

Food Security Status and Academic Performance of Students on Financial Aid: The Case of University of KwaZulu-Natal

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Abstract

Universities are required to improve access and facilitate academic success for students from economically disadvantaged backgrounds. However, tertiary education is costly and inadequate student financial support undermines academic interventions by contributing to high drop-out and low graduation rates. The prevalence of food insecurity (FI) under the local student community is high. However the extent to which FI affects academic performance is under researched. A cross-sectional descriptive survey was conducted on a random sample of local university students (n=269) on financial aid to try and contribute to the filling of this research gap. Anthropometric measurements, food security status, coping mechanisms, monthly food expenditure, dietary diversity, academic performance and nutritional knowledge were measured using standardised methods and questionnaires. The findings indicated that more than half of the participants (53.1%) reported to be moderately food insecure. No significant relationship between academic performance, determined by the Combined Performance Index (CPI), and level of FI was found. However, it was evident that all participants in this study under-performed with a CPI of less than 90 (a CPI below 120 is considered below average). The findings point to the need for further research into the financial aid received by underprivileged students as

it is evident from the study that almost all students on financial aid, whether they reported to be food secure or insecure, under-performed academically.

Keywords: food security status, food insecurity, academic performance, university students, financial aid, combined performance index

Introduction

A substantial increase in student enrolments has occurred in South African universities over the past decade. Overall government education spending and funding to higher education has also sharply risen over the years (Letseka & Maile 2008; Cloete & Moja 2005). Increased university access to students from previously disadvantaged communities introduced new levels of socio-economic disparities within the student community (Council of Higher Education 2010; Petersen, Louw & Dumont 2009; Letseka & Maile 2008), as a larger percentage of students do not have sufficient finances to cover their study and living expenses. In fact, in countries such as Australia, students on financial aid are classified as at risk, as financial aid is offered exclusively to those of a socio-economic status of 20-39% below the poverty line (Hughes, Serebryanikova, Donaldson & Leveritt 2011).

The South African Government provides financial aid to students through the National Student Financial Aid Scheme (NSFAS) (Letseka & Maile 2008) and aims to make a difference by providing a sustainable financial aid system for study loans and bursaries. It is therefore intended to enable students to complete their undergraduate studies, which in turn, will improve their employment prospects and consequently result in economic independence, including food security (Innes-Hughes, Bowers, King, Chapman & Eden 2010). However, in a report issued by the Department of Higher Education and Training (2011), every Vice Chancellor and Deputy Vice Chancellor, as well as the majority of student leaders interviewed, indicated that the NSFAS is inadequate to fund student fees, accommodation and food.

Subsequently, it has been documented that large numbers of South African students experience great financial difficulty (Department of Higher Education & Training 2011; Petersen *et al.* 2009). The cost of food is

substantial for those with limited financial resources. These limited funds dictate what students on financial aid are able to purchase and how they allocate their disposable income (Hughes *et al.* 2011). In a sample of Australian students, students who were food insecure were more likely to rent, board or share accommodation and their coping strategies included having a part time job and borrowing money and food (Hughes *et al.* 2011). Research conducted by Munro, Quayle, Simpson, and Barnsley (in press) at the University of KwaZulu-Natal (UKZN) confirmed that students on financial aid are significantly more vulnerable to FI when compared to those that are not receiving financial aid.

Poor nutrition is experienced by the food insecure student population as a result of an inadequate diet which is of a poor quality and lacks dietary diversity. In addition, in situations of FI, food intake becomes erratic (Hughes *et al.* 2011; Hodinott & Yohannes 2002; Maunder, Matji & Hlatshwayo-Molea 2001). Paradoxically, individuals that suffer from FI also often suffer from overweight and obesity (WHO 2012; Wilde & Peterman 2006) which increases the risk for non-communicable diseases of lifestyle (Adams, Grummer-Strawn, Chavez 2003; Vozoris & Tarasuk 2003; Steyn, Senekal, Britz & Nel 2000). The reason for this phenomenon is related to the fact that more affordable food options have a higher energy density (kilojoule content) and a low nutrient density. Foods such as fruit and vegetables with a higher nutrient density, are often more expensive (Oldewage-Theron & Egal 2010; Temple, Steyn, Myburgh & Nel 2006). Gooding, Walls, and Richmond (2011) reported that food insecure young adult women had a higher BMI when compared to their food secure counterparts. Wilde and Peterman (2006) also reported that both men and women from food insecure households were more obese and also gained more weight over a twelve month period when compared to their peers from food secure households. This was also observed in food insecure American women (Brown 2008; Adams *et al.* 2003). The above studies therefore confirm a negative relationship between food security and BMI. It is therefore not surprising that students who are food insecure tend to report a poor health status (Hughes *et al.* 2011; Newton & Turale 2000). What has not been adequately documented is the effect of FI and students' academic performance in a tertiary education context.

