AN ASSESSMENT OF DIETARY DIVERSITY AND NUTRITION KNOWLEDGE OF STUDENT NURSES AT THE KWAZULU-NATAL COLLEGE OF NURSING

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DECLARATION

This is to certify that the work is entirely my own and not of any other person, unless explicitly acknowledged (including citation of published and unpublished sources). The work has not previously been submitted in any form to the Durban University of Technology or to any other institution for assessment or for any other purpose.

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ABSTRACT

South Africa has a high prevalence of obesity, and many people live with diseases where dietary adaptations are part of the management of the disease. Nurses are important in the facilitation of people obtaining dietary advice. While nutrition education is part of the nursing curriculum, student nurses' knowledge of nutrition was not known, nor was their dietary intake and nutritional health status. The purpose of the study was to assess the nutrition knowledge of students at a nursing college, and to assess their dietary diversity. A quantitative study was used, with random sampling chosen for selection of campuses and convenience sampling for student group selection. Students of the KwaZulu-Natal College of Nursing were invited to complete a General Nutrition Knowledge Questionnaire. A Food Frequency Questionnaire was completed to assess dietary diversity, and respondents' anthropometric measurements were recorded to assess Body Mass Index and Waist to Height Ratio.

The results showed that a significant percentage of student nurses were overweight or obese. While students had a satisfactory knowledge of dietary recommendations and sources of different nutrients, their ability to make correct food choices, as well as their knowledge of diet-disease relationships was poor. They displayed good dietary diversity in their food intake. There were no statistically significant correlations between the students' Body Mass Index and their knowledge, which assumes that the individual's knowledge of nutrition does not directly influence their own food intake.

It is recommended that aspects of the content in the nutrition curriculum be emphasised during the training of nurses in order to increase nutrition awareness in areas where knowledge was found to be lacking.

DEDICATION

To Gavyn, Stephen and Kathryn.
Your loving support and constant encouragement
has meant so much to me.

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LIST OF ACRONYMS AND ABBREVIATIONS

AIDS	Acquired Immune Deficiency Syndrome
BMI	Body Mass Index
HIV	Human Immunodeficiency Virus
HSRC	Human Sciences Research Council
KZN	KwaZulu-Natal
KZNCN	KwaZulu-Natal College of Nursing
NLN	National League for Nursing
SAFBDG	South African Food Based Dietary Guidelines
SANC	South African Nursing Council
SD	Standard Deviation
USA	United States of America
WHO	World Health Organization
WHTR	Waist to Height Ratio
<	Less than
>	More than
≤	Equal to or less than
≥	Equal to or more than
=	Is equal to
%	percent
kg	kilogram
m^2	metres squared

GLOSSARY OF DEFINITIONS

Body Mass Index: Body Mass Index is a simple index of weight and height which classifies underweight, overweight and obesity. The measurement is calculated as: *Weight in kilograms divided by height in metres squared (kg/m²).* The World Health Organization calculates underweight as BMI of less than 18,5 kg/m². Normal weight is equal to or more than 18,5 and less than 25kg/m². Overweight is equal to or more than 25 and less than 30 kg/m². Obesity is equal to or more than 30 kg/m² (World Health Organization, 2006).

Dietary Diversity: This refers to the number of different foods or food groups which are eaten over a given period of time (Ruel 2003: 3912S). For this study a Food Group Diversity Score using a count of food groups, and a Food Variety Score which counts individual food items, were used (Ruel 2003: 3913S).

KwaZulu-Natal (KZN): One of the nine provinces of the Republic of South Africa.

The KwaZulu-Natal College of Nursing (KZNCN): This is an institution of the KwaZulu-Natal Department of Health. The Head Office is situated in the provincial capital, Pietermaritzburg. A Nursing Education Institution accredited by the South African Nursing Council, it offers the R425 course leading to Registration as a Nurse (General, Psychiatric and Community) and Midwife, among other nursing courses.

Student Nurses: In the context of this study these are students of the KwaZulu-Natal College of Nursing currently studying in the South African Nursing Council R425 course leading to Registration as a Nurse (General, Psychiatric and Community) and Midwife.

The South African Food Based Dietary Guidelines: These were developed and introduced in order to address the growing burden both of chronic diseases of lifestyle and problems associated with under-nutrition and poverty (Department of Health, 2004). It was planned that one set of guidelines would form the basis of nutrition education in the country (Department of Health, 2004). They were updated in 2012, together with a Food Guide, to include children from the age of 5 years (National Nutrition Week: 2012).

Waist to Height Ratio: This is a predictor of risk for metabolic disease. (Hsieh, Muto, Yoshinaga, Tsuji, Arimoto, Miyagawa, Hoshihara and Hara, 2006). A WHTR equal to or more than 0,5 is a risk (Hsieh *et al.*, 2006).

CHAPTER 1

INTRODUCTION

1.1 BACKGROUND

Food plays an important part in life, whether it is a scarce commodity essential for survival, or consumed as an integral part of a celebration. Food also plays a vital role in the contribution towards an individual's well-being. Nutrition can be regarded as the way in which food is taken in by the body in order for health to exist and growth of the body to occur (Oxford Advanced Learner's Dictionary: 2014). A basic knowledge of nutrition and how to make good food choices is important, but the availability of foods can influence choice**.**

There is no single food which is able to supply all the nutrients one needs for good health (Labadarios, Steyn and Nel 2011: 1). It is important that a diet is adequate which means that it contains all the essential nutrients, and meets the individual's energy requirements (Ruel 2003: 3912S).

For the individual who is able to afford it, there may be a wide variety of foods available to choose from. Among lower income groups, while people may know about good food choices, they may not be able to make the correct choices because of a lack of money to buy food, or limited access to food varieties.

The availability of food does not necessarily mean that good nutrition follows. Even if the individual has access to a variety of foods, eating the wrong type or amount of a food could result in obesity, for example (Maunder, Matji and Hlatswayo-Molea: 2001). An understanding of a varied diet is important due to the possible link between dietary variety and the quality of the diet, as well as the individual's health status. Variety can be seen as different foods, or

different food groups, and even different methods of preparing food (Maunder, Matji and Hlatswayo-Molea: 2001).

Diets which do not have variety may predispose to chronic diseases of lifestyle, such as heart disease, diabetes mellitus and high blood pressure, as well as inadequate energy and micro-nutrient intakes (Maunder, Matji and Hlatswayo-Molea: 2001). People need to know what healthy choices they can make from the foods available to them. A variety of information sources regarding nutrition and lifestyle choices is available to the public, and this includes articles in popular magazines, the Internet and books, as well as advice from different health care practitioners.

Health education focuses on promotion of healthy lifestyles and disease awareness and prevention, and this may include advice on nutrition. Correct nutrition is a fundamental part of disease prevention and management, and nurses need up-to-date nutrition knowledge in order to care for patients (Lindseth 1997: 245-251). Nurses should be able to identify good food choices that promote a healthy lifestyle, and therefore need a sound knowledge of nutrition in order to make correct choices related to diet, which can contribute both to their own wellbeing, and so that they are better equipped to teach patients effectively. Student nurses who give patients dietary advice need to know about food groups and the nutrient content of different foods so they can give correct education about disease management through nutrition.

It is important that health care providers such as nurses, are able to model healthy lifestyles (Staib, Fusner and Consolo 2006: 55). Practicing healthy behaviours can create challenges for the nurse. Staib, Fusner and Consolo (2006: 56) found that previous studies showed poor nutrition was one of two areas where student nurses showed least healthy behaviours, the other being a lack of exercise. It takes time, effort and knowledge to establish a healthy lifestyle. Facing these challenges, however, can help when having to

give practical advice to patients who are themselves faced with difficulties in trying to follow a healthy lifestyle (Stark, Manning-Walsh and Vliem 2005: 266-270). According to Stark, Manning-Walsh and Vliem (2005: 267), nurses often sacrifice their own health when caring for others, and so it is important that they know how to take care of themselves so that they have the ability to care for others.

Faber and Wenhold (2007: 398) reported that South Africa has a problem of chronic malnutrition. Malnutrition includes under-nutrition, which may be due to a protein-energy lack, or the deficiency of certain micronutrients, as well as over-nutrition from excessive intake of energy-rich foods and other nutrients (Faber and Wenhold 2007: 393). Reddy, Resnicow, James, Kambaran, Omardien and Mbewu (2008: 203) agree that under-nutrition and over-nutrition are experienced in South Africa. Under-nutrition can result in underweight, stunting and wasting, while over-nutrition is associated with overweight and obesity (Reddy *et al.* 2008: 203). In an earlier reference to chronic malnutrition, a report by Steyn, Bradshaw, Norman, Joubert, Schneider and Steyn (2006a) mentions the quadruple burden of disease in South Africa. The quadruple burden includes infectious diseases associated with under-nutrition, poverty and under-development, as well as chronic diseases linked to over-nutrition and a western type diet. The other two factors are the burden of HIV/AIDS and deaths related to injuries (Steyn *et al.* 2006a: 34).

It is known that both lifestyle and diet can influence morbidity and mortality. Maunder, Matji and Hlatshwayo-Molea (2001: 9) reported that prevalent among all the population groups in South Africa are chronic diseases of lifestyle related to over-nutrition. These diseases include cancer, non-insulin-dependent diabetes mellitus, hypertension and cardiovascular disease. Being overweight is also linked to some cancers (World Health Organization: 2012a). It is in each person's interest to adopt a healthy lifestyle pattern which includes a health-promoting diet. In addition, the long term

management of a disease such as diabetes, may include following a diet which is modified to meet health needs. The role of the dietician is recognised as key to advising patients on good nutrition, especially those who have diseases which require a change in eating habits. Not all patients, however, have access to a dietician when visiting a health care facility, and so nursing staff need to reinforce dietary information that has been given. It is important therefore that nurses have a sound knowledge of basic nutrition, and that they give the correct information (Lindseth 1997: 245-251).

In South Africa, a study conducted by Parker, Steyn, Levitt and Lombard (2011: 1429-1438), aimed at evaluating the knowledge and practices of primary care health professionals and final year health professions students, showed that the majority of health professionals had difficulty in giving patients practical advice, including nutrition, in the management of chronic diseases of lifestyle. Very few of the respondents, who included doctors and nurses, mentioned a lack of knowledge as a hindrance to effective counselling, and yet the survey showed that the majority of health professionals overestimated how much they knew of lifestyle modification. Nurses did not fare particularly well as over 60 percent of student nurses had poor or mediocre scores (Parker *et al.* 2011: 1432). The conclusion was that curricula for both nursing and medical students should include sufficient training on modification of lifestyle (Parker *et al.* 2011: 1436).

Yfanti, Tsiriga, Yfantis, Tiniakou, and Mastrapa (2011: 118-127) stated that in some fundamental areas of nutrition there appeared to be a lack of knowledge, and that medical schools need to improve teaching regarding nutrition. Yfanti *et al.* (2011) in their study which included nursing students in Lamia, Greece, found that even though nutrition education was in the curriculum, the students' knowledge was limited in some areas. This was despite the fact that the majority of students knew that poor nutrition predisposed toward chronic diseases (Yfanti *et al.* 2011: 118-127).

Nursing staff witness first-hand the effects of poor eating when caring for patients. A nurse may care for a child with kwashiorkor. She may encounter a child whose growth is stunted due to under-nutrition (Reddy *et al.* 2008: 203). Insufficient food intake combined with chronic diseases such as AIDS may cause underweight in patients (World Health Organization 2003:4). Overweight patients may have cardiac problems (World Health Organization: 2012a), and some obese patients are observed to have difficulty in mobilizing easily. Yet despite the obvious disadvantages of obesity, for example, it has been shown that many nurses are overweight or obese (Blake, Malik, Mo and Pisano 2011; Zapka, Lemon, Magner and Hale 2009; Miller, Alpert and Cross 2008).

South Africa has a high prevalence of obesity, with 2008 statistics stating that 71.8% of females were overweight (World Health Organization 2011c). The South African National Health And Nutrition Examination Survey (SANHANES-1) conducted during 2012 shows that obesity levels have increased, resulting in an increased risk of complications which are associated with chronic disease (Human Sciences Research Council 2013a: 5). The survey showed that when compared to the South African Demographic and Health Survey in 2003, there are fewer people who have a normal weight or who are underweight (Human Sciences Research Council 2013a: 2), except in males where the prevalence of underweight has increased slightly from 12.5% to 13.1% (Human Sciences Research Council 2013a: 5).

These statistics reflect a need for education on nutrition and its importance to good health to be an ongoing part of health care. Nurses are often seen as role models, health educators, and a source of information on health matters, by their communities and patients. Student nurses could use a good knowledge of basic nutrition for their own well-being, as well as for that of their patients. This knowledge could help patients to achieve healthy weights, for example, or it may help patients to manage chronic disease processes.

1.2 PROBLEM STATEMENT

Nurses who begin their professional education at the Campuses of the KwaZulu-Natal College of Nursing (KZNCN) are entering a new environment with a number of changes which may be faced by many student nurses and other students entering post-school education and training. These may include budgeting for and buying their own food, and making food choices. Students may also have to plan and prepare their own meals. Juggling their nutritional well-being with the demands of their studies, possibly travelling to and from their place of study, and a new social and working environment brings new challenges. Food may not necessarily be seen as a priority, and yet it is an important factor in their wellbeing.

Presently, not all nursing students live in a hospital residence, and those that do are not compelled to eat in the hospital dining room. Some nursing students continue to live at home, while others find rented accommodation. Students who are living away from home may be experiencing looking after themselves for the first time, and are responsible for making different lifestyle choices, one of which is what they will eat. Nurses who live in residence are generally limited in terms of cooking and food storage facilities, with some communal facilities available such as a microwave oven and a refrigerator.

Student nurses, whether they live in hospital residences or not, may have access to a hospital dining room where they are able to purchase meals when they are at work in the hospital. Some hospitals have a tuck shop or restaurant that is available to both the public and nursing staff. Nurses who do not use the dining room for meals are responsible for sourcing their own food. Some nurses bring food from home to eat during the working day. Students do not always work in the hospital, and may spend their day attending lectures at a campus separate from the hospital, or working in different community health facilities where a dining room is not available.

Ondieki (2011: 396) citing Brown, McIlveen and Strugnell (2000) mentions that people establish food choices and individual preferences early on in life. Some of these can change when a person moves away from home, or becomes financially responsible for sourcing their own meals. Students begin making independent decisions, and adopting lifestyles which will probably be maintained (Takomana and Kalimbira 2012: 132). Poor eating habits can have both economic and health implications for the individual. The food that student nurses choose to eat may positively or negatively affect their nutritional and health status.

Academic expectations, patient care demands and irregular working hours may all be factors that impact on nurses' food choices and eating patterns. Anecdotal evidence suggests that lack of time they have to prepare meals because of long working hours, and physical tiredness at the end of a working day may also influence food choices.

Student nurses of the KwaZulu-Natal College of Nursing receive either a monthly salary or a stipend, depending on their study contract (Province of KwaZulu-Natal Health Services n.d. a; Province of KwaZulu-Natal Health Services n.d. b). For many students this may be the first time they have a measure of financial independence and responsibility. While it is anticipated that some of this money is budgeted towards food, the student may have other financial commitments including contributing toward his or her family's needs. This may place restrictions on the amount they are able to spend on food for themselves, and the food choices made. The possibility exists that some students do not eat correctly because money that would be spent on food for themselves is used for their family needs.

Student nurses are given the opportunity to acquire knowledge of nutrition during their training as nutrition lectures are included in the curriculum at the KwaZulu-Natal College of Nursing. Nurses are taught basic nutrition in Fundamental Nursing Science in the first year of the course (KwaZulu-Natal

College of Nursing n.d. 38-39). In subsequent years disease processes are taught in General Nursing Science (KwaZulu-Natal College of Nursing 2001). Students are expected to be able to give health education which may include diet and change of lifestyle as part of the treatment or control of illness or disease.

It is not known whether nurses have an adequate knowledge of nutrition and whether their food choices are influenced by their knowledge or by other socio-demographic factors.

1.3 AIM OF THE STUDY

The aim of this study was to describe the food variety, dietary diversity, nutrition knowledge and nutritional status of student nurses, and to identify any factors that influence these in order to make possible recommendations regarding nutrition content for curriculum development in student nurse education.

1.4 OBJECTIVES

1.4.1 To describe the socio-demographic profile of student nurses at the KwaZulu-Natal College of Nursing.

1.4.2 To gather anthropometric measurements including height, weight and waist circumference, to determine Body Mass Index (BMI) and Waist-To-Height Ratio (WHTR) of student nurses in the study.

1.4.3 To determine the general nutrition knowledge of students.

1.4.4 To illustrate the food variety and dietary diversity of nursing students.

1.4.5 To identify if there is any relationship between nutrition knowledge and dietary behaviours of students.

1.5 THE SIGNIFICANCE OF THE STUDY

It is generally acknowledged that good nutrition contributes towards a healthy lifestyle. The management and prevention of disease often includes following a modified eating plan or diet. For many people living with a disease

condition that requires adaptation of diet and other lifestyle changes, a dietician will be involved in the individual's care and education. When patients are in hospital, correct nutrition forms part of their care, and while this may be initiated and monitored by the dietician, it is important that nurses are aware of patients' food intake, and be able to advise them accordingly. Patients, whether hospitalised or using out-patient facilities such as community clinics may often have dietary needs that the nurse can address. Nurses need to be equipped to implement or support nutrition principles in the treatment or control of a disease process. A patient who is told to reduce the amount of fat or salt in his diet, for example, needs to be told which foods to avoid, and how to read food labels. Patients may be encouraged to eat protein daily to facilitate wound healing, and should be given relevant examples of foods that they can access that have a good protein content.

According to the 2011/12 Annual Report from the KwaZulu-Natal Department of Health (2012: 325-328), 126 permanent dieticians and nutritionists were in employment, while in contrast there were 13 465 permanent professional nurses. This suggests that the KwaZulu-Natal Department of Health employs a limited number of dieticians within the public service This indicates a need for nurses to have a sound knowledge of nutrition because a health care facility might not have a dietician among their staff, and so advice on dietary modification, food choices and other aspects of healthy eating may be given by the nursing staff. Many clients use their local clinics to access health care, and in rural areas in particular, the only health care provider the patient may see regularly is a nurse.

Nursing staff may be required to reinforce dietary information that has been given previously by a dietician, or may need to initiate a treatment plan that includes dietary modification, so it is necessary that the information they give is correct. For this responsibility to be effective it is important that nurses remember what they have been taught regarding nutrition so that they are

able to give practical advice based on their own experiences and a sound knowledge of nutrition. Nurses can therefore play a significant role in nutrition education. There are a number of different conditions that the nurse may encounter where dietary modification may be needed, such as renal disease, diabetes mellitus, hypertension and hypercholesterolaemia.

The existence of the quadruple burden of disease referred to earlier (Steyn *et al.* 2006a: 34) affords opportunities for health education. As well as the challenges of obesity and chronic malnutrition mentioned, is the high burden of HIV disease in South Africa. There were an estimated 5,38 million HIV infected people in 2011 (Statistics South Africa 2011: 5). In the efforts being put into managing the disease and maintaining people's health, adaptation of diet may be a critical aspect of patient care. The South African Food Based Dietary Guidelines have been adapted for people living with HIV/AIDS (South African Sugar Association n.d.: 8.10-8.11), and this is just one example of the type of nutrition information nurses should be able to share with patients.

It is not known how much emphasis is placed on the importance of nutrition knowledge by nurse educators and student nurses, and whether students at the KwaZulu-Natal College of Nursing have an adequate knowledge of nutrition. It is also not known whether students regard nutrition knowledge as information that they could use not only for patient care, but also for their own nutritional wellbeing. Neither is it known whether or not a knowledge of nutrition does result in healthy eating**.** There appear to be only a few studies regarding nutrition knowledge or dietary lifestyles of student nurses in South Africa.

