	70	14.83	148	31.36	70	14.83	73	15.47	111	23.52
Fruit juice	98	20.59	189	39.71	100	21.01	43	9.03	46	9.66
Biscuits/cookies	27	5.71	91	19.24	109	23.04	134	28.33	112	23.68

and energy bars (4.05%), with fewer than 3% having sweets and candy (2.93%), yoghurt (2.7%) and fruit juice (2.93%). A similar response pattern with both healthy and unhealthy foods was evident at the mid-afternoon snack time. Beverages, especially tea (19.07%) and coffee (10.08%), were enjoyed after supper. It was sometimes accompanied by items such as biscuits or cookies (9.26%), rusks (6.8%), bread (5.45%) as well as chocolates (6.54%) and sweets (5.18%). A small minority (4.90%) had fruit at this time.

The non-quantitative food frequency questionnaire confirmed the assumption that fruit and vegetable consumption was low. With the exception of green vegetables, which nearly a quarter (24.58%) of the respondents consumed daily, all other vegetables and fruit were consumed less frequently (Table 4). Many of the respondents indicated that they included fruit and vegetables in their diets three to four times a week. As part of the general food consumption pattern, the frequency of consumption of fast foods, home-cooked meals, ready-prepared type of meals, as well as eating out, are illustrated (Table 5). About three-fifths (58.9%) of the sample recorded enjoying fast foods once or twice a week, while 17.2% did so three to four times per week, and 16.2% never ate these foods. More than 37.7% of the students consumed ready-prepared, convenience type of meals at least once or twice a week, followed by 26.3% who had these three to four times per week, while nearly the same percentage (26.7%) never made use of this kind of food for meals. This is in striking contrast to home-cooked meals that were enjoyed by 45.4% at least five to seven times a week; by 20.0% three to four times; and 21.6% once or twice a week. Thirteen per cent never consumed such ready-prepared food products. Most respondents (47.7%) reported that they eat out once twice a month or once a week (35.3%).

### ***Relationship between BMI, food consumption patterns and lifestyle***

The study also explored the relationship between BMI, gender, food consumption patterns and place of residence. Consideration was given to whether breakfast was eaten or not; snacking between meals; the consumption of fast foods; home-cooked meals; ready-prepared convenience meals; and eating out. Table 5 portrays these results. There were no statistically significant differences between the BMI categories of either males and females regarding the habit of eating breakfast or snacking between meals no matter the time of day, during the mornings, afternoons or after supper. Similarly, when relating BMI categories of the gender groups to the frequency of consumption of ready-prepared convenience take-away fast foods and home-cooked meals, no statistically significant differences were noted. However, a proven (p-value 0.006) statistically significant difference was found between BMI categories, gender and frequency of eating out. No statistical difference was noted between BMI