Relationship between Food Insecurity and Academic Performance: The Literature

Food Insecurity (FI) has a documented negative impact on academic outcomes, including attention span and school attendance (Hughes *et al.* 2011; Hoyland, Dye & Lawton 2009; Florence, Asbridge & Veugelers 2008; Cooke 2007; Taras 2005). Florence *et al.* (2008) also reported that apart from an association between malnutrition and academic performance, there also exists an association between dietary quality, variety and academic performance. However studies were only conducted on school-aged children. Yet, the authors propose a similar relationship between nutrition, diet and academic performance in students enrolled for tertiary education.

A paucity of published scientific literature exploring the possible relationship between food insecurity and academic performance among university students is therefore evident. Research conducted by Munro *et al.* (in press), on UKZN students, documents that hunger has a significant impact on the ability to concentrate. Just over 11% of the sample reported that this occurred 'often' or 'almost always', while just over a fifth (20%) indicated that it happened 'sometimes'. When asked whether hunger affected their energy levels, the trend for fatigue was similar to that of concentration in that 12.2% of the sample reported feeling tired 'often' or 'sometimes' in relation to hunger. Although the impact of the students' food security status on academic performance was not measured, the association between chronic malnutrition, acute starvation and impaired cognitive function is well recognised.

Poor nutrition knowledge has also been documented as a contributing factor to poor dietary habits (Steyn *et al.* 2001). Effective food utilisation depends on the individual's knowledge of food storage and basic nutrition principles (Riely, Mock, Gogili, Bailey & Fenefik 1999). Park and Kim (2005) reported that after nutrition education was given to Chinese students, meals were consumed more regularly. In addition, local studies reported that poor nutrition knowledge leads to a low consumption of calcium, iron and zinc among rural and urban black South African students (Steyn *et al.* 2001). It should be noted though, that extrapolating between groups of students and different country populations at large should be undertaken with care (Temple *et al.* 2006; Cleland, Worsley & Crawford

2004). Conversely, a study conducted among black students at the Durban University of Technology found that even though the nutrition knowledge of students ranged from average to poor, it did not have an impact on dietary adequacy (Ntuli 2005). This was echoed by Oldewage-Theron, and Egal (2010) who reported that nutrition knowledge did not have an impact on the food choices made by a food insecure community in Qwa-Qwa (possibly due to the fact that high fat- and low micronutrient dense foods were the most affordable).

As tertiary education is expensive, UKZN has adopted a policy in 2013 whereby at least 15% of all student enrolments should come from previously disadvantaged communities, with a low socio-economic background (i.e. quintile 1 and 2 schools). As an institution of higher education, it is the responsibility of academics towards these students to investigate the factors such as food security that have an impact on their academic performance in order to plan appropriate intervention strategies.

Methods

A cross sectional, descriptive survey was conducted on students on financial aid from April to May 2012 to determine the following: (i) food security status; (ii) monthly food budget; (iii) dietary diversity; (iv) nutritional knowledge; (v) body mass index (BMI); (vi) academic performance and (vii) food insecurity coping strategies.

Participants

A random sample (n=269) of second to fourth year students on financial aid at the Pietermaritzburg campus of UKZN were recruited using student email addresses, posters on campus and word of mouth. A list of all recipients of financial aid was obtained from the data management information system (DMI) of UKZN. This list was used for cross-reference purposes when students arrived for screening at the data collection venue. First year students on financial aid were excluded from the study sample as it was assumed that they did not have sufficient experience with food insecurity at the time of data collection.