It is hoped that the findings of this study will raise an awareness of the importance of good nutrition, and the role good nutrition plays in a health-promoting lifestyle, and that student nurses will be encouraged by their educators to use the nutrition principles they are taught for their own well-being as well as that of their patients.

The findings of this study may suggest how much emphasis needs to be placed on particular areas of nutrition education, such as an awareness of nutrient content of different foods. If the study shows areas where nutrition knowledge is inadequate this could be addressed by nurse educators.

It is anticipated that the study will also show if there is any relationship between nutrition knowledge, food consumption and Body Mass Index (BMI) and Waist to Height Ratio (WHTR) of student nurses. Due to the increased risk of mortality and morbidity associated with abdominal obesity and generalized obesity (World Health Organisation 2011e:12), it was decided that measuring both BMI and WHTR would be an interesting aspect of this study.

The results of this study may inform curriculum development, and whether emphasis needs to be placed on translating theoretical knowledge into lifestyle adaptation for nurses. It may encourage nurse educators to promote the need for healthy nutrition lifestyle choices among their students.

Nurse Managers could influence the creation of a health-promoting environment within hospitals. The availability of a variety of healthy food choices at hospital dining rooms and tuck shops could possibly be negotiated with those who are awarded catering contracts. It might be possible to initiate a support structure, such as an accountability group, or ongoing nutrition information updates for nurses who want to follow a healthy eating pattern.

1.6. CONCLUSION

The relationship between nutrition and chronic diseases of lifestyle is well documented. The present and future health of young adults can be affected by food choices that they make. Student nurses who have a good knowledge

of a balanced diet, and make sensible food choices using available resources, have the potential to enjoy the benefits of a healthy lifestyle, and to share nutrition information with their families, patients and the community, thereby contributing to their wellbeing.

CHAPTER 2

LITERATURE REVIEW

A review of the literature was carried out to explore different aspects of nutrition knowledge and food intake relating to nurses, university students and other sectors of the population . A search of the literature was conducted using a number of data bases including Summon, Science Direct, Ebscohost, Sabinet and Googlescholar. Relevant findings will be referred to in this chapter.

2.1 TRANSITION TO POST-SCHOOL EDUCATION

Students entering post- school education, including nursing students, are faced with new environments, challenges and responsibilities, but may also have a new freedom as they move away from home and make their own decisions (Takomana and Kalimbira 2012: 132). When young adults move to independence and enter tertiary or college education this is a time of transition with new challenges. As they develop their own lifestyle habits there is the opportunity to choose one's own dietary patterns, and nutrition education during this transition could be important in establishing these patterns (Cousineau, Goldstein and Franko 2004: 79-84). There is a risk of developing unhealthy eating habits as new patterns are established. With the correct information and encouragement, however, individuals can form or maintain healthy eating patterns. Clark (1982 cited in Shriver and Scott-Stiles 2000: 308-314) mentioned that an important time for nurses to consider good self-care behaviours, including nutrition, is at an early stage of their training.

2.2 THE ASSOCIATION BETWEEN KNOWLEDGE AND HEALTHY LIFESTYLE BEHAVIOURS

Although there appears to be limited information regarding student nurses' knowledge of nutrition, there are a few articles available regarding students nurses' lifestyles (Burke and McCarthy 2011; Stark, Manning-Walsh and Vliem 2005; Shriver and Scott-Stiles 2000). Burke and McCarthy (2011: 230)

who conducted their study in Ireland focused on nurses' physical activity, smoking and alcohol consumption rather than on diet. Despite the lack of information on nutrition in this study, it is regarded as relevant, as the authors stated that it is important for student nurses to adopt positive lifestyle behaviours in order to improve their ability to act as role models and promoters of health. They concluded that it was important that the nursing curriculum focused not only on health promotion for patients but on "the needs of individuals themselves" (Burke and McCarthy 2011: 242). The skills the nurses learned could then be used in clinical practice (Burke and McCarthy 2011: 242). The importance of nurses learning how to take care of themselves was highlighted in a study by Stark, Manning-Walsh and Vliem (2005: 266-270) who found the benefits included improved health, gaining insight into the challenges faced by living a healthy lifestyle, and increased knowledge, skills and confidence. Students who used a life-style self-care plan did benefit from this activity. The authors concluded that "Teaching nurses to care for themselves is an important component of nursing education" (Stark, Manning-Walsh and Vliem 2005: 270). This appears to be reinforced in a study by Shriver and Scott-Stiles (2000: 308-314) to determine whether student nurses, having had exposure to theory and to patients, do practice healthy lifestyles that would equip them to be effective promoters of health, which showed that nurses did improve over time in some behaviours when compared to non-nursing students. They concluded that nursing students should not just learn about health, but practice a healthy lifestyle, which could be facilitated by the content included in the curriculum. This suggests the need to promote self-care as part of a nursing curriculum.

Student nurse training is regarded as higher education or college education, and research findings have been published regarding lifestyle behaviours amongst college students in different countries, considering factors such as healthy eating (Garcia, Sykes, Matthews, Martin and Leipert 2010: 28-33), and diet, physical activity, alcohol, smoking and safe behaviours (Von Ah,

Ebert, Ngamvitroj, Park and Kang 2004: 463-474). Von Ah *et al.* (2004: 463) stated that "Health behaviours formed during young adulthood may have a sustaining impact on health across later life". They suggested that attention needed to be paid to identifying factors that influence protective health behaviours and that these can be used to develop health promoting programmes aimed at college students (Von Ah *et al* 2004: 464). The study showed that the higher the students' perceived self-efficacy for proper nutrition and other health behaviours, and the lower the recognised barriers, the higher the probability that they would use health-promoting behaviours such as eating a balanced diet (Von Ah *et al* 2004: 471).

Alpar, Şenturan, Karabacak and Sabuncu (2008: 382-388) evaluated student nurses' knowledge of healthy lifestyle behaviours, and showed that there were significant differences in the students' scores from the beginning of their nursing course and the end of their fourth year of training. However, the increase in the nutrition score was not significant, and it was thought that the students had not applied their learning to promote their own health behaviour (Alpar *et al.* 2008: 386). This is supported in recent research by Blake, Malik, Mo and Pisano (2011: 231-239), in which pre-registration student nurses were invited to participate in a study regarding health behaviours, which included dietary practices. The conclusion was that the health profiles of the nurses were relatively poor. A large number of participants responded that they ate healthily, but in fact didn't eat and drink the recommended quantities of fruit, vegetables and water, and ate food with high quantities of sugar and fat (Blake *et al.* 2011: 237). The authors concluded that it appears that knowledge is not always transferred into behaviour, and that the nurses need to "be educated early on the importance of maintaining and improving their own health" (Blake *et al.* 2011: 238). They suggested that there is urgency in finding interventions that will increase nurses' awareness of their potential to be role models and to encourage them to live out what they have learned.

Although dietary practices was only one aspect of healthy living that was explored, Blake *et al.* found that 18.1% of nurses were overweight, and 9% were obese (2011: 235). This concurs with other studies in which a significant number of nurses were found to be overweight. Miller, Alpert and Cross (2008: 259-265) reported that almost 54% of nursing professionals were overweight or obese, while Zapka, Lemon, Magner and Hale (2009: 56) reported that according to the Body Mass Index (BMI) calculations, 28.2 % of the nurses who participated in their study were obese, and 37.2% were overweight. Staib, Fusner and Consolo (2006: 56) found that lack of exercise and poor nutrition were two areas where student nurses exhibit the least healthy behaviours.

2.3 STUDENT NURSES AS ROLE MODELS AND HEALTH EDUCATORS

One role of the nurse is to be a health educator (Miller, Alpert and Cross 2008: 259-265; Borchardt 2000: 30), and patients often consider the nurse as a source of information. Hicks *et al* (2008 cited in Malik, Blake and Batt (2011:490) argued that patients are more likely to have confidence in the advice given to them about exercise and diet by a nurse who is of normal weight than from a nurse who is overweight. A nurse's lifestyle behaviour could influence the impact of the education she gives, and a healthy lifestyle behaviour can send a positive message to patients. However, the nurse also benefits from eating healthily by reducing her risk of diseases associated with malnutrition. Miller, Alpert and Cross (2008: 259-265) suggested that it is not reasonable for a patient to accept a weight reduction plan if it is not modelled by the health care professional. They also question whether students should be expected to respect an obesity management plan which is not lived out by nurse educators (Miller, Alpert and Cross 2008: 259-265). A recommendation by Staib, Fusner and Consolo (2006: 59) was that as much as the nursing curriculum should emphasise health care behaviours, it is important that nurse educators should attempt to model healthy self-care behaviours to their students. It has been suggested by

Stark, Manning-Walsh and Vliem (2005: 266 - 270) that nurses learn how to care for others but don't necessarily care for their own health (Stark, Manning-Walsh and Vliem 2005: 267). They mentioned the benefits of nurses caring for themselves and also suggested that teaching nurses about caring for themselves is an important part of nursing education (Stark, Manning-Walsh and Vliem 2005: 270). Staib, Fusner and Consolo (2006: 59) concur that students who care for themselves are more able to care for others than those who neglect their own health.

Borchardt (2000: 30) contends that to be a role-model can be a challenge due to a number of barriers nurses have to face, such as stress, burnout, and obligations to others, as well as "eating on the run" and not exercising regularly. A nurse who can speak from experience and can follow her own advice is able to contribute to her own wellbeing and to that of others (Borchardt 2000: 30). It is important that nurses do not neglect their own health, but that they role model healthy behaviours for patients (Borchardt 2000: 30).

Staib *et al.* (2006:56) found that previous studies on student nurses' health behaviours suggest that nursing students "lack outstanding health-promoting behaviours", but tended to show the same type of behaviours as the general population. This was particularly true of diet and exercise. In their daily work nurses can however see the effects of poor health behaviours on patients**.** Malik, Blake and Batt (2011:490) mentioned that while nurses are aware of the need for physical activity they report that they don't have the time for it.

2.4 NUTRITION KNOWLEDGE AMONG NURSES AND OTHER STUDENTS IN HIGHER EDUCATION

It is not known whether South African student nurses generally have sufficient nutrition knowledge to be able to model healthy living. On the other hand their knowledge of nutrition may be very good, but is not necessarily applied in their own eating patterns.

Previous studies show that there appears to be a lack of nutrition knowledge across the spectrum of students (both in nursing and other disciplines), as well as among qualified health professionals (Bakre, Akodu and Akodu 2012; Park, Cho, Song, Lee, Sung and Choi-Kwon 2011; Yfanti, Tsiriga, Yfantis, Tiniakou and Mastrapa 2011; Crogan, Shultz and Massey 2001).

2.4.1 The international experience

Soriano, Moltó and Mañes (2000: 1256) showed that Spanish university students consumed a diet with more fats and proteins than the recommended guidelines. One of their conclusions was that nutritional advice (according to Spanish recommendations), needed to be given to the students and other university populations (Soriano *et al.* 2000: 1256).

Results from a study of nursing students in Greece, concluded that there were limitations in nurses' knowledge of nutrition, and that improvement in knowledge could contribute to healthy eating habits being adopted by both medical professionals and the general public (Yfanti, Tsiriga, Yfantis, Tiniakou and Mastrapa 2011: 118-127).

Another consequence of inadequate knowledge was highlighted when it was shown that qualified nurses in Korea were not adequately prepared to give patients nutrition education regarding diet modification for metabolic and cardiovascular diseases. Such advice is important as these diseases are becoming more common in that country (Park, Cho, Song, Lee, Sung and Choi-Kwon 2011:192-197). A concern was that giving inaccurate dietary

advice to patients because of incorrect nutrition knowledge could impede their recovery (Park *et al*. 2011:197). Not only was the need for updated nutrition education in colleges mentioned in their research, but they also highlighted the need for nurses' education to be continually updated (Park *et al*. 2011:197). This latter need was also highlighted earlier by Crogan, Shultz and Massey (2001:171-176). When they investigated nutrition knowledge of a small sample of nurses in long-term care facilities in Washington, United States of America (U.S.A.), they found that nutrition knowledge differed significantly between the different categories of nurses. This finding may suggest that educational background does influence knowledge of nutrition. Their results also suggested that nutrition knowledge is not necessarily increased by nursing experience and other factors such as work environment, but is obtained during training, and that nutrition education and the curricula do need to be addressed by nursing schools. They did acknowledge however, that some nurses may have acquired more nutritional knowledge during their working life (Crogan *et al*. 2001: 171-176).

A recent systematic review by Bakre, Akodu and Akodu (2012: 105-109) focused on nurses' nutritional knowledge and whether they used this knowledge in patient care. They used fifteen studies that had been carried out during a period of twenty years. Fourteen of the studies used some form of nutrition knowledge questionnaire to get a result (Bakre *et al.* 2012: 107). Most studies were conducted in the U.S.A. (Bakre *et al.* 2012: 108) and none of the studies included any research undertaken in South Africa. The conclusion was that there is "a lot of effort needed to update the general knowledge of nurses in nutrition" (Bakre *et al*. 2012: 108), as well as the need to reconsider the curricula at different nursing education institutions in order to "close the gap" (Bakre *et al.* 2012: 108) with regard to nutrition knowledge of nurses and their care of patients.

Lindseth (1997: 245-251) also highlighted the need for graduating nurses to be competent in nutritional care in order to give quality nursing care, and

that nurses needed to be kept up to date in this area. She stated that it was debatable whether nutrition education within nursing curricula was sufficient (1997: 245-251), and that graduating nurses did have knowledge gaps. She refers to a study of the National League for Nursing (NLN) accredited schools which showed that not all nursing schools had nutrition courses required as part of the curriculum, and she questioned how prepared nurses were in terms of implementing nutrition care. Furthermore, she mentioned that the NLN curricular guidelines (1982, 1984, cited in Lindseth 1997) had no specific requirements regarding nutrition content (1997: 245-251).

Parmenter and Wardle (1999: 298-308) developed a General Nutrition Knowledge questionnaire for adults. The questionnaire refers to basic dietary guidelines, sources of nutrients, food choices, and the relationship between diet and disease. This questionnaire was adapted for use recently amongst groups of Iranian university students, including nursing students (Azizi, Aghaee, Ebrahimi and Ranjbar 2011: 351). In general students had an average knowledge of, and attitude towards nutrition, but their diet needed improvement. The group of nursing students scored the highest in the knowledge questionnaire, with a mean of 60,8%. The lowest score was 46,73% in the group of Business Administration students (Azizi *et al.* 2011: 351). While the student nurses did have an increased knowledge over other groups of students, their score was still only considered as average.

2.4.2 The African experience

The previous international studies mentioned which suggest that nurses generally do not have an adequate knowledge of nutrition, are supported by recent findings among nursing students at a university in Ghana (Buxton and Davies 2012). Third and fourth year nursing students completed a nutrition knowledge questionnaire. Nine of the twenty questions were correctly answered by at least half of the students (Buxton and Davies 2012: 3). The mean score for questions which were answered correctly was 8,95 (44,8%) out of 20. Buxton and Davies showed that most students had knowledge in

some important areas of nutrition, such as the food group that helps protect against cancer, and interpreting Body Mass Index. However, the results of other questions asked in the study suggest that nurses were not likely to have enough knowledge regarding the use of specific food items to be used in the management of conditions such as obesity and cardiovascular disease. Buxton and Davies (2012: 4) mention that the results of the questionnaire are not dissimilar to findings in studies from other countries including those by Mowe, Bosaeus, Rasmussen, Kondrup, Unosson, Rothenberg, Irtun and The Scandanavian Nutrition group (2008); Crogan, Shultz and Massey (2001); and Warber, Warber and Simone (2000).

Buxton and Davies concluded that nurses require more education in nutrition, which needs to be considered in curriculum planning. and the need for identification of knowledge gaps such as basic concepts in nutrition, in order to fill these gaps in the curriculum. They suggested it might be worth considering including in the curriculum the mentoring role a dietician could play as students apply their theoretical knowledge in a patient care situation (Buxton and Davies 2012: 5).

2.4.3 The South African experience

Buxton and Davies (2012) mentioned the need to establish the level of nutrition knowledge among nurses. Some research has been conducted regarding the nutrition knowledge of nurses and other health professionals in South Africa (Parker, Steyn, Levitt and Lombard 2011; Okeyo 2009; Kgaphola, Wodarski and Garrison 1997). Parker, Steyn, Levitt and Lombard (2011: 1429-38) evaluated the knowledge and practices of primary care health professionals and final year health professions students, and reported that the majority of health professionals had difficulty in giving patients practical advice, including nutrition, in coping with chronic diseases of lifestyle. The survey showed that the majority of health professionals overestimated how much they knew about lifestyle modification, and over 60% of student nurses had poor or mediocre scores (Parker *et al*. 2011: 1432). Okeyo's (2009: 90) research involving South African student nurses,

stated that the result of a nutrition knowledge questionnaire was a median score of 9 out of 15 questions (56.3%) which was reported as an average nutrition knowledge score. A knowledge score of less than 50% was obtained by 34.2% of the students (Okeyo 2009: 82). This study on whether nutrition knowledge and eating practices influenced body weight amongst student nurses at a University in the Eastern Cape showed that both obese and non-obese students had a similar knowledge of nutrition (Okeyo 2009: 95). Okeyo reported that this suggested that there may be reasons other than poor nutrition knowledge that relate to a high Body Mass Index in students in this group who were above normal body weight (Okeyo 2009: 96).

Results from Peltzer's study (2001) among Black university students in South Africa who were studying courses not related to health, showed no significant association between awareness of risk and the respondents' behaviour in two of the risk factors where risk awareness was reported on. One of these factors was the link between obesity and high blood pressure, and trying to lose weight, and the other was knowledge of the link between animal fats and heart disease (Peltzer 2001: 62). Attitudes towards certain dietary practices, and the relationship between lifestyle factors and certain health problems were among the areas assessed. The researcher did show that the prevalence of the healthy dietary practices of the students he investigated was low (Peltzer 2001: 64). Kgaphola, Wodarski and Garrison (1997: 295-303) found that nutrition knowledge among nurses based in clinics in a specified geographical area in South Africa was poor with a mean score of 35% (Kgaphola, Wodarski and Garrison 1997: 298). Questions were asked including various topics such as the functions of nutrients, food groups and dietary guidelines (Kgaphola, Wodarski and Garrison 1997: 300).

2.5 ONGOING NUTRITION EDUCATION IN NURSING

According to findings by various researchers there is a need for nurses to receive continuing education on nutrition so that they are able to learn about nutrition requirements to meet their patients' needs (Mowe, Bosaeus,

Rasmussen, Kondrup, Unosson, Rothenberg, Irtun and the Scandanavian Nutrition group 2008: 196-202; Lyon, Alho, Hillman and Colquhoun 2007: 397-403; Crogan, Shultz and Massey 2001: 171-176). It has also been suggested that continuing education can help where new graduate nurses have a poor nutritional knowledge (Lindseth 1997: 245-251). As dietary advice changes, and new practices are encouraged it is important that nurses are kept up to date in order to give appropriate advice (Lyon *et al.* 2007: 397-403).

2.6 FACTORS THAT MAY AFFECT EATING PATTERNS

Previous studies suggest a number of factors that could influence eating patterns. These factors relating to nurses could include shift work (Sahu and Dey 2011: 20; Lowden, Moreno, Holmbäck, Lennernäs and Tucker 2010: 150-162; Persson and Mårtensson 2006: 418 and Faugier, Lancaster, Pickles, and Dobson 2001a: 33-36), stress (Beck (1995) in Shriver and Scott-Stiles 2000: 308-314; Hope, Kelleher and O'Connor 1998: 438-447), time factors (Garcia, Sykes, Matthews, Martin, and Liepert 2010: 31) and food costs (Temple, Steyn, Fourie and De Villiers 2011: 55 – 58; Garcia *et al* 2010: 32).