**TABLE 5** Relationship BMI, gender, food consumption patterns, and residence

Type of meal	Consumption pattern	BMI categories males								BMI categories females								Total n	Sign diff
		Underweight		Normal weight		Overweight		Obese		Underweight		Normal weight		Overweight		Obese			
		n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%		
Breakfast	Yes	8	4.0	116	57.4	65	6.4	13	6.4	20	10.9	152	82.6	10	5.4	2	1.1	398	0.528
	No	1	1.6	28	45.2	27	43.5	6	9.7	2	6.9	23	79.3	3	10.3	1	3.4		
Morning snacks	Yes	6	4.0	85	57.0	51	34.2	7	4.7	13	11.6	93	82.0	4	3.6	2	1.8	261	0.128
	No	3	2.6	59	51.3	41	35.7	12	10.4	8	8.0	82	82.0	9	9.0	1	1.0		
Afternoon snacks	Yes	4	2.3	90	50.8	66	37.3	17	9.6	13	9.6	111	81.6	9	6.6	3	2.2	316	0.200
	No	5	5.7	54	62.1	26	29.9	2	2.3	8	10.5	64	84.2	4	5.3	0	0		
Evening snacks	Yes	6	4.7	71	55.5	43	33.6	8	6.3	11	10.2	89	82.4	7	6.5	1	0.9	236	0.571
	No	3	2.2	73	53.7	49	36.0	11	8.1	10	9.6	86	82.7	6	5.8	2	1.9		
Fast food	5-7 × per week	1	4.5	11	50.0	10	45.5	0	0	1	9.1	10	90.9	0	0	0	0	34	0.859
	3-4 × per week	2	3.6	27	48.2	24	42.9	3	5.4	1	3.7	23	85.2	3	11.1	0	0	83	
	1-2 × per week	4	2.7	81	55.5	47	32.2	14	9.6	17	13.2	105	81.4	5	3.9	2	1.6	284	
	Never	2	5.9	21	61.8	9	26.5	2	5.9	3	6.7	37	82.2	4	8.9	1	2.2	81	
Home-cooked meals	5-7 × per week	4	3.4	73	61.9	33	28.0	8	6.8	14	15.1	74	79.6	4	4.3	1	1.1	220	0.936
	3-4 × per week	1	2.4	19	45.2	20	47.2	2	4.8	4	7.7	42	80.8	4	7.7	2	3.8	97	
	1-2 × per week	4	6.7	24	40.0	24	40.0	8	13.3	1	2.2	41	91.1	3	6.7	0	0	105	
	Never	0	0	24	63.2	13	34.2	1	2.6	3	13.6	18	81.8	1	4.5	0	0		
Ready-prepared / convenience meals	5-7 × per week	2	7.4	10	37.0	12	44.4	3	11.1	2	11.8	15	88.2	0	0	0	0	44	0.617
	3-4 × per week	1	1.5	36	55.4	22	33.8	6	9.2	8	13.6	49	83.1	2	3.4	0	0	125	
	1-2 × per week	5	5.3	53	55.8	31	32.6	6	6.3	7	8.4	68	81.9	7	8.4	1	1.2	179	
Eating out	Never	1	1.4	41	57.7	25	35.2	4	5.6	5	9.4	43	81.1	3	5.7	2	3.8	127	0.006
	Daily	0	0	7	58.3	4	33.3	1	8.3	0	0	3	100	0	0	0	0	15	
	3-4 × per week	2	8.0	16	64.0	6	24.0	1	4.0	2	15.4	10	76.9	1	7.7	0	0	38	
	Once a week	1	1.2	35	41.7	40	47.6	8	9.5	10	11.9	69	82.1	5	6.0	0	0	171	
	1-2 × per month	4	3.3	76	61.8	37	30.1	6	4.9	9	8.4	89	83.2	6	5.6	3	2.8	231	
Residence	Never	2	10.0	9	45.0	6	30.0	3	15.0	1	11.1	7	77.8	1	11.1	0	0	29	0.863
	Living with parents	5	6.1	41	54.7	25	33.3	4	5.3	5	8.9	48	85.7	3	5.4	0	0	133	
	Live in flat	1	2.4	21	51.2	14	34.1	5	12.2	4	8.3	39	81.3	3	6.3	2	4.2		
	House with friends	1	4.2	17	70.8	4	16.7	2	8.3	3	11.1	21	77.8	2	7.4	1	3.7		
	Rent a room	0	0	2	50.0	1	25.0	1	25.0	0	0	1	100	0	0	0	0		
Residence	2	1.7	60	50.8	49	41.5	7	5.9	8	10.4	64	83.1	5	6.5	0	0			



categories, gender and place of residence, either living with parents or independently in a flat, an apartment, a house with friends, a room or a university residence.