Procedure

A pilot study was conducted on a sample of 15 students with similar inclusion criteria to that of the main study sample. The pilot study was used to standardise the self-administered questionnaires and determine whether any questions posed were ambiguous or misleading. In addition it was also used for training purposes of field workers. Pilot testing revealed that questions were easily understood by subjects. As a result, no subsequent changes were made to any of the questionnaires.

Nutritional status of subjects was determined by means of participant BMI (calculated as weight (kg)/height (m)² and interpreted according to WHO (2004) standards). Weight and height were measured by trained fieldworkers after subjects, dressed in light indoor clothing, removed their shoes. Weight was measured three times with a calibrated digital floor scale to two decimal places, while height was measured three times using a stadiometer with a sliding headboard and recorded to the nearest 0.1cm. The mean of the two closest values recorded for weight and height were used for calculation of subjects' BMI.

All subjects completed the self-administered questionnaires in a quiet venue where they were free from distractions. Trained fieldworkers were available on site to assist subjects where needed. The questionnaires included (i) a socio-demographic status questionnaire (developed for the purpose of this study in accordance with personal communication with staff from student counselling and the financial aid office); (ii) questions regarding coping strategies related to food insecurity; (iii) an adapted version of the Household Food Insecurity Access Scale (HFIAS) (Swindale & Bilinsky 2006); (iv) a non-quantified food frequency questionnaire adapted for the study sample as a measure of dietary diversity; and (v) an abbreviated version of the nutrition knowledge questionnaire developed for urban South African adolescents as part of the 'Birth-to-Twenty' study (based on the South African Food-Based Dietary Guidelines) (Whati 2005) as a measure of nutritional knowledge. Academic performance was determined in accordance with the CPI, a single index used to track student performance over the course of their studies. As the questions posed in the original version of the HFIAS referred to 'you or any of your household members' it was reworded for the purpose of this study to 'you', where relevant.

Ethics

Ethics approval for this study was obtained from the Humanities and Social Science Research Ethics Committee (Protocol Reference Number HSS/0150/012M of the University of KwaZulu-Natal). Prior to participation, all subjects signed an informed consent form, after they were informed of the nature and scope of the study, to ensure that participation was voluntary and that confidentiality and anonymity in reporting the study findings would be ensured. Individual data sets could not be traced back to specific participants, as they could only be identified by a participant code.

Results

The socio-demographic background and BMI of the study sample is presented in table 1.

Table 1: Socio-demographic variables and nutritional status of the study sample (N= 269):

Variable	Percentage/mean	p-value
Gender:		
Male	41.6% (n=112)	
Female	58.4% (n=157)	
Mean age (years)	18.1 (\pm 7.1)	
Mean BMI (kg/m ²):	23.3 (\pm 8.7)	0.00*
Male	22.3 (\pm 3.2)	
Female	25.6 (\pm 5.3)	
Monthly food expenditure (Rand):	487.90 (\pm 270.90)	0.172§
Male	514.99 (\pm 301.42)	
Female	469.01 (\pm 246.76)	
Majority of monthly expenses:		
Food	73.8% (n=222)	
Clothes	7.0% (n=21)	
Travelling	3.0% (n=9)	
Study extras	23.0% (n=6)	
Social events	1.7% (n=5)	

Residency:		
Home	5.6% (n=15)	
UKZN residence	78.4% (n=211)	
Off-campus	16.0% (n=43)	

* Independent samples t-test

§ Chi-square test

From the above it is evident that the gender distribution in the study sample was not equal. This is aligned with the UKZN intake of students by gender, whereby female student enrolment represented an average of 58.5% of the overall student body over the previous three years (2011; 2012; and 2013). In accordance with WHO standards (WHO, 2004), the mean subject BMI fell within the normal range. However, apart from being classified as obese, the mean female BMI was significantly higher (by 3.3 kg/m² on the average) compared to that of their male counterparts. The mean monthly food expenditure of R487.90 (\pm 270.90) for the group as a whole, amounts to R16.26 per individual per day. The majority of students in the study population resided in UKZN student residence accommodation. These residences are self-catering. This implies that food preparation and purchasing is the responsibility of the student.