2.6.1 Shift work

Shift work and night duty may affect eating habits as illustrated by Lowden *et al.* (2010: 150-162) who concluded that more research is needed to establish the link between shift workers (not only nurses) and their diet, together with the effects on metabolism and performance. A study by Waterhouse, Buckley, Edwards and Reilly (2003 cited in Lowden et al. 2010: 150-162) revealed that night duty nurses tended to eat when it was convenient, such as during a scheduled break, rather than when they were hungry. When Swedish community nurses who worked at night were interviewed, it was found that while some staff try to maintain a healthy diet when working night shift, others found themselves eating more to stay awake, or they relied on

fast food because they were not sure when they would get a chance to eat. Some nurses, however, said they felt less alert if they ate at night. (Persson and Mårtensson 2006: 418). Sahu and Dey (2011: 20), assessing the effect of shift work on nurses in India, showed that the number of full meals eaten was lower during night shift, but that the number of snacks eaten was significantly higher. According to Faugier *et al.* (2001a: 33-36), the two main barriers to healthy eating by nurses were identified as shift patterns, and the failure to take breaks due to workload and poor staffing. Other factors were availability and variety of foods, particularly on night duty, and the distance from the clinical area to catering facilities (Faugier, Lancaster, Pickles, and Dobson 2001b: 33 - 35). One of their conclusions was that nutrition was seen as a low priority for nurses, and that this was something that needed to be addressed within nurses' training, particularly considering the role that nurses have with regard to public health (Faugier *et al.* 2001a: 33-36).

2.6.2 Time pressure

Students may have little time for grocery shopping and preparing food, because of studying and also their need to socialise (Garcia, Sykes, Matthews, Martin, and Liepert 2010: 31). Faugier *et al.* (2001a: 33-36). found that some nurses didn't take meal breaks when they were at work because they were too busy, or breaks were shortened because of the workload, and the nurses felt that this impacted negatively on healthy eating. Convenience foods (fast food, take-aways) may be seen as an easy choice, but these foods tend to be unhealthy, such as being high in fat and kilojoules (Gores 2008).

2.6.3 Food costs

The cost of certain foods can be a barrier to healthy eating, where sometimes less healthy foods are cheap and filling, such as packets of potato chips (fries) (Garcia *et al.* 2010: 32). This particular study among Canadian University students revealed six barriers to, or facilitators of,

healthy eating, namely environment, nutrition knowledge, time, food costs, media influence and convenience foods (Garcia *et al*. 2010: 30). Students in higher education may be faced with the responsibility of managing a budget for the first time, and a certain amount of money needs to be allocated to meals, whether self-catered or provided by the institution.

The results of the Income and Expenditure Survey 2010/2011 conducted by Statistics South Africa (2012a) showed that expenses for food and non-alcoholic beverages was the fourth biggest contributor to household expenditure, with an average of 12.8% of the annual household expenses being used (Statistics South Africa 2012a: 2). The annual amount spent by a typical household was R12 200 (Statistics South Africa 2012a: 3). Money spent on food, all beverages and tobacco made up 13.9% of total consumption expenditure. Black African households were the highest across all population groups with food, all beverages and tobacco accounting for 19.9% of total expenses (Statistics South Africa 2012a: 14).

Temple, Steyn, Fourie and De Villiers (2011: 55–58) reported that in South Africa, healthy food choices are significantly more expensive than the foods that are usually consumed by low-income families. An earlier study found that generally food costs cause people in lower income groups to buy energy-dense, cheaper, nutritionally inferior foods such as biscuits, refined cereals and foods high in sugar and fat (Temple and Steyn 2009: 203-213). This may be especially true in rural towns where small local food stores have a limited supply of healthy foods. The study therefore concluded that buying foods that are needed for a healthy diet was not affordable for most of the population (Temple *et al*. 2011: 57). While the authors warned that the results be used with caution, as people could for example grow vegetable gardens to bring down food costs of healthy eating, they highlighted the importance of teaching people about a healthy diet and making healthy food choices (Temple *et al*. 2011: 57).

Although a search was done using different data bases no information has been found regarding the portion of their income that South African student nurses spend on food.

2.6.4 Stress

Stress experienced by student nurses has been reported (Evans and Kelly 2004; Timmins and Kaliszer 2002), with reasons given including academic performance and examinations, the workload, clinical placements, financial constraints and incidents such as patient deaths.

Hope, Kelleher and O'Connor (1998: 442) reported some student nurses eating more as a means of coping with stress. Shriver and Scott-Stiles (2000: 308-314) cite Beck (1995) who showed that poor eating habits, such as overeating, was one way of dealing with stress experienced by nursing students. Owens (1989 cited in Shriver and Scott-Stiles 2000: 308-314) found that student nurses may be aware of healthy lifestyle behaviours, but don't practice them due to stress. A study among registered nurses by Nahm, Warren, Zhu, An and Browne (2012) found that respondents with greater stress had more irregular meal patterns, and that the most frequent way to manage stress was to eat (Nahm *et al*. 2012: e28**).** Zapka, Lemon, Magner and Hale (2009: 856) reported that while the majority of nurses agreed that they were satisfied with their work, they found their work environment or their job stressful. They found however, that nurses with a stressful working environment ate more healthily (Zapka, Lemon, Magner and Hale 2009: 858). Buss (2012: 453-458) who reviewed previous studies on the effects of stress and shift work on obesity, mentioned that results from studies examining the relationship between stress and BMI or eating behaviours showed that there was little evidence that stress had much significance. Buss suggested that further studies be conducted regarding the association between stress and eating behaviours (2012: 456).

2.7 THE IMPACT OF OBESITY ON HEALTH

According to the World Health Organization (2012a) at least 2.8 million adults die globally each year as a result of being obese or overweight. In addition significant percentages of disease burdens such as certain cancers, diabetes and coronary disease can be attributed to being overweight (World Health Organization 2012a). Obesity has more than doubled internationally since 1980, and estimates from 2008 statistics showed that more than one in ten adults was obese (World Health Organization 2012a). Across the world there has been an increase in the consumption of energy dense foods. These are high in sugars, fats and salt but low in micro-nutrients, minerals and vitamins. There has also been a reduction in physical activity, and these are two factors that contribute to obesity (World Health Organization 2012a). According to the World Health Organization Non-Communicable Disease Statistics in 2008, the USA had estimated prevalences of 70.8% and 33% for overweight and obesity respectively (World Health Organization 2011b).

The United Kingdom, like the USA, is categorized as a high income country. (World Health Organization 2011a). Statistics released by the WHO indicated that in the population of just over 65 million, 64.2% were overweight and 26.9% were categorized as obese (World Health Organization 2011a). South Africa, classed as an upper middle income group country, has an estimated overweight prevalence of 65.4%, with obesity stated as 31.3% within the population of just over 50 million. 2008 statistics indicated that 71.8% of South African females were overweight (World Health Organization 2011c). Neighbouring Zimbabwe, categorized as a low income country, has a prevalence of 25.5% overweight people, and 7% obese people. (World Health Organization, 2011d). The South African National Health and Nutrition Examination Survey (SANHANES-1), conducted during 2012, has shown that the mean BMI has increased across all age groups, provinces and race groups. South African males had a mean Body Mass Index (BMI) of 23.6 kg/m², while that of females was 28.9 kg/m². Among females, 39.2% were obese, which was a large increase from the 27% reported in the 2003 South African Demographic and Health Survey. In the same period the percentage

of people who were of normal weight or who were underweight, had decreased (Human Sciences Research Council 2013a: 2).

2.8 OVERWEIGHT AND UNDERWEIGHT IN SOUTH AFRICA

South Africa experiences both under-nutrition (Human Sciences Research Council 2013a) and over-nutrition (World Health Organization 2011c) within its population. The South African National Health and Nutrition Examination Survey (SANHANES-1) conducted during 2012 reported that 13.1% of men and 4% of women are underweight (Human Sciences Research Council (HSRC) 2013a: 5). Under-nutrition is the failure to meet adequate energy, micronutrient and protein demands, resulting in underweight, wasting and stunting, while over-nutrition results in overweight due to excessive intake of energy (Faber and Wenhold 2007: 393). Under-nutrition in children has decreased since 2005, with the exception of the 0-3 year age group where stunting is still prevalent (26.9% of boys and 25.9% of girls) (HSRC 2013b: 2). A South African National Youth Risk Behaviour Survey carried out in 2002 showed that 16.9% of South African adolescents were overweight, and 4% were obese (Reddy *et al.* 2008: 206). The rates of overweight and obesity were comparable with many industrialized nations (Reddy *et al*. 2008: 206).

One of the changes in lifestyle that has occurred in South Africa has been the change in diet among the Black population. Bourne, Lambert and Steyn (2002: 157-162) stated that over time in South Africa, shifts in dietary intake are occurring in both urban and rural Black populations. Fat intake has increased, while carbohydrate intake has decreased, and this has been a shift towards a Western diet (Bourne *et al.* 2002: 158). A high intake of energy-rich foods increases the risk of non-communicable disease, such as obesity, joint disease, hypertension and diabetes mellitus (World Health Organization 2012a).

South Africa has a quadruple burden of disease, due to the presence of HIV and AIDS, violence related trauma, non-communicable diseases related to lifestyle, and poverty-related infectious disease (Steyn, Bradshaw, Norman, Joubert, Schneider and Steyn 2006a: 6; Bourne *et al.* 2002). Obesity is one of the factors which is contributing towards non-communicable disease (Bourne *et al.* 2002: 157).

While many people live with the consequences of over-nutrition, there are many others who suffer the effects of insufficient nutrient intake, and who have deficiency diseases such as kwashiorkor. Children are among those affected. In the KZN Department of Health Report for 2010 / 2011 (KZN Department of Health 2011: 43), severe malnutrition was reported at 7.1 per 1000 children in KwaZulu-Natal who were under the age of 5 years. World Health Organization statistics show that in 2008, 8.7% of South African children under the age of 5 were underweight (World Health Organization 2012b). However, recent statistics show that under-nutrition in children has largely decreased (Human Sciences Research Council 2013b: 2). It was reported in the KZN Department of Health Annual Report for 2012 / 2013 that the number of children diagnosed as being underweight for their age had dropped from 27 029 to 18 289, and the number of children under the age of five diagnosed with severe malnutrition had also decreased in 2012/2013 (KZN Department of Health 2013:25). A 2002 national survey among South African adolescents showed that 9% of that population was underweight. Higher percentages of Black and Coloured adolescents were underweight compared to White adolescents (Reddy *et al.* 2008: 205).

2.8.1 The effect of HIV/AIDS on weight

A possible factor contributing to statistics on underweight could be HIV and AIDS. Johnson, Schierhout, Steinberg, Russell, Hall and Morgan (2002: 207) stated that in 89% of households in which a person with HIV/AIDS was being cared for, weight loss was reported as a symptom in the ill person. There are nutrition challenges faced by people living with HIV/AIDS who have to adapt

their diet in order to control symptoms of the disease, such as diarrhoea and weight loss. The WHO reported that HIV-related infections can have nutritional consequences and a person can experience weight loss and anorexia, for example (World Health Organization 2003: 4). A person living with HIV or with AIDS needs to increase their intake of energy foods in order to maintain their weight (World Health Organization 2003: 4). People who experience persistent diarrhoea may need advice about their fat intake (World Health Organization 2003:6). These are examples of how the nurse needs to be able to give correct dietary information to her patients who face these challenges. In South Africa, the estimated HIV prevalence rate in 2011 was about 10.6%, with the number of people living with HIV estimated to be 5.38 million (Statistics South Africa 2011: 5). In 2011 there was an estimation close to 317 000 for new HIV infections among South African adults aged 15 years and above (Statistics South Africa 2011: 2). These statistics emphasize the need for nurses to have a good understanding of the nutritional needs of the person living with HIV, so to promote their health through providing correct nutritional advice.

It is estimated that 16.6% of the adult population from 15 to 49 years of age is HIV positive (Statistics South Africa 2011: 2). This is an important statistic as it includes people who can be part of the workforce, and student nurses fit into this age group (South African Nursing Council: 2013a). Shisana, Hall, Maluleke, Chauveau and Schwabe (2004: 846) in their study on HIV prevalence among South African health workers stated that among the younger age group (18 to 35 years), the estimated HIV prevalence was 20%. According to the South African Nursing Council, the average age of students across South Africa who commenced the 4 year course in 2012 was 25 years (South African Nursing Council 2013a). While statistics of student nurses infected with HIV are not available, it becomes apparent that there are those who are HIV positive, and are therefore at risk of nutrition-related complications for which they need to adapt their own dietary behaviours.

2.9 NUTRITION KNOWLEDGE AMONG NURSES

According to a number of researchers there is evidence that nurses are overweight or obese (Blake, Malik, Mo and Pisano 2011; Zapka, Lemon, Magner and Hale 2009; Miller, Alpert and Cross 2008). Miller *et al*. (2008: 259-265), who conducted research in diverse geographic regions of the USA, reported that 54.5% of the registered nurse respondents were overweight or obese. The researchers suggested that some nurses don't really understand the definitions of overweight and obesity, and reported that less than half the respondents could successfully name five unhealthy implications of obesity. Among the nurses who were overweight more than half of them said they lacked the discipline to change their diet and exercise habits, even though they knew they should (Miller *et al.* 2008: 259-265). Research in Scotland among health professionals, including nurses, showed that the understanding of obesity as a disease was limited in this group. Although there was nutrition knowledge, respondents were not sure how to give weight management advice (Hankey, Eley, Leslie, Hunter and Lean 2004: 342).

Okeyo (2009: 65) reported that 31.7% of the nursing students at a South African university were overweight while 18% were obese. The overweight students and normal weight students appeared to have the same knowledge of nutrition. Okeyo (2009) stated that from the results of a nutrition questionnaire, a lack of nutritional knowledge was not linked to obesity among the population studied. It was found, however, that a few more underweight nurses than overweight nurses scored 50% or more in the nutrition knowledge test (Okeyo 2009: 95). The results suggest that apart from nutrition knowledge there may be other reasons for overweight and obesity and variables in food consumption patterns (Okeyo 2009: 96). The eating practices of the nurses in this study were found to be unhealthy, and it was suggested that an attempt needed to be made to find out why nutrition knowledge does not translate into practice (Okeyo 2009: 100). Okeyo showed a need for more than just nutritional knowledge, and the importance of creating a supporting environment for students (Okeyo 2009: 100). Within

the health professions, obesity is not unique to nurses as illustrated in a study done at a private medical university in Pakistan to assess the dietary habits and lifestyles of medical students. Most students ate junk food, and 41.7% were overweight (Nisar, Qadri, Fatima and Perveen 2008: 687-90).

There appears to be a paucity of statistics or studies reporting the incidence of underweight among nurses. Researchers in India reported that 9.56% of student nurses at a particular nursing institute were underweight (Kaur and Walia 2008: 102), while Goon, Maputle, Olukoga,Lebese and Khoza (2013: 148) found that in the Limpopo province of South Africa, only 2% of the nurses who participated in their study were underweight. In Okeyo's South African study, 4.4% of the respondents were underweight (Okeyo 2009:65). This is similar to the findings of The South African National Health and Nutrition Examination Survey (SANHANES-1), conducted during 2012, which reported that 4% of women were underweight (Human Sciences Research Council 2013a: 5).

2.10 THE USE OF ANTHROPOMETRIC MEASUREMENTS IN NUTRITION

There are different methods to assess weight categories and what defines obesity, and two of the anthropometric measurements that may be used to assess nutritional status are Body Mass Index (World Health Organization 2011e: 12) and Waist To Height Ratio (Hsieh and Muto 2005: 216-220).

2.10.1 Body Mass Index

According to a Report from a World Health Organization Expert Consultation (2011e: 12), the measurement of body size and composition, and diagnosis of underweight and overweight has traditionally been done by determining Body Mass Index. Body Mass Index (BMI) is calculated as weight in kilograms / height in metres squared. The World Health Organization calculates underweight as BMI score of less than 18.5 kg/m², normal weight

as equal to or greater than 18.5 kg/m² and less than 25 kg/m², overweight as equal to or greater than 25 kg/m² and less than 30 kg/m², and obesity as equal to or greater than 30kg/m² (World Health Organization (WHO) 2006).

Recently it was debated whether it was necessary to develop different BMI cut-off points for different ethnic groups. This is because of different associations between body fat percentage, body fat distribution and BMI. Some populations do have an increased health risk even though the BMI is below 25 kg/m² (WHO 2006). This is particularly true of Asian people where the risk of developing cardiovascular disease and type 2 diabetes exists even below a BMI of 25 kg/m². However, because of variations in cut-off points for risk, the existing cut-off points have been retained (WHO 2006).

Senbanjo and Oshikoya (2012: 260) concur that Body Mass Index has traditionally been used to measure general obesity, and point out that there are studies in children and adolescents that support the relationship between the accumulation of body fat and chronic diseases such as hypertension (Maffeis, Pietrobelli, Grezzani, Provera and Tatò 2001; Daniels, Morrison, Sprecher, Khoury and Kimball 1999). Fat that accumulates in the central region of the body correlates with increased risk for these diseases. Maffeis *et al* (2001: 179) stated that intra-abdominal fat in humans is the most clinically relevant, and waist circumference measurements in children could facilitate detecting cardiovascular risk (Maffeis *et al*. 2001: 186). Measuring central obesity can therefore be a valuable tool in determining metabolic risk. Central obesity can be determined by several anthropometric measurements including Waist to Height Ratio.

2.10.2 Waist To Height Ratio

Waist to Height Ratio (WHTR) is one of the measurements that determines abdominal adiposity. Increased visceral adipose tissue is associated with various metabolic abnormalities which are risk determinants for

cardiovascular disease and diabetes mellitus type 2 (World Health Organization 2011e: 12). Lakhani in *The Independent* newspaper (12 May 2012: 22), reported that according to an analysis presented at the European Congress on Obesity, WHTR is the best way to predict one's risk for diseases such as diabetes, hypertension and cardiac disease, in both men and women and in all ethnic groups.

According to Hsieh, Muto, Yoshinaga, Tsuji, Arimoto, Miyagawa, Hoshihara, and Hara (2006: 186-189), Body Mass Index classification among Japanese people does not identify those who are at high metabolic risk even though they may fall within the normal weight range. Their investigations concluded that waist to height ratio (WHTR) was a better indictor than BMI and other measurements for coronary risk factors, and could be used to predict metabolic risk. They cited Hsieh, Yoshinaga and Muto (2003 in Hsieh *et al.* 2006: 187) who suggested that WHTR of 0,5 or more could be used to identify people at higher metabolic risk who have a normal weight, as well as for those people who fell into the overweight and obese ranges. Hsieh *et al.* (2006: 188) mention that there is supportive data for using waist to height ratio as a predictor of metabolic risk from other parts of the world. In another study by Hsieh and Muto (2005: 216-220), the findings also showed that a waist to height ratio was a practical way of screening non-obese people for coronary risk. These researchers assert that people should "Keep your waist circumference below half your height" (Hsieh *et al.* 2006: 188).

McCarthy and Ashwell (2006: 988-992) also used the waist to height ratio in the United Kingdom to assess central fatness in children. For a given height there is an acceptable degree of fat storage in the upper body, and they also suggested a measure of 0.5 as the cutoff point (McCarthy and Ashwell 2006: 991). They recommended that WHTR be used together with or instead of BMI in children, where WHTR is more closely associated with childhood morbidity than BMI, as well as using this ratio for adults (McCarthy and Ashwell 2006).

In comparison to the 2003 South African Demographic and Health Survey (SADHS), the recent South African National Health and Nutrition Examination Survey (SANHANES-1) findings released in 2013, in which anthropometric measurements including Body Mass Index and Waist Circumference were gathered, show an increase in levels of obesity, together with an increased metabolic risk associated with chronic disease (HSRC 2013a: 5).