## **DISCUSSION**

The prevalence of overweight (21.9%) and obese (4.5%) students, classified as those with a BMI greater than 25 kg/m<sup>2</sup>, resulted from an analysis of the self-reported weight and height data collected for this investigation. The figures for males were 35.3% and 7.1% respectively and 6.0% and 1.4% for females. Varying results are reported in other recent South African student studies where weight and height measurements were obtained by trained researchers. In a predominantly white group of students at the University of the Free State, 19.8% were overweight or obese (Van den Berg *et al.*, 2013), while in a mainly black group of nursing students from the Eastern Cape, 31.7% and 15.0% respectively were overweight or obese (Van den Berg *et al.*, 2012). In the comparative study by Peltzer *et al.* (2014) involving students from 22 low, middle and emerging economies, it is reported that only 55.1% of the South African female students had a normal BMI, with 25.3% classified as overweight and 15.6% as being obese. Among the males, 71.0% had a normal weight and 13.3% were overweight and 3.8% obese. In this present study, the prevalence of being overweight and obese in its entire student group was slightly higher when compared to similar conditions reported in North American and European countries (Cluskey and Grobe, 2009; Chourdakis *et al.*, 2010, Chourdakis *et al.*, 2011) and Australia (Riddell *et al.*, 2011). The South African results raise a concern since overweight and obesity are related to various health risks, such as diabetes, hypertension and hypercholesterolemia (Steyn and Michiza, 2014). Additionally, being overweight at the age of 20-22 years is associated with an increased incidence of obesity by the age of 35-37 years (Chourdakis *et al.*, 2011; Deliens *et al.*, 2013). The differences noted in the overweight and obesity results of the current and recently reported South African studies could possibly be attributed to one or more of the following reasons: race and gender group of the study population; cultural and regional differences in food consumption patterns; and how the weight and height measurements were obtained. The SANHANES-1 study (Shisana *et al.*, 2014: 135), for example reported that black females were significantly heavier and taller than their Asian/Indian and coloured counterparts. Recent food consumption studies confirm that cultural and regional differences continue to exist within the South African population (Labadarios *et al.*, 2011a; Labadarios *et al.* 2011b; Shisana *et al.*, 2014:169). It is further known that self-reported weight and height has limitations, as height is often overestimated and weight underestimated (Shiely *et al.*, 2013; Liechty *et al.*, 2016; Tang *et al.*, 2016)

The respondents' feelings about their current weight gave interesting insight into their perception of their own weight status. Although the majority were satisfied with their weight, the females felt they needed to lose weight although 84.5% in the group had a normal weight. The males had a contrasting view of wanting to gain weight although 72.1% of them had a normal weight. In the study by Gitau *et al.* (2014) on adolescent boys in Johannesburg, as well as the SANHANES-1 study by Shisana *et al.* (2014:200), the participating South Africans' perception of their BMIs was also measured and compared to their ideal BMI. The same tendency was noted, as South African males, in general, aspired to being heavier and bigger, with females wanting to be thinner. It seems as if the influence of psychosocial factors such as the desirable societal "ideal" body shape (which is often unrealistic) is used by young South Africans as the norm to achieve. A similar finding regarding weight perceptions of male and female Greek students was reported by Chourdakis *et al.* (2010).

The food composition and meal patterns observed in this investigation confirm Western-orientated food practices as the majority of the respondents consumed three meals a day with in-between meal snacking and had a different meal pattern over weekends. Food intake was characteristically frequent consumption of foods high in fat, sugar and sodium. with a low intake of fruit, vegetables and dairy products. These results concur with other recent studies on South African student groups (Van den Berg *et al.*, 2013; Gresse *et al.*, 2015). Data supported the notion that having a meal at breakfast time was common practice as the majority (81.3%) of the present study group consumed typical breakfast items. In comparison to other studies (Hallström *et al.*, 2011; Reeves *et al.*, 2013), it seems as if white South African students are more inclined to eat breakfast. Van den Berg *et al.* (2013) reported that 93.2% of their students consume breakfast regularly. Consumption of breakfast is associated with a healthy lifestyle and eating practices, and this truth needs reinforcement. Skipping breakfast is associated with overeating later in the day to satisfy the hunger pangs experienced. Hunger is often calmed down by choosing high fat or sugar-dense snacks (Hallström *et al.*, 2011; Hartmann *et al.*, 2012; Reeves *et al.*, 2013). To note in the present study is that more females have a normal weight and have a regular breakfast than their male counterparts (Table 5). More overweight males in comparison to overweight females did not consume breakfast.