The food security status and related factors of the study sample are reported in table 2.

Table 2: Food security status and related factors of study sample (N=269)

Variable	Percentage	p-value
HFIAS score:	10.7 (\pm 7.3)*	
Male	11.9 (\pm 6.7)	
Female	12.0 (\pm 6.8)	
Food security status:		
Food secure	34.4% (n=92)	
Moderately food insecure	53.1% (n=143)	
Food insecure	12.5% (n=34)	

When most hungry:		
Beginning of semester	26.6% (n=91)	
End of semester	66.1% (n=178)	
Longest time without food (days)	2.8 (± 4.1)	0.700
Male	2.7 (± 4.2)	
Female	2.9 (± 4.0)	
Coping strategies:		
Borrow money from friends	45.5% (n=137)	
Borrow money from family	16.3% (n=49)	
Drinking fluids	10.6% (n=32)	
Self-distraction	6.6% (n=20)	

* Score of 9 = food secure, score of 36 = food insecure

More than half of the study sample could be classified as moderately food insecure, whereas 12.5% could be classified as food insecure. Two thirds of the sample reported to be the hungriest at the end of the semester, a period that coincides with examination time. The average time that students reported to have gone without a substantial meal was almost three days (2.8 ± 4.1 days). However, this value varied drastically. Of the numerous coping strategies employed by participants, borrowing money from friends was preferred, followed by borrowing money from family members. In the group as a whole, the food security status and nutritional knowledge score correlated significantly with the BMI of the study sample (Table 3).

Table 3: Correlation between BMI, HFIAS and the nutrition knowledge score.

Correlation with BMI	r ²	p value
HFIAS	0.455	0.000
Nutrition knowledge	1.36	0.026

In Table 4, subject nutrition knowledge score is reported after completion of 18 multiple choice questions based on the South African Food Based Dietary Guidelines (Whati 2005). Dietary diversity is reported in relation to the completion of a non-quantified food frequency questionnaire.

Table 4: Subject nutrition knowledge score and dietary diversity (FFQ) (n=269)

Variable	Percentage/mean
Nutrition knowledge score:	58.2% (± 12.2)
• Male	55.7% (± 13.1)
• Female	60.4% (± 10.7)
Dietary diversity (daily portions):	
• Milk	0.7 (± 0.6)
• Other milk products	0.4 (± 0.5)
• Breakfast cereal/porridge	0.8 (± 0.5)
• Bread, rice, potato, samp	1.5 (± 0.6)
• Beans	0.4 (± 0.5)
• Meat, fish, poultry	0.8 (± 0.6)
• Processed meat	0.6 (± 0.6)
• Eggs	0.7 (± 0.6)
• Vegetables	0.7 (± 0.7)
• Fruit	0.8 (± 0.7)
• Cooking oil, margarine, mayonnaise	1.2 (± 0.7)
• Cakes, biscuits, doughnuts, sweets	0.9 (± 0.7)
• Salty snacks e.g. chips	0.7 (± 0.6)
• Fizzy drinks	0.5 (± 0.6)
• Coffee, tea	1.1 (± 0.8)
• Pizza, pies, fast foods	0.4 (± 0.4)

Participants had a satisfactory nutrition knowledge score as the mean test score was nearly 60%. The consumption of staples such as bread, rice, potato, samp, breakfast cereal and porridge was the highest, while similar mean consumptions were found for fruit, vegetables and milk. The high fat content of the diet was evident from the consumption of cooking oil, margarine, mayonnaise, cakes, biscuits, doughnuts and sweets, as well as salty snacks like potato chips and processed meat. Of interest was the fact that the consumption of expensive protein-rich foods such as meat, fish and poultry was higher than that of more affordable options such as beans and soya products. The frequency of consuming coffee and tea was the highest when compared to other food categories.