2.11 FOOD INTAKE DATA FROM SOUTH AFRICA

It appears that there is a general scarcity of national studies on food intake within South Africa, with some authors highlighting the need for food intake data, including being able to determine the nutrient intake of people, and so be able to implement national policies on food and nutrition (Herselman and du Plessis 2011; van Heerden and Schönfeldt 2011). van Heerden and Schönfeldt (2011: 10) mention that as well as using food intake data to plan nutrition policies it can be used for nutrition education and to plan HIV/AIDS nutrition interventions, and to update Food Based Dietary Guidelines. This suggests the need for up to date information that could be used in patient care by health professionals, including nurses.

van Heerden and Schönfeldt (2011: 10) pointed out that only one national food consumption survey had been carried out to date, but this survey in 1999 only focused on children up to the age of nine years. They reported that although small but useful studies among adults have been conducted, there has been a decrease in food intake studies in South African populations over a 30 year period (van Heerden and Schönfeldt 2011: 10). Steyn (2003 cited in van Heerden and Schonfeldt 2011: 12) stated that there had not been a national dietary survey conducted on South African adults. The scarcity of recent survey results was addressed when in 2013 the results of the first South African National Health and Nutrition Examination Survey

(SANHANES-1) were published. These results included topics such as the nutritional status, dietary practices and dietary behaviours of both adults and children (Shisana Labadarios, Rehle, Simbayi, Zuma, Dhansay, Reddy, Parker, Hoosain, Naidoo. Hongoro, Mchiza, Steyn, Dwane, Makoae, Maluleke, Ramlagan, Zungu, Evans, Jacobs, Faber and SANHANES-1 Team 2013).

2.12 THE SOUTH AFRICAN FOOD BASED DIETARY GUIDELINES

The South African Food Based Dietary Guidelines were developed and introduced in order to address both the growing burden of chronic diseases of lifestyle and problems associated with under-nutrition and poverty. It was planned that one set of guidelines would form the basis of nutrition education in the country (Department of Health, Nutrition Directorate 2004).

The 2004 South African Food Based Dietary Guidelines for adults and children over the age of seven years are (Department of Heath 2004) :

- **Enjoy a variety of foods**. This includes eating different foods each day, and varying cooking methods, adding enjoyment to meals by making meals interesting, and helping to ensure one gets all necessary nutrients.
- **Be active.** It is recommended that one aims to do at least 30 minutes of physical exercise each day, or divide it into shorter sessions during the day.
- **Make starchy meals the basis of most meals.** These are staple foods in the diet and a rich source of carbohydrate which is the main source of energy for the body. These include foods like potatoes, maize meal and rice.
- **Eat dry beans, split peas, lentils and soya regularly**. These plant proteins which are high in fibre and low in fat should be eaten 2 to 3 times a week. They are also a good source of energy and minerals.

- **Chicken, fish, meat or eggs can be eaten daily**. These are rich sources of protein, and small amounts can be eaten daily, but do not necessarily have to be eaten every single day.
- **Drink lots of clean, safe water**. The recommended amount is 6 to 8 glasses in order to keep replenishing water used by and lost from the body.
- **Eat plenty of vegetables and fruits every day**. The daily goal is at least five portions of fruit and vegetables. They are a rich source of a variety of vitamins and minerals, which help with immunity, healing and other important aspects. Vitamin A-rich sources include spinach and mangoes while Vitamin C is found, for example, in tomatoes and oranges
- **Eat fats sparingly**. Fats are a concentrated source of energy and can be used excessively. It is important that the intake of saturated fats like full cream dairy products, red meat and butter is limited, and that one is aware of the type of fats contained in different foods.
- **Use salt sparingly**. Too much salt is linked to heart disease and stroke. Salt must be limited by reducing the amount used in cooking and adding to food, and by being aware of which foods are high in salt.
- **Use food and drinks containing sugar sparingly and not between meals.** Sugar-rich foods should be limited and consumed as part of a meal. Sugar rich foods should be seen as treats reserved for special occasions. Examples of treats are sweets and chocolates, biscuits and jam.
- **If you drink alcohol, drink sensibly.** Alcohol does not have to be taken at all, and some people should avoid it completely. The recommended daily limit is 2 “standard drinks” per day for a woman, and 3 “standard drinks” for a man. An example of a standard drink is a 125ml glass of wine.

  (Department of Heath 2004) .

These older guidelines are referred to in the Nutrition study unit in the Fundamental Nursing Science Learning Objectives for KZNCN (KwaZulu-Natal College of Nursing n.d.).

The revision and updating of the guidelines started in 2011, and the updated Guidelines for Healthy Eating, agreed upon by the Department of Health were released in late 2012. The revised guidelines, for South Africans five years and older are similar to the previous guidelines and are as follows: (Department of Health n.d.; National Nutrition Week 2012; Vorster, n.d.).

- Enjoy a variety of foods.
- Be active.
- Make starchy food part of most meals.
- Eat dry beans, split peas, lentils and soya regularly.
- Have milk, maas or yoghurt every day.
- Fish, chicken, lean meat or eggs could be eaten daily.
- Drink lots of clean, safe water.
- Eat plenty of vegetables and fruit every day.
- Use fats sparingly; choose vegetable oils rather than hard fats.
- Use salt and food high in salt sparingly.
- Use sugar and food and drinks high in sugar sparingly.

The guideline regarding use of alcohol was removed because the risks of alcohol use outweigh the health benefits (Meyer 2012). Vorster (n.d.) also mentioned that the wording had caused confusion, and so this guideline was removed.

2.13 DIETARY DIVERSITY

Dietary diversity increases the chances of meeting nutritional requirements, as it is generally understood that no single food can provide the different nutrients needed for health (Labadarios, Steyn and Nel 2011). According to Kennedy (2004) South Africa is one of 25 countries that includes a guideline

about food variety in their Dietary Guidelines. Kennedy (2004) mentioned that there are differences in scientific literature as to how dietary diversity is measured. Dietary diversity refers to the number of different foods or food groups which are eaten over a given period of time (Ruel 2003: 3912S). For this study a Food Group Diversity Score using a count of food groups, and a Food Variety Score which counts individual food items, were used (Ruel 2003: 3913S).

Previous research regarding food intake has made use of food diaries (Irazusta, Gil, Ruiz, Gondra, Jauregi, Irazusta, and Gil 2006 :179), 24 hour recall and questionnaires (Soriano, Moltó and Mañes 2000), and food frequency questionnaires (Oldewage-Theron and Kruger 2008) .

Maunder, Matji and Hlatshwayo–Molea (2001: S7 –S11) mention that where there is a lack of dietary variety, this may contribute to chronic diseases of lifestyle, as well as low energy and micronutrient intakes. They state that studies have shown that diets low in fats and meat, but high in fruits and vegetables can help protect against chronic diseases of lifestyle (Maunder, Matji and Hlatshwayo–Molea 2001: S9). Eating a diet rich in variety does need to be understood in terms of the correct food choices, as it is possible that dietary variety could be interpreted as being given permission to increase the number of processed foods in the diet, or as increasing dietary energy intake. In certain sectors of the population where obesity is already prevalent this could further increase obesity. Maunder Matji and Hlatshwayo–Molea (2001:S7) indicate that food variety is understood to not only be the presence of different food groups and foods in the diet, but also as different methods of food preparation.

Steyn, Nel, Nantel, Kennedy and Labadarios (2006b : 644-650) conducted a study using data collected among South African children in the National Food Consumption Study of 1999 to assess whether a dietary diversity score and a food variety score were good indicators of nutrient adequacy. The dietary

diversity score was classified into nine different food groups. Recommended by the Food and Agriculture Organization (FAO) of the United Nations, the nine groups are:

1. Cereals, roots and tubers.
2. Vitamin A – rich fruits and vegetables
3. Other fruits
4. Other vegetables
5. Fats and oils
6. Meat, poultry and fish
7. Nuts and legumes
8. Eggs
9. Dairy products.

The conclusion from the study was that a dietary diversity score, which is the number of food groups eaten over 24 hours (Steyn *et al.* 2006b: 645) was a quick and efficient way of estimating dietary adequacy in children (Steyn *et al.* 2006b: 644).

A later study by Labadarios, Steyn and Nel (2011) undertaken to assess dietary diversity in adult South Africans mentioned that up until the time of their study, dietary diversity among adults in South Africa had not been determined. Their study comprised of adults who had participated in the national South African Social Attitudes Survey from the different population groups, with the sample reflecting the different proportions of the population. Based on what the respondents had eaten over the last 24 hours, the foods were divided into nine groups. The food groups were categorized according to Steyn's *et al.* (2006b: 644-650) nutrition study of children. A score of below four indicated poor dietary diversity, while a score of nine indicated a varied diet. The children's mean dietary diversity score of four was used as a reference point for the adult survey (Labadarios, Steyn and Nel 2011: 3). The results showed that at a national level the mean Dietary Diversity Score of the adults was 4.02. The authors stated that poor people do not often have access to a variety of foods, and so even if they know about food based

dietary guidelines, these cannot be followed if food accessibility is a problem, and because having a varied diet could increase the cost of the diet (Labadarios, Steyn and Nel 2011: 8). KwaZulu-Natal had 40.8% of participants with a low score. This categorized it as the province with the fourth highest prevalence of poor dietary diversity (Labadarios, Steyn, and Nel 2011).

Oldewage-Theron and Kruger (2008: 106) assessed dietary diversity as an indicator of dietary adequacy in their study on an elderly South African population. All the participants were Black and aged sixty years and older (Oldewage-Theron and Kruger 2008: 108). As in the study on children, this study also showed the use of dietary diversity as a means of identifying dietary inadequacies. The study confirmed low dietary diversity amongst the elderly population, due to low income, which resulted in poor dietary intake (Oldewage-Theron and Kruger 2008: 129).

The South African National Health And Nutrition Examination Survey (SANHANES-1) conducted during 2012 showed that 39.7% of participants ate a diet which was low in dietary diversity, indicating a diet of poor nutritional quality (Shisana *et al.* 2013: 169). Diets high in fat were eaten by 18.3% of the population, and 19.7% of the sample population ate diets high in sugar, while diets low in fruit and vegetables were eaten by 25.6% of participants (Shisana *et.al*. 2013:171-176). The same study showed that 62.9% of South African adults achieved a medium score (5.26 out of 10 points) regarding general nutrition knowledge (Shisana *et.al*. 2013:178).

2.14 THE KWAZULU-NATAL COLLEGE OF NURSING CURRICULUM

The KwaZulu-Natal College of Nursing (KZNCN) curriculum for Fundamental Nursing Science includes a study unit on nutrition (KwaZulu-Natal College of Nursing n.d: 38-39). This subject includes knowledge of basic food nutrients, requirements at various ages, food groups, a normal balanced diet, and the

South African food based dietary guidelines, as well as diet modification such as light and soft diets, a low salt diet, and high fibre diets. Within the first year of study the student does not learn about specific pathologies, but is expected to know about diet modification for someone living with HIV/AIDS (KwaZulu-Natal College of Nursing n.d.: 38-39). Knowledge of Body Mass Index and other anthropometric measurements is not stated. One of the specific learning outcomes is that the student "Uses the scientific nursing approach to manage nutritional needs and problems across the lifespan." (KwaZulu-Natal College of Nursing n.d.: 3).

From the second year of training, students are taught specific disease conditions such as those related to the cardiovascular, gastrointestinal and urinary systems. Student nurses are also expected to be able to give health education on diet and change of lifestyle (KwaZulu-Natal College of Nursing 2001: 17, 23, 41). This could include, for example, advice to a patient who has hypertension or diabetes mellitus.

2.15 THE PROPOSED NEW NURSING QUALIFICATIONS AND THE NURSES' SCOPE OF PRACTICE

The student nurses included in this study are training according to SANC Regulation 425 leading to registration as a Nurse (General, Psychiatric and Community) and Midwife. The Scope of Practice of a Registered Nurse is regulated according to the South African Nursing Council Regulations Relating to the Scope of Practice of Persons who are Registered or Enrolled under the Nursing Act, 1978 (South Africa 1978). According to this the Scope of Practice of a Registered Nurse includes "the facilitation of the maintenance of nutrition of a patient" (South African Nursing Council 1984, Government Notice No R2598, as amended. Chapter 2 (l)). In October 2013, new regulations regarding the Scope of Practice of Nurses and Midwives (Government notice R786) according to the Nursing Act No 33 of 2005 (South Africa 2005) were published for public comment. However, at present

the older Scope of Practice remains. In the proposed new Scope of Practice a Registered Nurse is expected to be accountable and responsible for the "provision of comprehensive nursing treatment and care of persons in all healthcare settings" (South Africa. 2005. Nursing Act No 33 of 2005: 4.1.(a) p.4**).**

The South African Nursing Council has approved new nursing qualifications, to submit to the South African Qualifications Authority (SAQA) for inclusion in the National Qualifications Framework (NQF). In terms of the National Qualifications Framework Act 67 of 2008, provision has been made for a framework with ten levels. These levels of learning achievement are in ascending order from one to ten (SAQA 2012:2). Two of the new nursing qualifications are a Bachelor of Nursing, proposed at NQF level eight, and a Diploma in Nursing at NQF level six (South African Nursing Council, 2012*).* These new qualifications mean a revision of the nursing curriculum in order to meet the requirements of the new courses. The South African Nursing Council has published Circular 8/2013 which is entitled "Curriculum Framework for entry levels of nursing (Higher Certificate: Auxiliary Nurse; National Diploma: Staff Nurse; Advanced Diploma: Midwifery and Bachelor's Degree: Professional Nurse and Midwife)", to give general instructions to nursing education institutions in the development of the curriculum for the new qualifications. This does not include any criteria regarding specific nutrition content (South African Nursing Council 2013b). To date a teaching guide which includes aspects of nutrition education for the new curriculum at KZNCN is still to be finalized.

2.16 THEORETICAL FRAMEWORK: COX'S INTERACTION MODEL OF CLIENT HEALTH BEHAVIOUR (IMCHB)

Cox (1982: 42) indicated a need in research for a client-focused framework that would recognize the individual's uniqueness in attaining health behaviours, address factors that determine the interaction between a client

and the health professional and how these affect health behavior. This model (Figure 2.1) was proposed to guide development of nursing interventions that were focused on the individual's health needs The objective was to "identify and suggest explanatory relationships between client singularity, the client-provider relationship and subsequent client health care behavior" (Cox 1982: 46). The model (Figure 2.1) assumes that clients are able to make informed decisions about their health care behaviours, and that clients be given as much control as possible within the limitations of their situation in taking responsibility for their own health promoting behaviours (Cox 1982: 47).

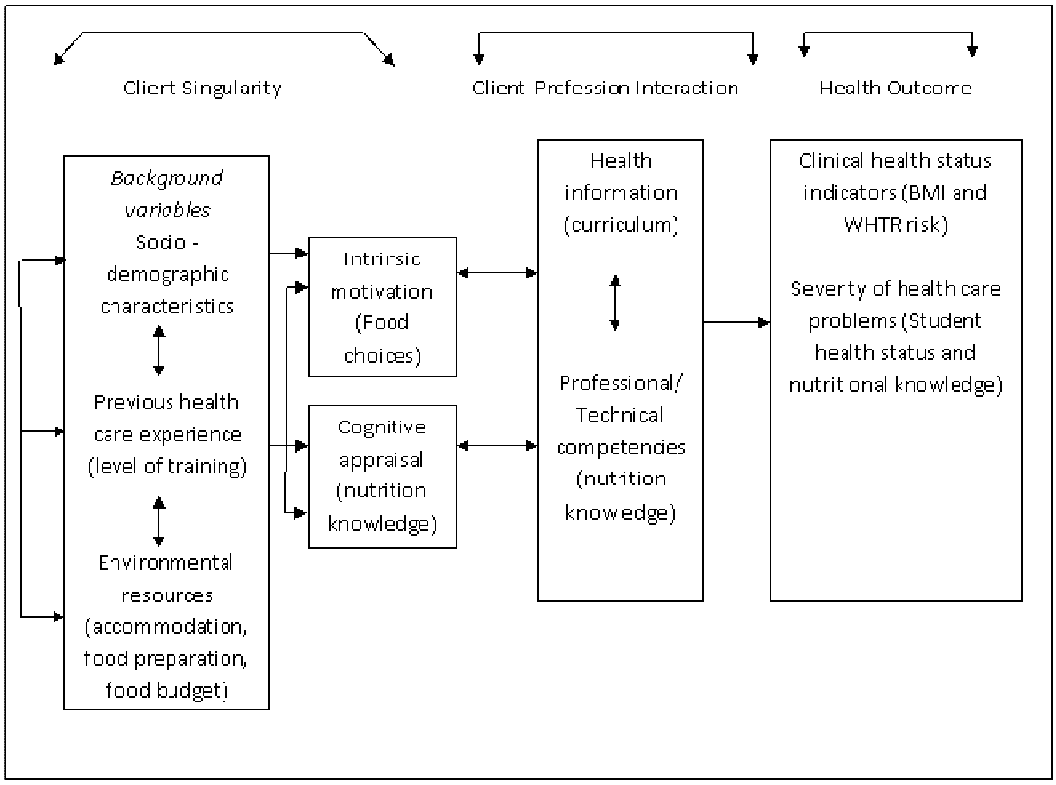

Figure 2. 1 ***Adapted from: Cox's Interaction Model of Client Health Behaviour (Cox 1982: 47)***

Aspects of this model were used, with the student nurse considered as the client. The model is suitable to investigate the role of self-care practices (Cox 1982: 53), and was therefore considered for the current study, as it was an assessment of the student's nutrition knowledge together with food consumption practices which do influence health. This study considered level of training and other personal factors, as well as anthropometric measurements which can indicate health status. Cox (1982: 54) mentions that the model can be used, for example, to address concerns relating to chronic disease prevention and health promotion.

The major elements of the model are Client Singularity, Client-Professional Interaction, and Health Outcome (Cox 1982: 47).

Client singularity includes background variables, and other variables namely intrinsic motivation, cognitive appraisal, and affective response (Cox 1982: 47).

Background variables included demographic characteristics of gender, age, race, and training campus. Health experience considered the level of training that was reported by the nurses, while environmental resources included aspects such as income, accommodation during training, place where meals were prepared and eaten, and the amount of money nurses spent on food for themselves.

Cox's model postulates that background variables interact to produce specific health behaviour (Cox 1982:48). It also suggests that by understanding the interaction of background variables and health behaviour, appropriate health management can be planned, such as a health education programme (Cox 1982: 49).

Another element, motivation, recognises choice, and the need for competence in making choices, which lead to wellbeing (Cox 1982: 49). The

respondents' food choices were analysed from foods eaten as reported in the Food Frequency Questionnaire (Annexure F).

Cognitive appraisal, which considers that clients act according to their perceptions of reality (Cox 1982: 50), used the scores that students obtained in the Nutrition Knowledge Questionnaire (Annexure G).

Client-professional interaction. The four variables are the provision of health information, affective support, decisional control and professional/technical competencies (Cox 1982: 47). For purposes of this study the professional is the nurse educator enabling the learning process. Nutrition lectures within the nursing curriculum were considered to be the provision of health information. Although the nursing curriculum is designed to give nurses knowledge to be able to give effective care of patients, it is hoped that the same information is used in their own wellbeing. Professional/technical competencies could include the students' knowledge of diet disease relationships. In this study, how this was applied in a practical situation was not measured, but a section of the questionnaire was used to assess knowledge of diet-disease relationships. A future study could possibly investigate the students' knowledge, for example, when given a particular case-based scenario.

Decisional control and affective support were not considered in any detail in this study, as the students were not asked to identify their own health needs or consider how their own behaviours needed to change. Students were not given feedback regarding their knowledge of nutrition, or of their anthropometric measurements, but will have access to the general findings of this study when they are published**.** The students' need for information on nutrition will vary according to the diagnosis and treatment of patients, and they could refer to their educators, to textbooks, the advice of the dietician and many other resources available through online websites.

Health outcomes refers to a state of health that results from a health behaviour. The variables include use of health care services, severity of the healthcare problem, clinical health status indicators, adherence to recommended care regimen (treatment plan) and satisfaction with care (Cox 1982: 53). In this study the variables used were the severity of the health problem, and clinical health status indicators. These were considered when the anthropometric measurements of the students were analysed, as well as their nutritional knowledge. It is possible that future studies regarding the nutrition knowledge and health status of nurses could incorporate additional variables from Cox's theory that were not used in this study.