The composition of lunch and snacks between meals reflect that both healthy and unhealthy foods were consumed during the day. This concurs with the food frequency questionnaire results (Table 4) as  $\geq 23\%$  of the respondents marked that snack foods that are usually high in fat, sugar or sodium) were indulged in three to four times per week. They were in the form of sweets (23.13%), chocolates (26.1%), potato chips (29.18%), sugar-sweetened beverages (31.65%) and fruit juice (39.71%). Biscuits and cookies were also enjoyed three to four times

per week by 19.4% of the students. A further concern is the large majority that do not seem to include fruit and vegetables as part of their regular daily food consumption (Table 4). Nearly 50% reported that these were consumed only three to four times per week. They thus do not adhere to the South African Food Based Dietary Guidelines which recommend five portions of fruit and vegetables daily (Naudé *et al.*, 2013). These results concur with South African and international studies (Sharma *et al.*, 2009; Chourdakis *et al.*, 2010; El Ansari *et al.*, 2012; Van den Berg *et al.*, 2012; Van den Berg *et al.*, 2013; Peltzer *et al.*, 2014; Gresse *et al.*, 2015). Fruit and vegetables are sources of fibre, vitamins and anti-oxidants that should be part of daily food intake. The frequency of the consumption of dairy products could be improved on as well. Although as many as nearly 60% (59.66%) consumed milk daily, nearly 40% did not.

Lack of time is often seen as a barrier to healthy eating in that people seem to devote less time to meal preparation and eating as a matter of choice when shifting their time allocation schedule or because of a lack of cooking skills, or both of these circumstances (Pelletier and Laska, 2012; De Backer, 2013; Hartmann *et al.*, 2013; Sobal and Hanson, 2014). Advances in food technology have enabled the food industry to also respond by offering time-saving options through the increased availability of convenience and ready-to-eat food (Hartmann *et al.*, 2013). Strategies students and young adults devise to overcome time constraints could incorporate consumption of fast foods, skipping meals or resorting to ready-prepared convenience foods. Although the study group used fast foods regularly, they were not consumed as frequently as reported in other South African and international studies. In the latter case, consumption frequency of three and more times per week were usual (Gresse *et al.*, 2015; Steyn *et al.*, 2011). Home-cooked meals continue to form part of the food consumption patterns of white students as more than 60% enjoyed such meals three and more times per week. This result could be interpreted as implying that these meals are valued. Since eating out is generally expensive and often regarded as a treat, most students do this either only once a week or once or twice a month. A statistically significant difference was found between the BMI rating and the frequency of eating out. The tendency of a higher body weight to coincide with an increased frequency of eating out concurs with international studies (Van der Horst, *et al.*, 2010; Sobal and Hanson, 2014).

Studies that investigated the association between the BMI and selected consumption patterns yielded positive results in adults concerning the habits of eating breakfast, consuming fast food and snacks and having home-cooked meals (Sobal and Hanson, 2011; Hartmann *et al.*, 2012; Sobal and Hanson, 2014). Student populations (Utter *et al.*, 2013) also reported that BMI was not significantly associated with consumption patterns like these. No statistically significant differences were found between BMI and the type of residence arrangement.