Table 5: Level of Food Insecurity in relation to some of the measured variables

	Food Secure	Moderately Food Insecure	Food Insecure
BMI/ (kg/m²)	23.5±4.9	23.2±4.7	25.3±4.4
Money Spent on Food/ (Rands per month)	578.53±217.34	560.90±207.16	564.40±153.35
Days gone without food	4.4±13.9	4.5±6.3	6.6±9.0
CPI 2011*	85.9±10.4	86.9±13.3	83.8±8.5

*The maximum CPI a student can achieve is 140. A student with a CPI below 120 is considered academically weak

The study population was categorised according to different levels of Food Security, based on the Household Food Insecurity Access Scale (HFIAS). Results show a non-significant increase in BMI in the Food Insecure group, when compared to the group that is Food Secure, as well as the Moderately Food Insecure group. Interestingly enough, the Food Secure group only reported spending about R20.00 per month more on food when compared to the Moderately Food Insecure and Food Insecure groups. The Food Insecure group also reported to go much longer without food, compared to any of the other groups. The Food Insecure group also had the lowest CPI score of all three groups, even though the difference was not statistically significant.

Discussion

The mean subject BMI of the study sample fell within that of the healthy ‘general’ population. However, the mean BMI for female subjects fell within a range which could classify them as overweight (WHO 2004). Research conducted by Reddy, Resnicow, James, Kambaran, Omardien and Mbewu (2008) amongst adolescents 14 – 19 years of age, showed that a significantly higher percentage of females were overweight and obese by age 18,

compared to their male counterparts. In addition, Racette, Deusinger, Strube, Highstein & Deusinger (2005) report that female college students tend to eat more fatty foods than male students, even though their fruit and vegetable consumption tends to remain similar. Numerous authors have reported that food insecure individuals often consume a diet that contributes to the development of overweight and obesity (WHO 2012; Gooding *et al.* 2011; Brown 2008; Wilde & Peterman 2006; Adams *et al.* 2003) due to the fact that more affordable food options have a higher energy density (kilojoule content) and a low nutrient density, while foods such as fruit and vegetables with a higher nutrient density are often more expensive (Oldewage-Theron & Egal 2010; Temple *et al.* 2006). Results from this study confirm these findings. The Food Insecure student population had a BMI of almost 2 kg/m² units higher compared to that of the food secure students, which, in an average person of 175 cm, amounts to almost 4 kg more in body weight. The average difference in food expenditure between those reported to be food insecure, and those to be food secure, was less than R14 per month. The study findings as a whole should therefore be put into perspective, as based on these findings, there was a very narrow band of overall variance between the two groups. However, it is important to recognise that all the study participants received financial aid, which does not allow for much variance in the availability of cash within the group as a whole. Having a similar budget to spend, the difference in BMI as well as the fact that some students reported to be food insecure, and others not, indicate mainly a difference in the nutritional quality of food purchased. The majority of students that participated in this study resided in UKZN self-catering student residences and are therefore responsible for their own food preparation, and purchasing. According to UKZN student funding (<http://studentfunding.ukzn.ac.za/Policy.aspx>), in 2011 UKZN students on financial aid received an annual meal allowance to the value of R5 026, which is paid out in eight instalments of R628.24. This gives each student access to R20.85 per day to spend on food, and therefore just under R7/meal. Munro *et al.* (in press) explains that it is possible that many students on financial aid use their meal allowance to supplement textbook allowances, pay for stationery, photocopying and other study expenses, cover travel costs, fund food for family members where the student is the head of the household and supplement living expenses for family members in cases of unemployment.

More than half of the study population could be classified as moderately food insecure, with 12.5% of the population classified as food insecure. In addition, almost two thirds of the entire sample reported to be the hungriest at the end of the semester, a period that coincides with examination time. Authors such as Florence *et al.* (2008) and Taras (2005) have emphasized the fact that effective study and exam preparation behaviours rely strongly on sound nutrition. The longest time that students reported to have gone without a substantial meal was in some cases almost 7 days (6.64 ± 9.01 days). Results confirm a tendency towards weaker academic performance in the Food Insecure student group, even though the difference when compared to academic performance in the food secure group was not statistically significant. This phenomenon could be ascribed to a number of factors, which could be of psychological or physiological nature, or both. A CPI score of less than 120 is considered as weak academic performance, and an indication of a student who has already failed some modules.