Possible interventions resulting from the outcomes could influence curriculum development in the future, as well as possible ongoing nutritional support for nurses.

2.17 CONCLUSION

Nurses are among the health care professionals who have the opportunity to give health education regarding nutrition. The importance of nutritional knowledge stems from evidence in the literature regarding the role that nurses play in respect of advising patients on the need to eat correctly. Correct nutritional knowledge is important to prevent various forms of malnutrition which are among the health problems found in South Africa. However, there is a paucity of information available on South African student nurses' nutritional knowledge or their nutritional status.

CHAPTER 3

RESEARCH METHODOLOGY

A description of the research setting and the process used in sampling and collecting data, and the tools used for the study are set out in this chapter.

3.1 SETTING DESCRIPTION

KwaZulu-Natal is one of nine provinces within the Republic of South Africa. It is situated on the east coast of the country, and is the second most populated province with 10.81 million residents, or 21.39 percent of South Africa's population living there (Statistics South Africa 2011). This study investigated dietary diversity and nutrition knowledge of student nurses at the KwaZulu-Natal College of Nursing. The study was carried out at four different Campuses of the KwaZulu-Natal College of Nursing.

3.2 THE KWAZULU-NATAL COLLEGE OF NURSING (KZNCN)

The KwaZulu-Natal College of Nursing (KZNCN) falls under the KwaZulu-Natal Department of Health. The Head Office is situated in Pietermaritzburg, the provincial capital of KwaZulu-Natal. As a Nursing Education Institution approved by the South African Nursing Council (SANC), KZNCN offers several nursing programmes including the R425 course leading to Registration as a Nurse (General, Psychiatric and Community) and Midwife. The course is offered over four academic years (KwaZulu-Natal College of Nursing 2005: 8,9).

There are 10 Campuses within the College which offer the R425 course, namely Addington, Benedictine, Charles Johnson Memorial, Edendale, Grey's, Madadeni, Ngwelezane, Port Shepstone, Prince Mshiyeni and R.K.Khan. Some of these campuses are situated in or near the cities of Pietermaritzburg and Durban, while others are found in more rural areas of the province (KwaZulu-Natal Department of Health 2001a).

Some campuses and sub-campuses also offer the course leading to Enrolment as a Nurse (R2175), while others offer the Bridging course for Enrolled Nurses leading to Registration as a General Nurse (R683) (KwaZulu-Natal Department of Health 2001b). King Edward VIII Campus and fourteen sub-campuses were not included in this study because they do not offer the R425 programme.

Up until 2010, student nurses became Department of Health employees when they commenced training, but since 2010, however, new students enter into a contract / study agreement with the KZN Department of Health and receive a fixed monthly stipend (Province of KwaZulu-Natal Health Services n.d. b: 9). The students do not have employee status, and work within hospitals and other clinical areas as determined by the curriculum. Students do shift work and some night duty and are given duties assigned by the operational manager of the ward / unit. There are some student nurses who have already completed a South African Nursing Council course, such as that leading to Enrolment as a Nurse (R2175), and have been given the opportunity to do the 4 year course leading to Registration as a Nurse (General, Psychiatric and Community) and Midwife. These students are seconded from health institutions in the province and retain their employee status (Province of KwaZulu-Natal Health Services n.d. a) and their salary.

At the end of 4 years students are required to work in the KwaZulu-Natal Department of Health for a time period equal to that of their training according to the contract signed at the beginning of the course (Province of KwaZulu-Natal Health Services n.d. b:9). During these years the qualified nurses are placed in provincial health facilities.

Students who are accepted for the course are chosen from the surrounding geographical areas as demarcated into various health districts. There are eleven health districts throughout the province (KwaZulu-Natal Department of Health 2001c).

Some students' homes are a distance from the campus, and so these students may be accommodated at the hospital residence. Students are required to pay for this accommodation from their stipend, as well as for their books and uniforms (Province of KwaZulu-Natal Health Services n.d. b :6). If no accommodation is available students are required to find their own accommodation and transport, for which they are financially responsible. Within hospital residences there may be limited food preparation and storage facilities, and this may cause restrictions on the type of meals nurses can prepare for themselves if they choose to buy groceries and prepare their own meals instead of buying meals at the dining room. It is expected that the type and availability of food storage and cooking facilities varies with privately rented accommodation, which may also influence the choice and variety of meals students eat. Nurses generally have access to the hospital dining room when working in the hospital, where they can buy meals if they wish. It is not known whether students buy adequate amounts of food for themselves. For many students the stipend may be the first regular income they have received and so they may not know how to manage their expenses. Some students have dependents and it is anticipated that many students do contribute from the stipend towards family needs, and so do not necessarily use the entire stipend for their own needs which includes buying food.

3.3 POPULATION

The population group consists of all student nurses at the KwaZulu-Natal College of Nursing (KZNCN) registered with the SANC as students who are studying the R425 course. Among the ten campuses there are approximately 2000 students who are registered at any one time during the four years of the duration of the course. The number changes every six months as students start and complete the course. The number of students varies per campus and by year, as does the size of the new student intakes per campus.

KZNCN has two intakes each year on 1st January and 1st July. The academic year therefore starts in January for some students, and in July for others (KwaZulu-Natal College of Nursing 2005:12).

The majority of students of the College are from the Black population group, with small numbers of Coloured and Indian learners, and very few White students (e-mail correspondences from various Campus Principals within KZNCN: on 4 September 2012 from Mrs M. Zibane, on 24 January 2013 from Mrs M Sissing, on 7 February 2013 from Mr B Gwala). Visits were made to three Campuses (in November 2012, on 7 February 2013 and on 22 February 2013) in order to obtain numbers. The population of approximately 2000 students is divided into ten groups according to the ten campuses.

3.4 SAMPLING METHOD

Sampling is a process whereby a group that will represent the population to be studied is selected (Brink, van der Walt and van Rensburg 2012: 132). It is important that the group selected represents the population as much as possible so that conclusions drawn from the group can be used to generalise about the target population (Brink *et al*. 2012: 133). The two sampling approaches are random sampling and non-probability sampling (Brink *et al*. 2012: 134). Random sampling was chosen for selection of Campuses, and non-probability (convenience sampling) was used for student group selection.

3.4.1 Sampling of campuses

A random selection of four of the ten campuses in the province that offer the R425 course was done. Random samples are more likely to be representative of the population because all subjects have an equal chance of being included in the study (Brink *et al.* 2012:135).

Random sampling was done using the fish bowl method (Brink *et al.* 2012:135). The names of all ten campuses were written on separate pieces

of paper, put into a bowl, and shaken well. One paper was pulled out, and that campus was considered as selected. The piece of paper was then replaced so that statistically, everyone still had a one in ten chance of being selected. The next piece of paper was drawn out. If it was the same piece as drawn out previously, it was replaced, the bowl given a good shake, and the process continued until the required number of campuses was reached (Brink *et al.* 2012: 135). The Campus where the researcher is employed was not going to be considered if it was selected during random sampling, as it was decided that inclusion of students from this campus could have influenced objectivity. The four Campuses selected were in three different areas of the province. Campus A is situated in northern KZN. The hospital, situated a few kilometres away from the Campus, is a regional hospital. The population served by this hospital includes people from the nearby towns as well as from rural areas. The services offered by the hospital include Mental Health Care Services. Campus B is situated in a small coastal town in southern KZN. The associated hospital is a regional hospital meeting the health needs of people in the district. Campus C is linked to a regional hospital which has about 1200 beds and serves the surrounding areas including part of the Eastern Cape Province. The campus is in the grounds of the hospital which is situated within the boundaries of the largest city in the Province. Campus D is also situated at a hospital in a suburb close to the same city. It is a regional and district hospital with about half the number of beds of Hospital C, and tends to serve people in the surrounding areas (KwaZulu-Natal Department of Health 2001d).

3.4.2 Sampling of students

Students from all four years of the R425 programme at the chosen campuses were potential participants in the study. The sample size was determined using the total number of students. Permission was obtained from Principal, KZNCN to obtain student numbers from each Campus Principal (Annexure A). With an estimated population of 2000 in KZNCN, a sample size of 387

students across the 4 years of study across the campuses was required. This included an extra 20 percent in case of non-response (e-mail correspondence on 4 September 2012 from Mrs G Hendry, statistician). The estimated number of 2000 was used for the study as despite attempts to obtain accurate numbers at any one time from all ten campuses this was not achieved. Estimated numbers at any time were slightly less than 2000. E-mail correspondence was received from various Campus principals within KZNCN giving student numbers (e-mail correspondence on 4 September 2012 from Mrs M. Zibane, on 5 September 2012 from Mrs J Reddy, on 24 January 2013 from Mrs M Sissing, and on 7 February 2013 from Mr B Gwala). Visits were made to three Campuses (in November 2012, on 7 February 2013 and on 22 February 2013) in order to obtain numbers. Examination statistics were also used to estimate student numbers (KwaZulu-Natal College of Nursing 2013) but these would not have included students who did not write the examinations.

A convenience sample of students was the method used, as data was collected when students were at their campus attending lectures at the time of the planned visits by the researcher. Convenience sampling is a type of non-probability sampling which involves using readily available participants, and can be useful when time and cost factors need to be considered (Brink, van der Walt and van Rensburg 2012: 140). There can however, be elements of bias, such as under-representation of a group (Brink, van der Walt and van Rensburg 2012: 140).

Student groups attend lectures in the campus for a specified number of weeks at a time, at intervals during the academic year. Students who were attending lectures at the campus in their groups according to the individual campus programmes at the time of data collection were invited to participate in the study. All students in a chosen group who consented to participation were included. Students from across the four years of training at each of the four different campuses participated in the study so a fair representation of the student population was considered to have been obtained.

In order to obtain data from students from each of the four years at each of the four selected campuses, more than one visit to each campus was needed. The majority of students gave consent to participate in the study, and so the required total number of participants (387) was obtained.

Convenience sampling was chosen over random sampling because if a random selection of students had been chosen, such as assigning a number to each student and then using a table of random numbers to select students (Brink *et al.* 2012: 136), there was the possibility of rejecting students who would have been willing to participate in the study. Similarly, if a proportionate random sample was collected, there was the potential for willing respondents to be excluded. There was also the possibility that if campuses with a smaller number of students were chosen during random sampling of campuses, using random or proportionate sampling of students may not have resulted in adequate total numbers. Using a convenience sample resulted in data being collected from a slightly larger total number of students than had been calculated as recommended for the study (e-mail correspondence on 4 September 2012 from Mrs G Hendry, statistician).

An advertisement printed on brightly coloured cardboard (Annexure E) was sent to the campus to be displayed on notice boards, or to be given by lecturers to students just before the anticipated visits. Arrangements were made with individual Campus Principals and group lecturers for times to be allocated during the college day for students to be addressed and given the Letter of Information, for the informed consent to be obtained, and for the questionnaires to be completed and anthropometric measurements obtained.

3.4.2.1 Inclusion criteria

- All student nurses, both male and female, doing the South African Nursing Council R425 course leading to Registration as a Nurse

(General, Psychiatric and Community) and Midwife, across all the four years.

- Student nurses in the first year should have received their nutrition lectures.
- Students had to be at least 18 years old in order to give informed consent for the study.

3.4.2.2 Exclusion criteria

- Students who did not give consent for study.
- Students who were under 18 years of age.
- The first year groups of students who had not yet received nutrition lectures.
- Any students who were not doing the R425 course.
- Students at the Campus where the researcher is employed were not included in the study.

3.5 RESEARCH DESIGN

A quantitative descriptive cross sectional survey design was used. Quantitative research focuses on aspects of human behaviour which can be measured, using formal instruments and structured procedures (Brink *et al* 2012:11). The information was collected under controlled conditions, and was collected objectively. The numerical information which was gathered in the research process was analysed using statistical procedures, and so the findings can be seen to be the result of deductive reasoning (Brink *et al.* 2012:11). According to Brink *et al.* (2012:113) descriptive studies involve gathering data from a sample which represents the population, and the emphasis in data collection is on questionnaires, interviews, or structured observation. Data was collected for this study through means of a questionnaire which had three parts, namely a nutrition knowledge section, a food frequency questionnaire, and a section for socio-demographic data.

Variables were not manipulated at all, but were presented as facts or needs, and provided a picture of the situation as it was (Brink *et al.* 2012:114). This study described the nutrition knowledge, dietary diversity, nutritional status and food variety of student nurses, and identified factors that influenced these. Variables included the level of training of the students, gender, and the amount which students spent on food each month.

Brink and Wood (1998 cited in Brink *et al.* 2012:113) state that descriptive designs are based on certain assumptions: Firstly, that there is not enough existing literature which describes the study population or the variable. Secondly, studies that have been done may provide the reasons and theoretical framework for the proposed study. However, a study may be started without a theoretical framework, provided that the rationale for doing the study is based on a thorough literature review. Various theoretical frameworks were considered, and aspects of Cox's Interaction Model of Client Health Behaviour were used, which has been described in Chapter Two.

A cross-sectional study was conducted across student groups during the four years of training. The data was collected during a particular time, using a large number of participants (Brink *et al.* 2012: 101). The study was limited to a given time period of four months, and sufficient data was collected during this time. Data was collected from students during pre-arranged periods in the college day. The opportunity to address the groups of students and collect data during these times was planned to minimize disruption to the scheduled timetable. Most data was collected during lecture periods at the start of the college day or either side of tea or lunch breaks as determined by individual campus lecturers, and appeared to keep disruptions to a minimum.

3.6 DATA COLLECTION

As the researcher is a nurse and not a dietician, this study focused on nutrition knowledge, dietary diversity and anthropometric measurements. Assessment of food intake with analysis of different nutrient content of foods eaten was not part of the study, and neither was dietary sufficiency nor insufficiency considered.

3.6.1 Research instruments

Data was collected with a questionnaire. The questionnaire comprised of three parts:

- A Food Frequency Questionnaire which documented foods eaten over the last seven days [Annexure F].
- A Nutrition Knowledge Questionnaire [Annexure G]
- Socio-demographic questions [Annexure G].

It was decided that for the purpose of this study in which information regarding dietary diversity, and not detailed food intake, was being obtained, that the use of a seven day Food Frequency Questionnaire would be sufficient. A validated Food Frequency Questionnaire (Oldewage-Theron and Kruger 2008) which was obtained from the Department of Food and Nutrition Consumer Sciences of the Durban University of Technology was used to assess the dietary diversity of participants (See Annexure F). Permission for the use of this questionnaire was obtained (Annexure H). The Food Frequency Questionnaire used in this study was divided into the nine food group categories used in previous studies (Labadarios, Steyn and Nel 2011; Oldewage-Theron and Kruger 2008; Steyn, Nel, Nantel, Kennedy and Labadarios 2006b).

Parmenter and Wardle (1999: 298-308) described the development of a nutrition knowledge questionnaire used on adults in the United Kingdom. The aim was to investigate the relationship between peoples' eating and their

knowledge of nutrition. Parmenter and Wardle's *General Nutrition Knowledge Questionnaire for Adults* comprises four parts, namely:
Dietary Recommendations
Sources of Foods / Nutrients
Choosing everyday foods
Diet-Disease Relationships (Parmenter and Wardle 1999: 298-308).

The section on dietary recommendations asked questions such as whether people should be eating more or less of certain foods such as salty foods or fibre-rich foods. It also asked how many portions of fruit and vegetables should be eaten daily, and what types of fats should be limited.

Questions from the section on sources of foods/nutrients tested the respondents' knowledge of nutrients in everyday foods. An example was:

Do you think experts put these in the starchy foods group? Tick one box per food.

	Yes	*No*	*Not sure*
Cheese			
Pasta			
Butter			
Nuts			
Rice			
Porridge			

The correct "yes" answers were pasta, rice and porridge (Parmenter and Wardle 1999: 298-308).

The third section of the questionnaire on choosing everyday foods asked for healthy/best choices to be made from options given, such as choosing between a sandwich made from two thick slices of bread with a thin slice of cheddar cheese filling, or two thin slices of bread with a thick slice of cheddar cheese filling.

The fourth part of the questionnaire focused on diet-disease relationships. Respondents were asked if they were aware of any major health problems associated with, for example, the amount of fat that people ate in their diet, and if yes, to name the health problems. The section also assessed the respondents' knowledge of dietary intake linked to heart disease and cancer.

This questionnaire (*A General Nutrition Knowledge Questionnaire for Adults)* was chosen for use in this study because it covers a variety of nutrition topics, and was found to meet criteria for reliability as well as construct validity (Parmenter and Wardle 1999: 301).
Permission was granted to use Parmenter and Wardle's questionnaire for this study (Annexure I).

Minor modifications were made to the questionnaire regarding some foods, such as changing "kippers" to "haddock/smoked fish", "tomato ketchup" to "tomato sauce" and "luncheon meat" to "polony" as these were thought to be more familiar terms in South Africa. The socio-demographic questions were modified to suit the South African population and the student nurse population (Annexure G).

At the end of the questionnaire the student's weight, height and waist circumference measurements were recorded. These measurements were taken and recorded by the researcher in order to ensure accuracy and consistency as far as possible. Details relating to confidentiality and privacy are given later in the chapter.

Equipment needed to collect the data included introductory letters and informed consent forms for students, as well as a questionnaire for each student. A medical scale with a height measure, for measuring height and weight was required. The electronic scale used to measure body weight is an Adam MDW 250L Physician scale, with a maximum capacity of 250kg,

with scale divisions of 0.1kg. It has a power supply and a re-chargeable battery. It can be calibrated through the keypad. The accuracy of the scale was checked against the known weight of a particular item which was used at each weighing session, in order to ensure consistency. The scale display returns to zero after each participant has been weighed (Adam Equipment Company 2011). A tape measure was used for measuring the participants' waist circumference. The measurements were written onto each questionnaire by the researcher.

3.6.2 Assessment of Body Mass Index [BMI] and Waist To Height Ratio [WHTR]

In order to calculate BMI and WHTR it was necessary to measure each student's height, weight and waist circumference.

3.6.2.1 Weight

An electronic medical scale as described above was used to measure body weight. Each participant was asked to take off their shoes and jacket/ jersey, and was asked to remove any heavy items on their person such as a wallet or mobile phone, which may have affected their body weight reading. Students had also been asked in the advertisement sent earlier to the Campus, to wear light weight clothing on the day of interview. Each student was weighed once and the result recorded by the researcher.

3.6.2.2 Height

The above-mentioned scale has a built in height measuring rod with a maximum height recording of 212cm. Participants were asked to remove their shoes and stand erect on the scale platform facing away from the measuring rod, looking straight ahead. The participants were asked to not have hair extensions, or to wear any hat or cap because that could increase their height. The measuring rod was extended and the height arm was

placed on the top of the participant's head. The height was read off the measuring rod. There were a few female students who adjusted their hairstyles in order to accommodate the measuring rod.

3.6.2.3 Waist circumference

The waist circumference was measured at the approximate mid-point between the top of the iliac crest and the last palpable rib, which is an accordance with the World Health Organisation STEPwise approach to chronic disease risk factor surveillance (WHO STEPS) protocol (World Health Organization 2008: 3-3-11 and 3-3-12). The tape measure which was used as the measuring tool was stretch resistant, and was placed so that it was snug but not constricting, and the measurement was read at the end of a normal expiration. The participant stood with their arms at their sides, feet together, with weight distributed evenly across the feet (World Health Organisation 2008: 3-3-12).The participant should wear little clothing (World Health Organisation 2008: 3-3-11), and so the measurement was taken over one layer of clothing, usually a vest, t-shirt or blouse, and the tape measure was placed so that it was snug, so that the thin clothing did not alter the reading. The students were asked in the information advertisement (Annexure E) to wear lightweight clothing on the day of the researcher's visit, and were informed of the need to remove jackets and shoes before measurements were taken. Only the researcher measured height and weight and waist circumference, to ensure consistency and privacy.