This study had several limitations. Data was self-reported and, although studies often use self-reported weight and height in population-based studies due to practical, time and cost considerations. The accuracy of the self-reported weight and height can be challenged as the possibility of underestimation of weight and the overestimation of height occurs (Deliens *et al.*, 2013; Liechty *et al.*, 2016; Tang *et al.*, 2016). It is admitted that objective measurement of height and weight using standardised protocols, although time, cost and labour intensive, is the ideal, as it is more reliable and should thus be incorporated in study designs if practically feasible (Liechty *et al.*, 2016; Tang *et al.*, 2016). In the same vein, the self-reported frequency of consumption and patterns of eating practices could be under or over reported in certain cases of the collected food intake data, and consequently suffer from measurement error (Hartmann *et al.*, 2012; Hébert *et al.*, 2014; Subar *et al.*, 2015). However, the present study was explorative in nature. It aimed to describe and gain insight into the type of food a purposively selected student group habitually consumed. Thus the self-reported food intake data aided in characterising and providing an overview of the food choices and food consumption patterns of this group of white students. There is ample evidence that shows that self-reported food intake data can be used successfully to inform dietary guidance to the group studied (Hébert *et al.*, 2014; Subar *et al.*, 2015). Admittedly, only one item was used to measure some variables and concepts. Examples are the frequency of consumption of home-cooked meals, fast food and participation in sport or physical activity. More objective measurements of these elements and the habitual food intake, including the quantities and portion sizes of foods consumed, should be considered in future studies. ,

## **CONCLUSION AND RECOMMENDATIONS**

Despite limitations, this study does contribute to filling the knowledge gap around the paucity of data on the food practices of white South African university students. In this work, food consumption patterns represented situations in which breakfast was either eaten or not; snacking between meals; consuming fast foods, home-cooked meals and ready-prepared, convenience type of meals. No statistically significant differences were found between these food consumption patterns and the students' type of residence or the BMI categories of the male and female students. It is known that certain behaviours are related to a high prevalence of overweight and obesity. Especially important too is the confirmation that this young adult life stage is critical in the shaping of food-related behaviours that will not only affect their own future health, but also that of their future families (Sharma *et al.*, 2010; Schnettler *et al.*, 2015). Thus the low reported intake of fruit, vegetables and dairy products rises significant concerns as the majority of students did not include these items in their daily meal patterns. Of equal

concern is the fact that nearly a quarter of the students, as frequently as three to four times a week consume snack foods high in fat, sugar and sodium.

Although most of male and female students in the study could be classified in the normal weight BMI group, a striking observation was the prevalence of overweight and obesity among males. Specifically important is the fact that it stood as high as 35.3% for being overweight and 7.1% for obesity. These percentages are higher than those reported for males in other recent South African studies on student groups (Van den Berg *et al.*, 2012; Van den Berg *et al.*, 2013; Peltzer *et al.*, 2014). Ethnic representation was not taken into account in the South African study Peltzer and colleagues did in 2014. Indications from other recent work seem to suggest that ethnic background and environmental influences could affect the food environment and food accessibility in such a way as to contribute to a higher incidence of overweight and obesity within some communities and regions of South Africa. Further investigation in this field is required. The study, which Reddy *et al.* (2008) undertook on South African adolescents, illustrates the feasibility of such research. They found that, amongst white adolescent males, overweight and obesity were higher than was the case among their black and coloured counterparts.

The prevalence of overweight and obesity is increasing in young adults worldwide in conjunction with the incidence of non-communicable diseases as a consequence. It is projected that the intensity and nature of these afflictions will not only rise in South Africa but that more males specifically will be affected. To effectively curb the rising trend of overweight and obesity in the South African population this study indicates that further research regarding the food practices and lifestyle patterns of young South African adults and students is timeous. Apart from quantitative studies to determine how nutritional and socio-economic status, physical activity levels, psychosocial and environmental factors contribute to the obesity pandemic, qualitative studies to gain further in-depth insight and understanding of these aspects should be considered as well. Effective prevention and treatment programs could then be planned through consumer education and facilitation with the emphasis on an increased awareness of healthy weight management and promoting healthy food choices and practices, and increasing physical activity levels.

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