Conclusion and Recommendations

A national investigation into the financial aid received by underprivileged students is vital, as it is evident from this study that almost all students, whether they reported to be food secure or insecure, under-perform academically. The inclusion of a group of students that come from high socio-economic backgrounds may also be helpful for comparative purposes. In addition, further investigation into food security status of UKZN students that are stratified according to campus and study major is also recommended as it could shed more light on confounding factors that affect academic performance. Although knowledge is not a guarantee that student eating- and purchasing practices would facilitate more nutritious food choices, it is recommended that the orientation of first year students should include aspects related to budgeting and the acquisition of basic nutrition knowledge to facilitate appropriate food purchases. Topics such as weight maintenance and /or weight loss should also be addressed. In addition, it is recommended that government reconsider the amount available to students on financial aid, in order to improve their capacity to afford more wholesome and nutritious foods that promote a feeling of mental wellbeing and physical health which,

in turn, could improve academic performance in students from previously disadvantaged backgrounds. Nutrition intervention should therefore target all students on financial aid.

References

- Adams, EJ, L Grummer-Strawn & G Chavez 2003. Food Insecurity is Associated with Increased Risk of Obesity in Californian Women. *Journal of Nutrition* 133,4:1070 - 1074.
- Badenhorst, AM, A Dannhauser, M Slabber, WC du Toit & M Nel 1998. Nutrient Intake of Undergraduate Hostel Students at the OFS. *South African Journal of Clinical Nutrition* 10: 15.
- Brown, L 2008. Food: Will There be Enough? In Mazur, L (ed): *A Pivotal Moment: Population Justice and the Environmental Challenge*. California: Island Press.
- Cleland, V, A Worsley & D Crawford 2004. What are Grade 5 and 6 Children Buying from School Canteens and What do Parents and Teachers Think about It? *Nutrition and Dietetics* 61,3:145 - 150.
- Cloete, N & T Moja 2005. Transformation Tensions in Higher Education: Equity, Efficiency and Development. *Social Research* 72,3:693 - 722.
- Cooke, L 2007. The Importance of Exposure for Healthy Eating in Childhood: A Review. *Journal of Human Nutrition and Dietetics* 20:294 - 301.
- Council of Higher Education 2010. *Higher Education Monitor 9. Access and Throughput in South African Higher Education: Three Case Studies*. Pretoria: Council on Higher Education.
- Department of Higher Education and Training 2011. *Cluster Media Briefing*. Matekga.
- Florence, MD, M Asbridge & PJ Veugelers 2008. Diet Quality and Academic Performance. *Journal of School Health* 78, 4:209 - 215.
- Gooding, HC, CE Walls & TK Richmond 2011. Food Insecurity and Increased BMI in Young Women. *Obesity* 21,10: 233 - 239.
- Hoddinott, J & Y Yohannes 2002. Dietary Diversity as a Food Security Indicator. *Food Consumption and Nutrition Division Discussion Paper* 136:1 - 94.

- Hoyland, A, L Dye & CL Lawton 2009. A Systematic Review of the Effect of Breakfast on the Cognitive Performance of Children and Adolescents. *Nutrition Research Reviews* 22:220 - 234.
- Hughes, R, I Serebryanikova, K Donaldson & M Leveritt 2011. Student Food Insecurity: The Skeleton in the University Closet. *Nutrition & Dietetics* 68:27 - 32.
- Innes-Hughes, C, K Bowers, L King, K Chapman & B Eden 2010. *Food Security: The What, How, Why and Where to of Food Security in NSW. Discussion Paper*. Sydney: PANORG.
- Letseka, M & S Maile 2008. *High University Drop-out Rates: A Threat to South Africa's Future*. Cape Town: Human Sciences Research Council.
- Maunder, EMW, J Matji & T Hlatshwayo-Molea 2001. Enjoy a Variety of Foods – Difficult but Necessary in Developing Countries. *South African Journal of Clinical Nutrition Supplement* 1,3:57 - S7 - S11.
- Munro, N, M Quayle, H Simpson & S Barnsley. [2013]. Hunger for Knowledge: Food Insecurity amongst Students at the University of KwaZulu-Natal. *Perspectives in Education* forthcoming.
- Newton, J & S Turale 2000. Student Poverty at the University of Ballarat. *Australian Journal of Social Issues* 35,3:251 - 265.
- Norvilitis, JM, MM Merwin, TM Osberg, PV Roehling, P Young & MM Kamas 2006. Personality Factors, Money Attitudes, Financial Knowledge, and Credit-Card Debt in College Students. *Journal of Applied Social Psychology* 36,6:1395 - 1413.
- Ntuli, Z 2005. *An Investigation of Sociodemographics, Nutrition Knowledge and Dietary Intakes of Black Students Attending the Steve Biko Campus of Durban Institute of Technology*. Unpublished dissertation. Available at: http://ir.dut.ac.za/bitstream/handle/10321/97/Ntuli_2005.pdf?sequence=4. (Accessed on 15 January 2013.)
- Oldewage-Theron, WH, AA Egal 2010. Nutrition Knowledge and Nutritional Status of School Children in Qwa Qwa. *South African Journal of Clinical Nutrition* 23,3:149 - 154.
- Park, MS & SA Kim 2005. Effect of Nutrition Education on Improving Diet Behaviour of University Students. *Korean Journal of Community Nutrition* 10,2: 189 - 195. Available at: <http://www.koreamed.org/SearchBasic.php?RID=0106KJCN/2005.10.2.189&DT=1>. (Accessed on 07 March 2012.)