3.6.2.4 Calculation of Body Mass Index (BMI) and Waist to Height Ratio (WHTR)

The formula used to calculate Body Mass Index is weight in kilograms divided by height in meters squared (World Health Organization 2006). The calculation was done according to a formula entered onto the computer spread sheet. The World Health Organization calculates underweight as BMI of less than 18.5 kg/m². Normal weight is equal to or more than 18.5 and less

than 25 kg/m². Overweight is equal to or more than 25 and less than 30 kg/m². Obesity is equal to or more than 30 kg/m² (WHO 2006).

According to a Report from a World Health Organization Expert Consultation (2011e:12), the measurement of body size and composition, and diagnosis of under-weight and overweight has traditionally been done by determining Body Mass Index. Waist to Height Ratio is one of the measurements that determines abdominal adiposity (WHO 2011e:12). Increased visceral adipose tissue is associated with various metabolic abnormalities which are risk factors for cardiac disease and Diabetes Mellitus Type 2 (WHO 2011e:12).

3.7 VALIDITY AND RELIABILITY

Instrument validity seeks to determine whether an instrument accurately measures the things it is expected to measure within the context in which it is used (Brink, van der Walt and van Rensburg 2012: 165). Otherwise, according to these authors, results can be meaningless to the study. (Brink, van der Walt and van Rensburg 2012: 165). Face validity determines if the instrument measures what it is meant to, while content validity assesses how effectively the instrument represents all the parts of the variable that are to be measured (Brink *et al.* 2012: 165-166).

Reliability is the extent to which a research instrument can be depended upon to give consistent results when it is used repeatedly over a period of time on the same individual, or if it used by two different researchers. The reliability of an instrument is expressed by a correlation measure (number) that varies between 0 and 1. The closer the measure is to 1, the higher the correlation will be (Brink *et al.* 2012: 169).

The Nutrition Knowledge Questionnaire (*A General Nutrition Knowledge Questionnaire for Adults)* designed by Parmenter and Wardle (1999) was

chosen for use in this study because it covers a variety of nutrition topics. It has also been found to meet criteria for reliability as well as construct validity, with the internal consistency of each section, and the test-retest reliability above the minimum requirement of 0,7 as stated by Parmenter and Wardle (1999: 301). The questionnaire was adapted and used recently in a study amongst Iranian university students, including nursing students. After being translated to suit Iranian food culture, it was found to be reliable, with a Cronbach's alpha value of 0.80 for the knowledge section (Azizi, Aghaee, Ebrahimi and Ranjbar 2011: 351). The general nutrition knowledge questionnaire was also used by Peltzer (2004) to test nutrition knowledge in urban black and white South Africans, with the Cronbach's alpha score for the different sections of the questionnaire ranging from 0.68 to 0.79 (Peltzer 2004: 26).

Table 3. 1 ***Table of Comparisons: Nutrition Knowledge Questionnaire***

STUDY	VALIDITY	RELIABILITY
Parmenter and Wardle (1999)	Good construct validity $F(1167) = 200.5$, $P < 0.001$ [Nursing experts scored better than computer experts]	Test-retest reliability above 0.7 Internal reliability using Cronbach's alpha values: Dietary recommendations:0.7 Sources of nutrients: 0.95 Choosing every day foods: 0.76 Diet-disease relationships: 0.94
Peltzer (2004)		Cronbach's alpha values in pilot study: Dietary recommendations: 0.74 Sources of nutrients: 0.70 Choosing everyday food:0.68 Diet-disease relationship: 0.79
Azizi, Aghaee, Ebrahimi and Ranjibar (2011)	Knowledge: $F=4.05$ $P < 0.001$ Attitudes: $F=3.68$, $P < 0.003$ [Nursing students scored highest while business management students scored lowest in knowledge score]	Cronbach's alpha values Knowledge: 0.80 Attitude towards nutrition and related diseases: 0.81

The Food Frequency Questionnaire (FFQ) was obtained from the Department of Food and Nutrition Consumer Sciences at the Steve Biko Campus at the Durban University of Technology. The seven day FFQ is divided into nine food groups and is used to measure an individual's food intake as recommended by the Food and Agriculture Organisation (FAO) of the United Nations (Oldewage-Theron and Kruger 2008; Steyn *et al.* 2006b). A validated seven day FFQ using the nine food groups has been used in a previous study to analyse food variety and dietary diversity (Oldewage-Theron and Kruger 2008), while another South African study used the nine food groups to assess dietary diversity (Labadarios, Steyn and Nel 2011). (See Table 3.2).

Table 3. 2 ***Previous use of Food Frequency Questionnaire: validity***

AUTHOR / STUDY	VALIDITY
Steyn, Nel, Nantel, Kennedy and Labadarios (2006b)	Calculations of food variety score(FVS) and dietary diversity score(DDS) and mean adequacy ratio (MAR). Pearson's correlation tests done between FVS and MAR, DDS and MAR.
Oldewage and Kruger (2008)	Use of an adapted, previously validated seven day Food Frequency Questionnaire. Different cut-off points used to determine levels of food variety and dietary diversity. Pearson's correlation tests done to determine significant relationships. Food variety, dietary diversity, mean adequacy ratio of different foods used.
Labadarios, Steyn and Nel (2011)	Dietary diversity score calculated using nine food groups, as used in a validation study on children (Steyn *et al.* 2006b)

3.8 DATA ANALYSIS

Descriptive statistics were used to describe and organize data collected (Polit and Beck 2012: 379). The use of descriptive statistics, including frequency distributions and graphs were used to describe socio-demographic data including the respondents' age, gender and level of training. Measures of central tendency and variability were used to describe the anthropometric measurements and knowledge scores.

Inferential statistics help to draw conclusions about the characteristics of a population based on the sample used during the study. Inferential tests include parametric and non-parametric tests (Brink, van der Walt and van Rensburg 2012: 190). Such statistics test for significant trends in the data, which it does in an objective manner (Polit and Beck 2012: 404) Parametric tests include the t-test and analysis of variance (ANOVA) (Brink, van der Walt and van Rensburg 2012: 190). ANOVA shows the differences between two means so they can be compared (Brink, van der Walt and van Rensburg 2012: 190). Non-parametric tests including the chi-square goodness-of-fit test, the Kruskal-Wallis test and the Mann-Whitney U test were used.

The chi-square goodness-of-fit was applied to categorical variables to ascertain whether the category options were chosen equally or whether there was a significantly higher or lower frequency of choice of any one or more options. A goodness-of-fit test determines how closely a group or the distribution of a score comes to what is considered normal or what is expected (Treece and Treece 1986: 505).

The Kruskal - Wallis test, an equivalent of ANOVA (Brink, van der Walt and van Rensburg 2012: 192), was used to test whether or not significant differences exist in an interval scale variable for the different categories of a nominal variable (16 August 2013, e-mail from Mrs G Hendry, statistician). This tests the difference between three or more independent groups, based on ranked scores (Polit and Beck 2012: 732). If the variable had more than 2

categories and there were significant differences, further analysis was done using the Mann-Whitney U Test (16 August 2013,e-mail from Mrs G Hendry, statistician).

The Mann-Whitney U Test is a non-parametric test (Polit and Beck 2012: 733), done on pairs of categories to ascertain if significant differences exist for the interval variable between the two categories. Pearson's correlation tests were used to see if there was a significant correlation between two interval or ordered variables (16 August 2013, e-mail from Mrs G Hendry, statistician). This is a correlation coefficient (Polit and Beck 2012: 737).

The SPSS Statistics version 17 computer package was used to assist in the analysis of the data. Throughout a *p*-value of 0.05 was used to indicate significance. The validity of results depended on the correct and appropriate use of statistical tests such that assumptions were not violated.

Analysis of the food frequency questionnaire was done using the SPSS Statistics version 17 programme and Excel spreadsheets. The results of the food frequency questionnaire and the nutrition knowledge questionnaire were used, and the results of these two questionnaires have been correlated and will be reported on in chapters four and five.

3.9 LIMITATIONS OF THE STUDY

Only one population of nurses was used, i.e. student nurses attending lectures during the research period. The study excluded other categories of learner nurses, such as pupil nurses, in sub-campuses of the KwaZulu-Natal College of Nursing. It only considered nurses from one province, and from one college of nursing. There is an element of this study being a convenience study, as the researcher used nurses who were in the campus attending lectures rather than those working in clinical areas.

3.10 ETHICAL CONSIDERATIONS

It was important that ethical guidelines were followed during the research process.

3.10.1 Permission to conduct the study

Initial permission was obtained from the Principal of KwaZulu-Natal College of Nursing (KZNCN) to collect information regarding student groups and numbers (Annexure A).

Ethical clearance from the Institutional Research and Ethics Committee at Durban University of Technology was obtained. (No. 020/13) (Annexure B).

Permission was obtained from the Principal of KZNCN (Annexure C), as well as the Principals of the four campuses that were used in the study.

Permission was obtained from the KwaZulu-Natal Department of Health to carry out the study at the selected Campuses (Annexure D).

3.10.2 Privacy and confidentiality

An Introductory Letter was written to participants with regard to potential harm (none anticipated) and benefits, and the purpose of the study (Annexure J). It was important that students were informed of measures to maintain privacy and confidentiality, particularly with regard to taking and recording of height, weight and waist circumference. This information was included in the information advertisement (Annexure E) as well as the Letter of Information given to students. The advertisement informing students of the study and inviting them to participate was sent to the Campus Principal for distribution to students. Students were informed of the planned research process when they came to the campus for a lecture block, through an advertisement poster on notice boards situated in the various campuses. It was planned that a screened off area would be created at the back of the room where participants were not easily observed by their peers. Students would come into the area individually for measurements to be taken. If there was a separate venue close to the room used by students while filling in the

questionnaire this was used by the researcher for taking measurements. At all visits a separate venue had been made available for students to have their anthropometric measurements taken and recorded. Only the researcher taking the measurements was in the area with the student. Although anonymity was not possible during data collection because the researcher interacted with students while collecting anthropometric measurements of the participants, anonymity was assured in the publication of data, as no student names were entered onto the documents. No students were identified, but the campuses used in the study were identified initially for statistical purposes (total student numbers from each campus used). Students were asked to enter the name of their campus on the questionnaire, as well as their level of training. They were not required to give their names. Each questionnaire was numbered after it had been completed and returned to the researcher.

Written informed consent from participants was required. A consent form was attached to the Letter of Information so that once the study had been explained, and the students had read the letter and asked any questions, the consent form was signed (Annexure J).

The questionnaires and other related documents are kept in a locked cupboard, and then after a specified period of fifteen years will be destroyed according to Durban University of Technology protocol. All paper documentation will be shredded and electronic records will be deleted from the password protected file

3.10.3 Reporting of results

It is required that the results of the study be reported to the Principal of the KwaZulu-Natal College of Nursing, and to the Research and Ethics Department of the KwaZulu-Natal Department of Health (Annexures C and D).

3.11. CONCLUSION

The study involved four Campuses within KZNCN. Data, including socio-demographic information, nutrition knowledge and food intake, was collected from students across all four years of training, using a three part questionnaire, and by collecting anthropometric measurements. All the data collection was done by the researcher.

CHAPTER 4

PRESENTATION OF RESULTS

The data collected from respondents will be reported on in this chapter, using the objectives defined for this study. Some results are illustrated with tables and figures.

4.1 SAMPLE REALISATION

With an estimated population of 2000 student nurses undertaking the R425 course in KZNCN, the aim was a sample size of 387 students across the four years of study across the campuses, which included an extra 20 percent in case of non-response. Students across the four years of study at four different Campuses were invited to participate. A total of 407 questionnaires were returned by respondents. Nine questionnaires were excluded from the analysis because the Food Frequency Questionnaire component was not completed by three respondents, and six respondents did not agree to have their height, weight and waist circumference measured by the researcher. A total of 398 questionnaires was therefore used for the analysis (n= 398). Where analyses were done regarding gender differences the number used was 396 (n= 396) as two respondents did not indicate their gender.

4.2 ANALYSIS OF DATA COLLECTED

Descriptive statistics were used to calculate the response frequency. Means and standard deviations were calculated for knowledge scores. Frequency tables and graphs have been used to depict results. During the analysis of the data various tests were used as described in Chapter 3. Data were entered into SPSS Statistics version 17, and various inferential analyses were carried out.

4.3 OBJECTIVE 1: TO DESCRIBE THE SOCIO-DEMOGRAPHIC PROFILE OF STUDENT NURSES AT THE KWAZULU-NATAL COLLEGE OF NURSING

The number of respondents from each Campus varied, with the smallest number of respondents n= 82 (20.6%) from Campus C, and the largest group n= 114 (28.6%) from Campus A. The largest group of respondents were in their third year of training n= 139 (34.9%). Second year respondents n= 78 (19.6%) were the smallest group. Refer to Tables 4.1 and 4.2.

Table 4.1 ***Student numbers per campus (n= 398)***

Campus	Student Numbers	Percentage (%)
A	114	28.6
B	105	26.4
C	82	20.6
D	97	24.4
Total	**398**	**100.0**

Table 4.2 ***Students' year of training (n= 398)***

Year of study	Student Numbers	Percent (%)
First	98	24.6
Second	78	19.6
Third	139	34.9
Fourth	83	20.9
Total	**398**	**100.0**

Of the total sample (n= 398), 76.1% (n= 303) were bursary students, while another 20.6% (n= 82) were either employees in their training hospital or on secondment from another hospital.

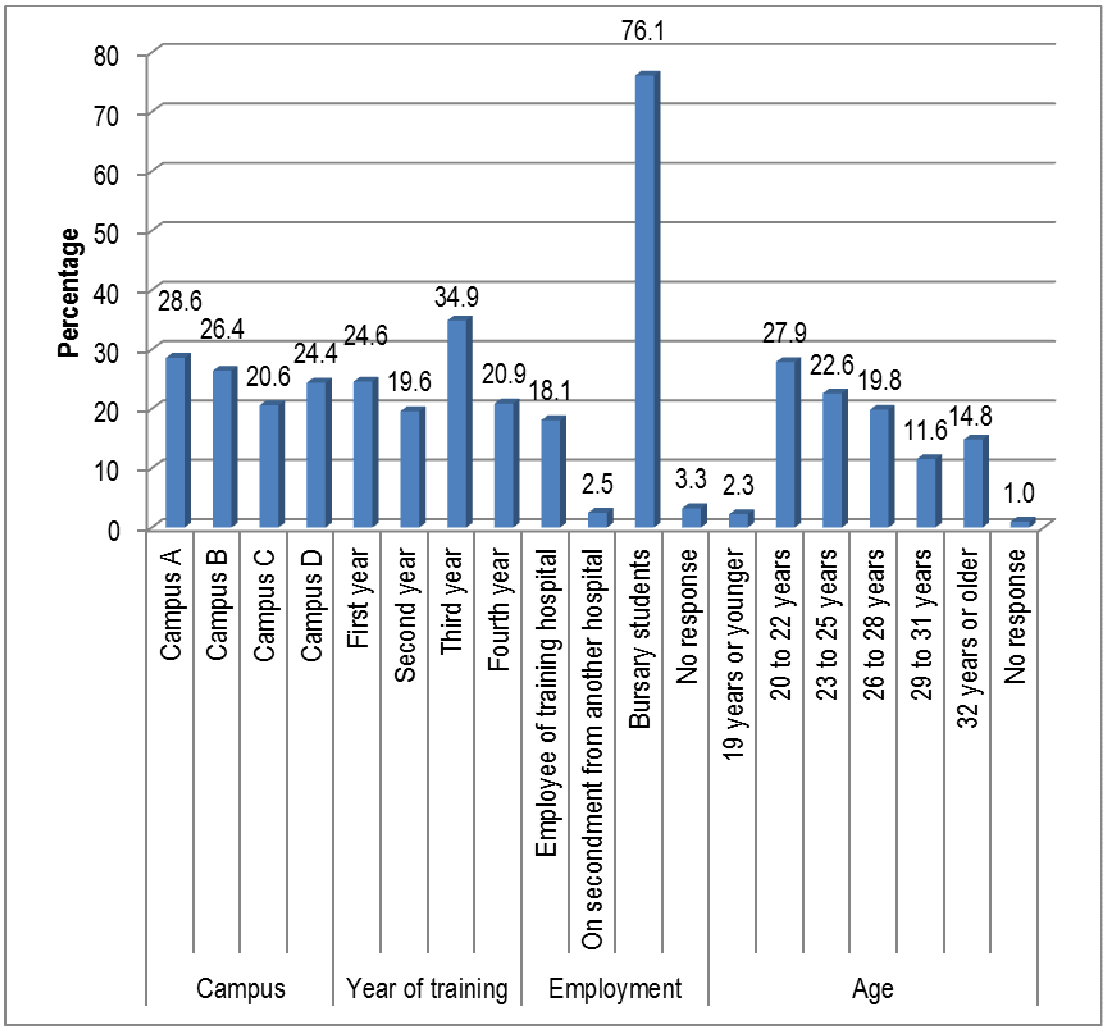

Figure 4.1 ***Respondent percentages according to campus, year, employment status and age***

The largest number of respondents 27.9% (n= 111) were aged from 20 to 22 years, followed by 22.6% (n= 90) who were aged 23 to 25 years. See Figure 4.1.

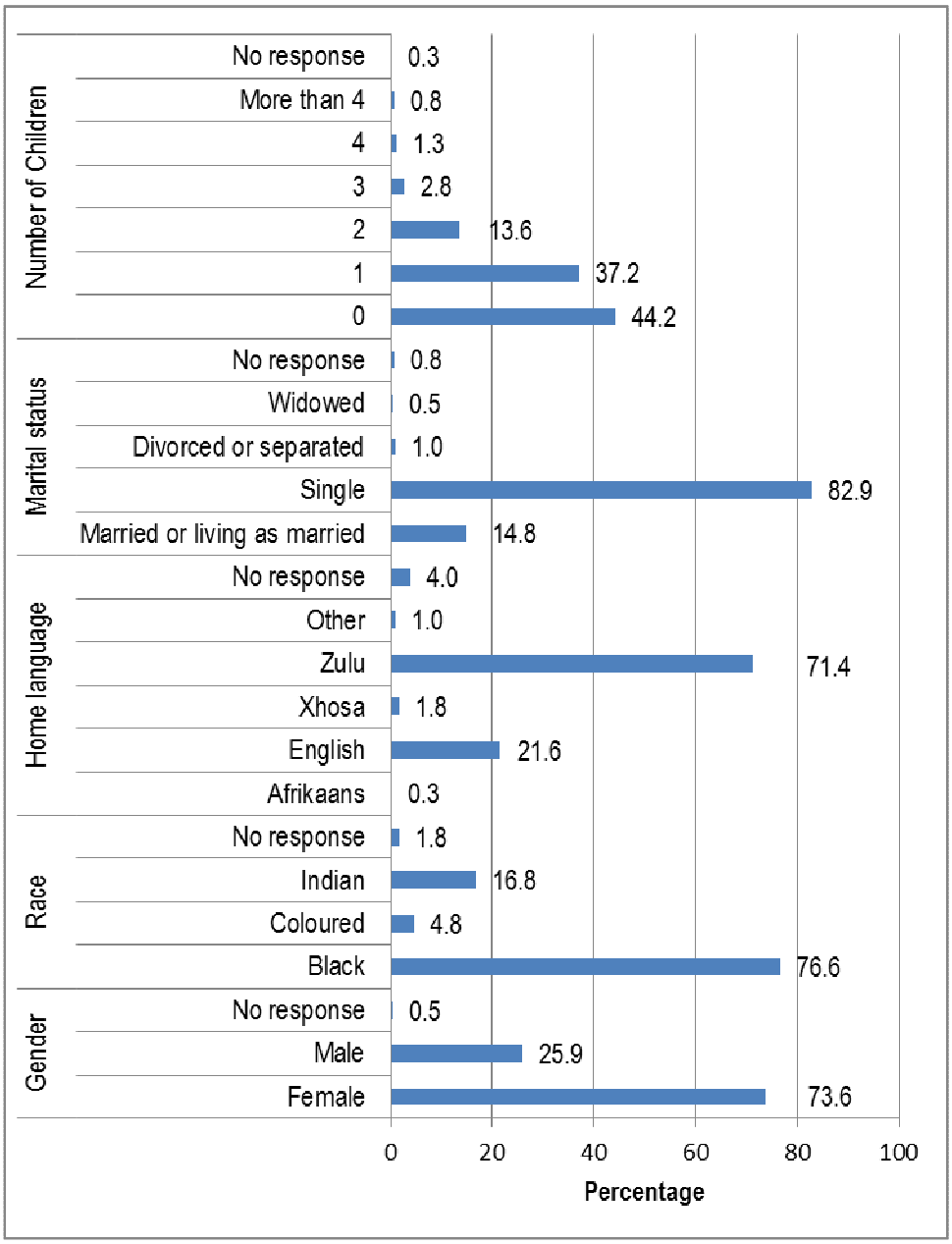

Figure 4.2 ***Respondent percentages according to gender, race, home language, marital status and number of children***

The information in Figure 4.2 indicates that the majority of the respondents (76.6% n= 305) were Black.

Most were female 73.6% (n= 293) and mostly single 82.9% (n= 330).

Two hundred and eighty respondents (70.3%) were from twenty to twenty-eight years old, and a large percentage 71.4% (n= 284) were Zulu speaking.

More than half the respondents have children n= 221 (54.9%). See Figure 4.2.

When asked how much they spent on food for themselves each month, most respondents n= 129 (32.4%) spent R401.00 to R600.00 per month on food, followed by n= 116 (29.1%) who spent from R201.00 to R400.00. See Table 4.3.

Table 4.3 ***Amount of money students spent on food for themselves each month (n= 398)***

Amount in Rands (R)	Student Numbers	Percent (%)
R200.00 or less	26	6.5
R201.00 to R400.00	116	29.1
R401.00 to R600.00	129	32.4
R601.00 to R800.00	64	16.1
R801.00 or more	60	15.1
No response	3	0.8
Total	**398**	**100.0**

Just over a third of the respondents 33.4% (n= 133) indicated that they live at home with their family during training, while almost two thirds 64.8% (n= 258) of the students live away from home.

A total of 136 respondents (34.2%) eat meals that they prepare or provide for themselves at the hospital residence, and a further 95 respondents (23.9%) eat meals they have prepared or provided at their rented accommodation. Sixty-one respondents (15.3%) indicated that they ate meals at the hospital dining room / canteen, as shown in Figure 4.3.

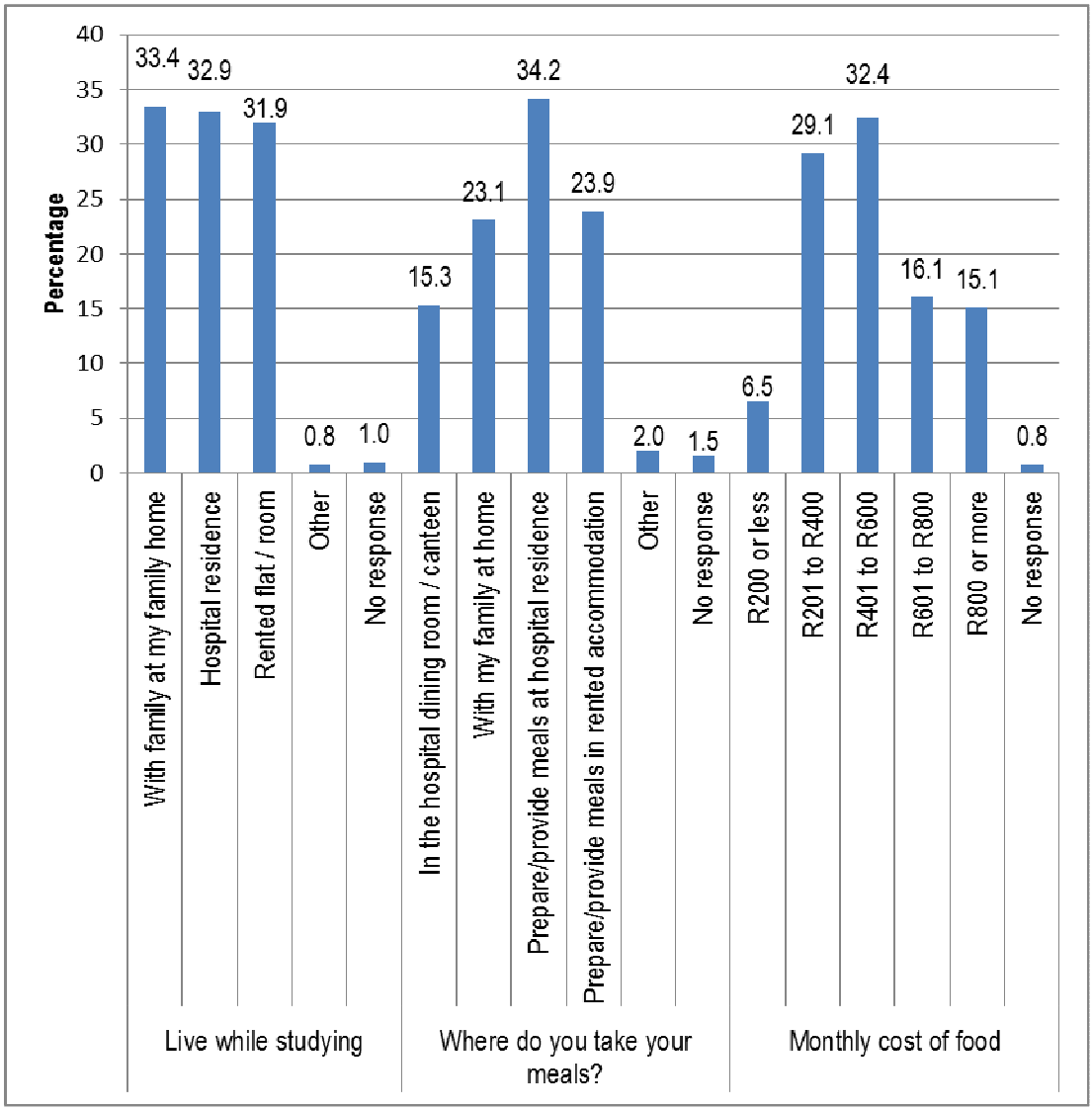

Figure 4.3 ***Respondent percentages for accommodation, venue for meals, amount spent on food***

4.4 OBJECTIVE 2:

TO GATHER ANTHROPOMETRIC MEASUREMENTS INCLUDING HEIGHT, WEIGHT AND WAIST CIRCUMFERENCE, TO DETERMINE BODY MASS INDEX (BMI) AND WAIST-TO-HEIGHT RATIO (WHTR) OF STUDENT NURSES IN THE STUDY.

4.4.1 Weight changes

Just over half the respondents n= 202 (51%) reported a weight increase during nurse training, while a smaller number n= 72 (18%) indicated that they had lost weight. See Figure 4.4.

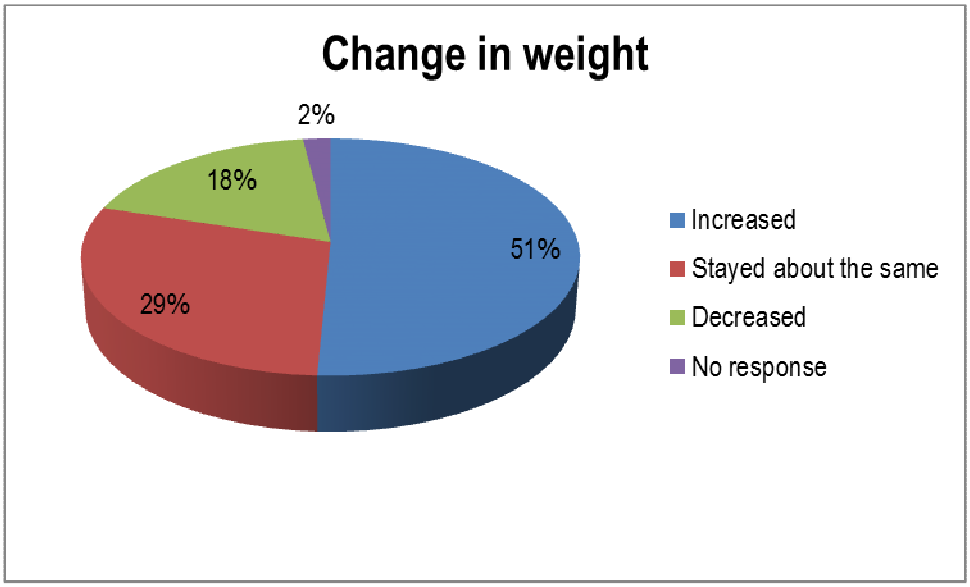

Figure 4.4 ***Weight changes during training***

Table 4.4 ***Anthropometric measurements of respondents (n = 398)***

Measurement	Number	Minimum	Maximum	Mean	±Standard Deviation
Body weight in kg	398	36.70	135.70	70.31	±16.048
Height in cm	398	145.00	195.00	160.92	±8.195
Waist circumference in cm	398	60.00	123.00	82.92	±12.472
Body Mass Index (BMI)	398	15.70	49.10	27.20	±6.090
Waist To Height Ratio (WHTR)	398	0.36	0.78	0.51	±0.080

4.4.2. Body Mass Index

Body Mass Index calculations showed that in total 59.8% of the sample was overweight. The mean Body Mass Index was 27.20 kg/m², SD ±6.090. See Tables 4.4 and 4.5. There was no statistically significant difference between the Body Mass Index of the different race groups.

Table 4.5 ***Body Mass Index Category (n=398)***

BMI Category (kg/m²)	Student Numbers	Percent (%)
Underweight < 18.49	17	4.3
Normal weight ≥18.5 ≤ 24.99	143	35.9
Overweight ≥ 25 ≤ 29.99	128	32.2
Obese ≥ 30 ≤ 34.99	71	17.8
Very obese ≥ 35	39	9.8
Total	**398**	**100.0**

4.4.3 Waist to height ratio

Waist to height ratio (WHTR) showed that 179 respondents (45%) had a ratio of below 0.5. 219 respondents (55%) had a ratio of 0.5 or above, indicating that they are at risk of metabolic disease. The mean was 0.51 with SD ±0.08.

Table 4.6 ***Waist To Height Ratio Risk (n=398)***

WHTR Risk	Student Numbers	Percent (%)
< 0.5	179	45
≥ 0.5	219	55
Total	**398**	**100**

For both the BMI category and the WHTR risk, a chi-square goodness of fit test was applied to ascertain whether there is a significantly higher/lower frequency in a category.

With regard to the BMI category, results from a chi-square goodness of fit analysis show that there was not an equal distribution of respondents between the categories (χ^2 (N = 398, 4) = 150.80, $p < 0.0005$). Specifically, more respondents than expected were measured as either of normal weight (35.9%) or overweight (32.2%), while fewer than expected were underweight (4.3%) or very obese (9.8%).

WHTR Risk: Analysis shows that significantly more of the sample than expected (55%) had a WHTR Risk score of at least 0.5 (χ^2 (N = 398, 1) = 4.02, $p = 0.045$). See Table 4.6.

4.4.4. Gender, BMI and WHTR

With regard to gender differences in BMI categories, higher percentages of males than females were underweight (5% of males and 4% of females), or of normal weight (52% of males and 30% of females). Greater percentages of females than males were overweight (33% of females and 30 % of males), or obese (20% of females and 13% of males). While no males were very obese, 13% of females were in this category. There was a higher percentage of males in the WHTR group with a ratio of below 0.5 (64% of males and 38% of females), but the opposite was true in the WHTR category of 0.5 and above (62% of females and 36% of males). See Figure 4.5.

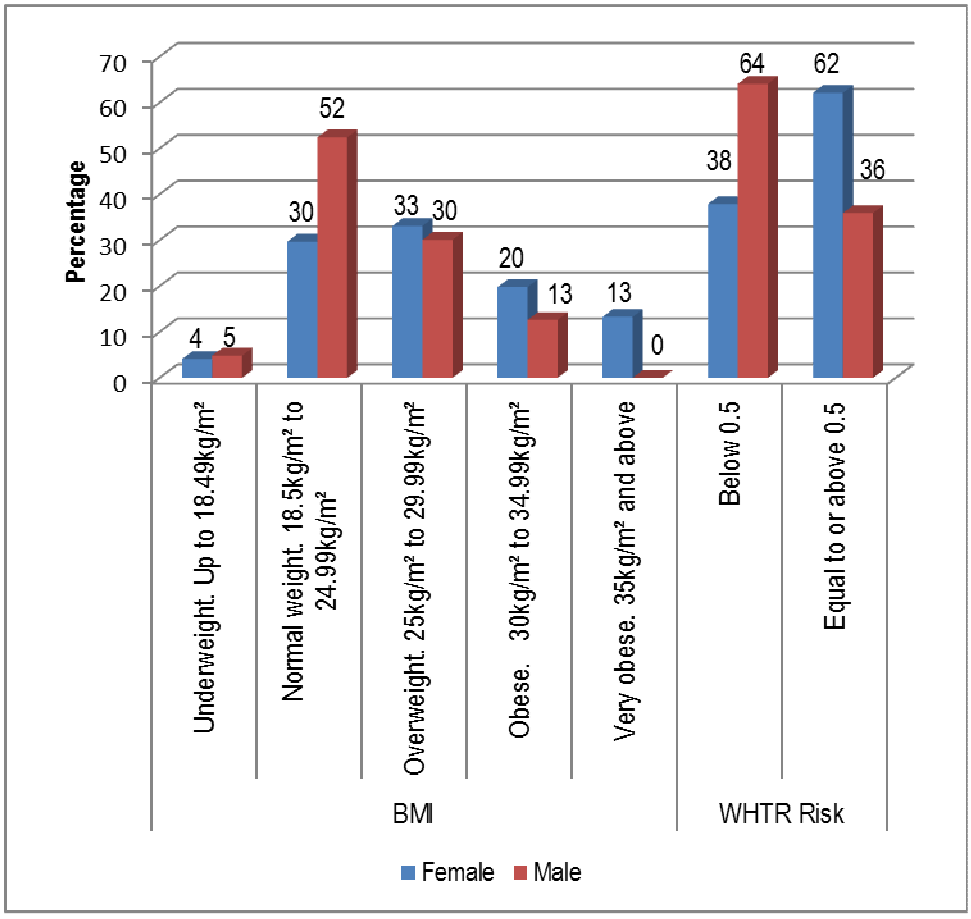

Figure 4.5 ***BMI (kg/m²) and WHTR according to gender***

4.5 OBJECTIVE 3: TO DETERMINE THE GENERAL NUTRITION KNOWLEDGE OF STUDENTS

The respondents' knowledge was assessed using the Nutrition Knowledge Questionnaire (Annexure G)**.** The questionnaire comprised of four different sections which will each be reported on. Each correct answer throughout the questionnaire scored one mark. The way in which respondents were asked to answer questions varied throughout the questionnaire. In Section One, for example, respondents were asked to respond "more" or "less" or "the same" regarding the amount of a food group to be eaten. In Section Two respondents were asked to state whether they "agreed" or "disagreed" with a particular statement regarding the sources of nutrients, or whether they were

"not sure". Some questions asked students to indicate whether a food was high or low in a particular nutrient, and the choices given were "high", "low" and "not sure".

4.5.1 Section 1: Dietary Recommendations.

This section was made up of eleven questions. The maximum possible score for this section was 11. The mean was 6.82 (SD ±1.676).

Table 4.7 ***Score on knowledge of Dietary recommendations (n = 398)***

Score for Dietary recommendations	Number	Minimum score	Maximum score	Mean	±Standard deviation
11	398	0	11	6.82	±1.676

Questions included whether or not one should be eating more or less of certain foods, and how many servings of fruit and vegetables should be consumed daily. One hundred and nine respondents (27.4%) scored seven correct answers out of 11 questions, while another 97 (24.4%) scored eight correct. Forty-eight respondents (12%) had nine or more correct answers, while 144 (36.2%) respondents scored less than seven out of 11 questions.

Table 4.8 ***Scores- Dietary recommendations (n=398)***

Score obtained	Student Numbers	Percent (%)
0	1	0.3
1	3	0.8
2	4	1.0
3	6	1.5
4	21	5.3
5	38	9.5
6	71	17.8
7	109	27.4
8	97	24.4
9	36	9.0
10	10	2.5
11	2	0.5
Total	**398**	**100.0**

Results from a chi-square goodness-of-fit test showed that significantly more than expected scored 6, 7, or 8 out of 11. (χ^2 (N = 398, 11) = 496.814, $p <$ 0.0005).

This section scored the highest mean of the four sections (62%). In this part of the knowledge questionnaire, students were asked to state whether one should be eating more or less of certain types of foods. Most respondents correctly answered that one should be eating more vegetables 93% (n= 370), fruit 89.7% (n= 357), and high fibre foods 71.1% (n= 283). The majority of respondents also knew one should eat less sugary foods 81.95% (n= 326), fatty foods 90.7% (n= 361) and salty foods 87.75% (n= 357). Ninety three percent (n= 370) and 89.7% (n= 357) of respondents correctly stated that health experts recommended that people should be eating more vegetables, and more fruit respectively. However only 19.6% (n= 78) said people should eat five servings of fruit and vegetables daily, and another 1.5% (n= 6) said

the recommended servings was six. Five servings or six servings were accepted as the correct answers. A total of 241 respondents (60.6%) gave responses ranging from one to four servings daily.

When asked what type of fat should be reduced in a diet, 191 respondents (48%) said they were not sure. One hundred and forty-four respondents (36.2%) correctly stated that the amount of saturated fat in the diet should be cut down, but in a later question, 166 respondents (41.7%) stated that cholesterol in the diet is more likely to raise one's cholesterol levels, while only 83 respondents (20.9%) stated correctly that it was saturated fats that raise cholesterol.

4.5.2 Section 2: Sources of foods/nutrients

This section tested the respondents' knowledge of food groups and of the sources of different nutrients. Questions in this section asked whether foods were high or low in a particular nutrient, such as whether ice cream is high or low in added sugar, and whether baked beans are a healthy alternative to red meat. The maximum score for this section was 69.

The lowest score in this section was 6 correct answers, and the highest was 56 correct out of a possible total of 69 answers. The mean was 36.23 (SD ±8.451). See Tables 4.9 and 4.10.

Table 4.9 ***Scores on knowledge of Sources of foods / nutrients (n=398)***

Score for Sources of foods/nutrients	Number	Minimum score	Maximum score	Mean	±Standard Deviation
69	398	6	56	36.23	±8.451

The largest percentage of respondents, 23.2% (n= 92) gave 31 to 35 correct answers, followed by 22.2% (n= 88) with 36 to 40 correct answers. See Table 4.10.

Table 4.10 ***Scores - Sources of foods / nutrients (n=398)***

Score obtained	Student Numbers	Percent (%)
6 – 10	5	1.3
11 – 15	2	0.5
16 – 20	6	1.6
21 – 25	25	6.3
26 – 30	50	12.6
31 – 35	92	23.2
36 – 40	88	22.2
41 – 45	84	21.1
46 – 50	33	8.5
51 - 56	13	3.4
Total	**398**	**100.0**

An independent samples t-test was applied to test whether the average score for this section was significantly different from 50%. It was found that the average score of 36.23 (52.5%) was significantly different from 50% ($t(397) = 4.093$, $p < 0.0001$).