- Petersen, I, J Louw & K Dumont 2009. Adjustments to University and Academic Performance among Disadvantaged Students in South Africa. *Educational Psychology* 29,1:99 - 115.
- Racette, SB, SS Deusinger, MJ Strube, GR Highstein & RH Deusinger 2005. Weight Changes, Exercise, and Dietary Patterns during Freshman and Sophomore Years of College. *Journal of American College Health* 53,6:245 - 251.
- Reddy, SD, K Resnicow, S James, N Kambaran, R Omardien & AD Mbewu 2008. Underweight, Overweight and Obesity among South African Adolescents: Results of the 2002 National Youth Risk Behaviour Survey. *Public Health Nutrition* 12,2: 203 - 207.
- Riely, F, N Mock, B Gogill, L Bailey & E Kenefik 1999. *Food Security Indicators and Framework Used in the Monitoring and Evaluation of Food Programs*. Washington: Academy for Educational Development.
- Steyn, NP, M Senekal, S Britz & JH Nel 2001. Urban and Rural Differences in Dietary Intake, Weight Status and Nutrition Knowledge of Black Female Students. *Asia Pacific Journal of Clinical Nutrition* 9,1:53 - 59.
- Swindale, A & P Bilinsky 2006. Development of a Universally Applicable Household Food Insecurity Measurement Tool: Process, Current Status and Outstanding Issues. *Journal of Nutrition* 136:1449S - 1452S.
- Taras, H 2005. Nutrition and Student Performance at School. *Journal of School Health* 75,6:199 - 213.
- Temple, NJ, NP Steyn, NG Myburgh & JH Nel 2006. Food Items Consumed by Students Attending Schools in Different Socioeconomic Areas in Cape Town, South Africa. *Nutrition* 22:252 - 258.
- Vozoris, NT & VS Tarasuk 2003. Household Food Insufficiency is Associated with Poorer Health. *Journal of Nutrition* 133,1:120 - 126.
- Whati, LH 2005. *The Development of a Valid and Reliable Nutrition Knowledge Questionnaire and Performance Rating Scale for Urban South African Adolescents Participating in the 'Birth-to Twenty Study'*. Unpublished dissertation. Available at: scholar.sun.ac.za/bitstream/handle/.../Whati_development_2005_.pdf?... (Accessed on 10 January 2013.)
- Wilde, PE, JN Peterman 2006. Individual Weight Change is Associated with Household Food Security Status. *Journal of Nutrition* 136,5: 1395 -

1400. Available at: <http://jn.nutrition.org/content/136/5/1395.full.pdf+html>. (Accessed on 29 February 2012.)

World Health Organization 2012. *Food Security*. Available at: <http://www.who.int/trade/glossary/story028/en/>. (Accessed on 12 January 2013.)

World Health Organization 2004. *Obesity: Preventing and Managing the Global Epidemic. Report of a WHO Consultation on Obesity*. Geneva: World Health Organisation.

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