One area in this section where respondents did not appear to have a good understanding was on the types of fats and the fat content of different foods, as evidenced in a variety of questions. Three hundred and forty-eight respondents (87.4%) responded incorrectly that low fat spread was low in fat. Two hundred and six respondents (51.8%) knew that polyunsaturated margarine is high in fat. However, 291 respondents (73.1%) answered that sunflower margarine is high in saturated fat, and only 59 (14.8%) were correct in stating that it is low in unsaturated fats. Only 70 respondents (17.6%) knew that butter and margarine have the same number of kilojoules. One hundred and twenty-five respondents (31.4%) answered incorrectly that polyunsaturated margarine contains less fat than butter does. One hundred and twenty-seven respondents (31.9%) stated incorrectly that harder fats

contain more polyunsaturated fats, and a further 147 (36.9%) said they were not sure, while 103 respondents (25.9%) knew that the answer was saturated fats. Only 74 respondents (18.6%) answered that fats have the most kilojoules for weight, while 114 (28.6%) chose starch and another 82 (20.6%) chose sugar as the answer. Two hundred and twenty-six respondents (56.8%) answered correctly that luncheon meat (polony) is high in fat, but only 87 (21.9%) stated correctly that cottage cheese was low in fat.

Mostly respondents answered correctly, when asked about the added sugar content of different foods, except for a couple of questions. Only 24.6% (n = 98) of respondents knew that tomato sauce was high in added sugar. Nearly half the respondents, 47.7% (n= 190) indicated that bananas were high in added sugar. This was possibly a misinterpretation of the statement, with respondents thinking of bananas being naturally high in sugar. In this section respondents were asked whether brown sugar was a healthy alternative to white sugar. Only 30 respondents (7.5%) correctly answered “no”, while 344 students (86.4%) said brown sugar was a healthy alternative.

4.5.3 Section 3: Choosing everyday foods

Respondents were given ten questions, which asked them to make the best food choice. In each question there was a list of foods from which to choose. An example was selecting the best meal if one was trying to reduce the amount of salt in the diet. The maximum possible score for this section was 10. See Table 4.11.

Table 4.11 ***Score on knowledge of Choosing every day foods (n=398)***

Maximum possible score for : Choosing every day foods	N	Minimum score	Maximum score	Mean	±Standard Deviation
10	398	0	9	4.43	±1.652

None of the respondents scored full marks for this section. One respondent obtained the highest mark of nine correct answers. The largest percentage, 22.9% (n= 91) obtained five correct answers. See Table 4.12.

Table 4.12 ***Scores – Choosing every day foods (n=398)***

Score obtained	Student Numbers	Percentage (%)
0	2	0.5
1	9	2.3
2	41	10.3
3	66	16.6
4	87	21.9
5	91	22.9
6	55	13.8
7	37	9.3
8	9	2.3
9	1	0.3
Total	**398**	**100.0**

Results from a chi-square goodness-of-fit analysis showed that more respondents than expected scored five or six, while fewer respondents than expected scored zero, one, eight or nine correct (χ^2 (N = 398, 10) = 332.975, $p < 0.0005$). However, 74.4% (n= 296) of respondents scored five or less out of nine.

When asked a question about choosing a high fibre, low fat snack, 157 respondents (39.4%) chose a muesli bar and 117 (29.4%) chose cheddar cheese on whole-wheat crackers. These were both incorrect choices. In another question regarding the best choice of chips to eat if wanting to reduce fat, only 50 respondents (12.6%) correctly chose thick cut chips, while 186 (46.7%) chose thin cut chips and 159 (39.9%) chose crinkle cut chips. This further appears to illustrate the respondents' lack of understanding of fat contents of foods. Many respondents chose stir-fried vegetables in soy sauce

as the best low salt option, demonstrating a lack of knowledge of salt content in the sauce. On a positive note, while only 87 respondents (21.9%) correctly responded in an earlier question that cottage cheese was low in fat, 223 respondents (56%) said they would choose cottage cheese as a low fat cheese option.

4.5.4 Section 4: Diet-disease relationships

In this section students were asked whether they were aware of health problems related to, for example, a lack of fibre in the diet. Other questions asked whether the presence of particular nutrients in the diet was related to disease, such as whether certain nutrients could help reduce the chances of cancer.

Respondents could respond with “yes”, “no” or “not sure”. Only the respondents who answered “yes”, were then considered for the next part of the question “... if yes, what diseases result ...”.

Table 4.13 ***Score for knowledge of Diet-disease relationships (n = 398)***

Score for diet- disease relationships	N	Minimum score	Maximum score	Mean	±Standard Deviation
20	398	0	16	7.16	±2.819

The maximum score for this section was 20. The largest group of respondents n= 66 (16.6%) scored eight correct answers out of a possible score of 20. A total of 350 respondents (88%) scored 50% or less for this section. None of the respondents scored more than 16 out of 20. See Table 4.13.

Table 4.14 ***Scores - Diet-disease relationships (n=398)***

Score	Student Numbers	Percent (%)
0	3	0.8
1	8	2.0
2	9	2.3
3	19	4.8
4	16	4.0
5	50	12.6
6	62	15.6
7	54	13.6
8	66	16.6
9	41	10.3
10	22	5.5
11	14	3.5
12	20	5.0
13	8	2.0
14	3	0.8
15	2	0.5
16	1	0.3
Total	**398**	**100.0**

While the majority of respondents indicated an awareness of the diet-disease relationship, naming the associated health problems did not always yield good scores. Two hundred and forty-five respondents (61.6%) were aware of a link between low intake of fruit and vegetables and health problems, but 180 of them (73.5%) did not name a disease, while another 61 (24.9%) named only one disease correctly. The response for lack of fibre was better, with 285 (71.6%) correctly naming an associated health problem. Three hundred respondents (75.4%) were aware that there were health problems related to how much sugar one eats, but only 17 (4.3%) mentioned tooth decay, which was the recommended answer. A total of 242 (60.8%) respondents reported that diabetes is linked to how much sugar is in the diet.

Two hundred and ninety-one respondents (73.1%) had not heard of antioxidant vitamins. Students were asked whether more or less of certain foods helped to reduce the chances of cancer, such as “Does eating more fruit and vegetables help reduce the chance of cancer?” For each of the six foods named, the majority of respondents (between 172 and 287, (43.2% to 72.1%)) responded with a “yes” answer, demonstrating a lack of knowledge in this section (three answers were correct as “yes”, and three as “no”). A similar pattern was noticed when respondents answered the same type of question relating to the prevention of heart disease.

4.5.5 Overview of nutrition knowledge scores.

A summary of the average percentage score across the sample for the four sections of the questionnaire follows in Table 4.15 and Figure 4.6

Table 4.15 ***Average scores across four sections of the Nutrition Knowledge Questionnaire***

Section of questionnaire	Maximum possible score	Mean score	Mean percentage
Dietary recommendations	11	6.82	62.0
Food / nutrient sources	69	36.23	52.5
Choosing everyday foods	10	4.43	44.3
Diet-disease relationships	20	7.16	35.8

The results suggest that students’ knowledge of sources of nutrients and nutrient intake is adequate, with mean percentages above 50, but the knowledge of the role of nutrients in relation to disease, and of making correct food choices is inadequate. It must be noted however, that for comparative purposes, only scores for the students who responded “yes” to being aware of a diet-disease relationship were used.

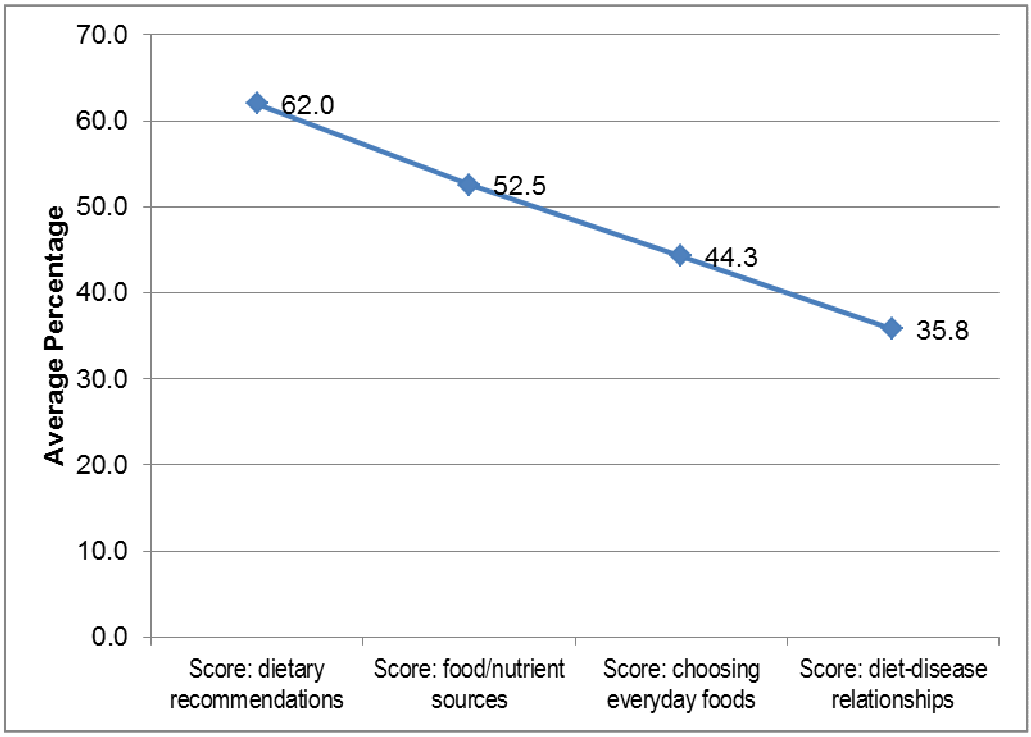

Figure 4.6 ***Average percentage for different sections of Nutrition Knowledge Questionnaire***

The mean score for the respondents for the entire Nutrition Knowledge Questionnaire was 49.67 % (SD 10.428) as shown in Table 4.16

Table 4.16 ***Average percentage of the Nutrition Knowledge Questionnaire***

	N	Range	Minimum	Maximum	Mean	±Standard deviation
Total percentage	398	68.18	11.82	80.00	49.67	±10.428

4.5.6 Exploring relationships between knowledge and various demographic factors

Various relationships were explored using the available data, and are illustrated in Tables 4.17, 4.18 and 4.19. These included any association between knowledge and gender, and knowledge differences between the genders, knowledge and year of study, as well as knowledge with age and with BMI.

Table 4.17 ***Knowledge by Gender (female n = 293; male n = 103)***

Section of questionnaire	Gender	Number	Mean score	±Standard Deviation
Dietary recommendations	Female	293	6.97	±1.644
	Male	103	6.48	±1.614
	Total	396	6.84	±1.648
Food / nutrient sources	Female	293	36.91	±7.922
	Male	103	34.40	±9.621
	Total	396	36.26	±8.457
Choosing everyday foods	Female	293	4.48	±1.671
	Male	103	4.29	±1.607
	Total	396	4.43	±1.654
Diet-disease relationships	Female	293	7.40	±2.736
	Male	103	6.51	±2.957
	Total	396	7.17	±2.819

Because two students did not indicate their gender the total number of students used in this analysis was 396 not 398.

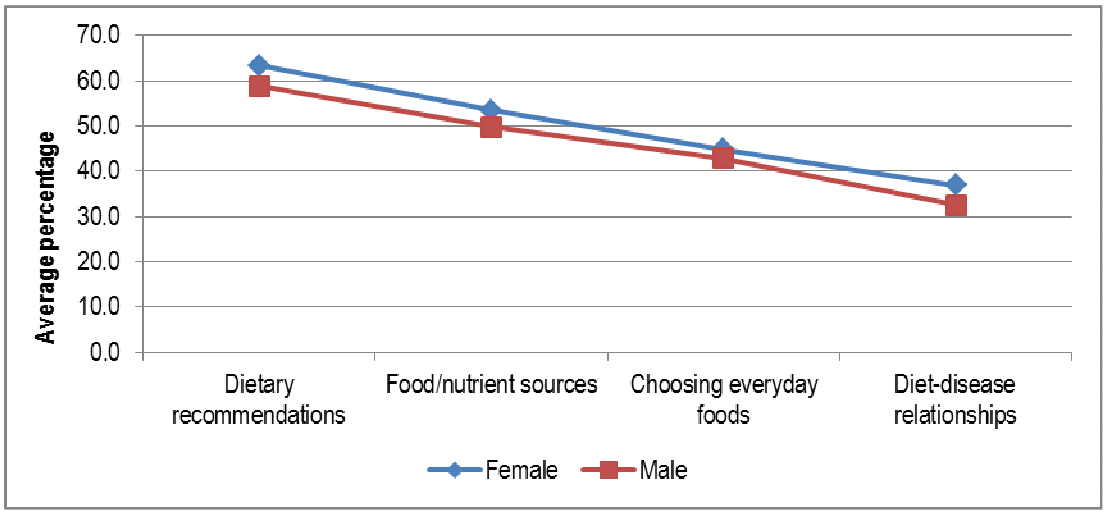

Figure 4.7 ***Comparison of knowledge scores between genders***

Females scored significantly higher than the males regarding knowledge about dietary recommendations (X^2(N=396,1) = 7.378; p = 0.007), food/nutrient sources (X^2(N=396,1) = 5.555; p = 0.018), and diet-disease relationships (X^2(N=396,1) = 9.288; p = 0.002). However, there is no statistically significant difference in the groups' knowledge of choosing every day foods. See Table 4.17 and Figure 4.7

Table 4.18 indicates the results of the respondents' knowledge of each section of the questionnaire according to the year of study.

Table 4.18 ***Knowledge by Year of study (n = 398)***

Section of Questionnaire	Maximum score	Year of study	Number	Mean	±Standard Deviation
Dietary recommendations	11	First	98	6.23	±1.704
		Second	78	6.90	±1.456
		Third	139	6.95	±1.750
		Fourth	83	7.22	±1.554
		Total	398	6.82	±1.676
Food / nutrient sources	69	First	98	33.19	±8.960
		Second	78	37.95	±7.887
		Third	139	38.04	±7.675
		Fourth	83	35.18	±8.528
		Total	398	36.23	±8.451
Choosing everyday foods	10	First	98	4.35	±1.408
		Second	78	4.31	±1.677
		Third	139	4.79	±1.705
		Fourth	83	4.02	±1.711
		Total	398	4.43	±1.652
Diet-disease relationships	20	First	98	5.80	±2.596
		Second	78	7.35	±2.603
		Third	139	7.59	±2.771
		Fourth	83	7.88	±2.852
		Total	398	7.16	±2.819

As all scores were significant, the Mann-Whitney U test was applied on pairs of categories to see where the differences lie.

Score: Dietary recommendations

There is a statistically significant difference in the knowledge of the students from different years of study (X^2 (N=398,3) = 21.943; $p < 0.0005$). Specifically, first years scored significantly lower than second years (Z(N=176) = -2.713, $p = 0.007$), third years (Z(N=237) = -3.672, $p < 0.0005$) and fourth years (Z(N=181) = -4.381, $p < 0.0005$).

Score: Food/nutrient sources

There is a statistically significant difference in the knowledge of the students from different years of study (X^2 (N= 398,3) = 25.087; $p < 0.0005$). Specifically, first years scored significantly lower than second years (Z(N= 176) = -3.533, $p < 0.0005$) and third years (Z(N= 237) = -4.617, $p < 0.0005$). An interesting result was that third years scored significantly higher than fourth years (Z (N= 222) = -2.576, p= 0.010).

Score: Choosing everyday foods

There is a statistically significant difference in the knowledge of the students from different years of study (X^2 (N= 398,3) = 11.501; $p < 0.009$). Specifically, first years scored significantly lower than third years (Z (N= 237) = -2.209, p= 0,027) and third years scored significantly higher than fourth years (Z(N= 222) = -3.073, $p = 0.002$).

Score: Diet – disease relationships

There is a statistically significant difference in the knowledge of the students from different years of study (X^2 (N= 398,3) =36.562; $p < 0.0005$). Specifically, first years scored significantly lower that second years (Z (N= 176) = -3.893, $p < 0.0005$), third years (Z (N= 237) = -5.235, $p < 0.0005$) and fourth years (Z (N= 181) = -5.095, $p < 0.0005$).

Knowledge and Age

There were no statistically significant differences in any of the scores for different age categories.

Knowledge and BMI

The Pearson's correlation was applied to test whether there was any correlation between the two variables of knowledge and Body Mass Index.

The calculated value for BMI is significantly positively correlated with the score for dietary recommendations (r= 0.169, *p*= 0.001). This means that the higher the knowledge score for dietary recommendations, the higher the BMI. In other words, high/low values for the knowledge score are associated with high/low values for BMI. This is an unexpected direction as one would anticipate that an increased knowledge score for dietary recommendations would be associated with a lower BMI. See Table 4.19

The calculated value for BMI has no significant correlation with the knowledge scores for food / nutrient sources, choosing every day foods or diet-disease relationships.

Table 4.19 ***Correlation between Body Mass Index and the four sections of the Nutrition Knowledge Questionnaire***

		BMI calculated	**Score: Dietary recommendations**	**Score: Food / nutrient sources**	**Score: Choosing everyday foods**	**Score: Diet – disease relationships**
BMI calculated	Pearson correlation	1	0.619*	0.084	0.052	0.072
	Significance (2-tailed)		0.001	0.096	0.300	0.419
	n	398	398	398	398	398

*Correlation is significant at the 0.01 level (2-tailed)

4.6 OBJECTIVE 4. TO ILLUSTRATE THE FOOD VARIETY AND DIETARY DIVERSITY OF NURSING STUDENTS

The food frequency questionnaire in which the students were asked to identify the foods they had eaten over the last seven days, was used to determine food variety and dietary diversity (See Annexure F).

Nine nutrient food groups with a count of individual foods within each group is reported in the Food Variety Score Table (Table 4.20). The total number of individual food items consumed by respondents over a period of seven days ranged from 13 to 57. The total sum of all the food items eaten by the respondents over the seven days was 75.

Table 4.20 ***Food Group Variety consumed over a period of seven days (n =398)***

Flesh Group (n=10)	Egg Group (n=1)	Dairy Group (n=9)	Cereal Group (n=9)	Legumes Group (n=5)	Vitamin A- Rich Group (n=7)	Fruit Group (n=15)	Vegetable Group (n=12)	Fat Group (n=7)	Total Individuals' Food Items Eaten From All Food Groups (n=57)
0= 0	0= 86	0= 19	0= 0	0=100	0=35	0=15	0= 0	0= 0	0-12= 0
1= 4	1=312	1= 47	1= 1	1=151	1=78	1=27	1= 2	1= 11	13-15= 5
2= 22		2= 95	2= 1	2= 91	2=78	2=31	2= 12	2= 40	16-20=26
3= 53		3=113	3= 22	3= 41	3=86	3=66	3= 49	3= 82	21-25=45
4= 87		4= 80	4= 45	4= 13	4=74	4=73	4= 45	4=110	26-30=84
5=103		5= 34	5= 80	5= 2	5=33	5=68	5= 56	5= 94	31-35=80
6= 77		6= 6	6=111		6=12	6=47	6= 71	6= 51	36-40=85
7= 36		7= 1	7= 76		7= 2	7=33	7= 62	7= 10	41-45=45
8= 10		8= 2	8= 51			8=14	8= 48		46-50=18
9= 3		9= 1	9= 11			9=10	9= 23		51-57=10
10= 3						10=8	10=19		
						11=3	11=10		
						12=1	12= 1		
						13=1			
						15=1			

Eighty five respondents (21.3%) ate between 36 and 40 different food items, and 80 respondents (20.1%) ate between 31 and 35 food items, followed by 84 (21.1%) who ate between 26 and 30 items. The mean Food Variety Score (FVS) for all foods eaten from the different foods groups was 32.87 (SD ±8.471). This indicates a medium food variety score. A low score equals 0-3

food groups or < 30 individual foods, a medium score equals 4-5 food groups or 30-60 individual foods. A high score equals 6-9 food groups or > 60 individual foods (Oldewage-Theron and Kruger 2008: 118).

Within the flesh group, which includes chicken, red meat, processed meats and fish, the total number of food items is ten. Three respondents reported eating all ten items. The largest number of respondents n= 103 (25.9%) indicated that five different food items in this group were eaten. Four respondents (1%) indicated that only one item was eaten from this group.

Eggs were reportedly eaten by 312 (78.4%) of the respondents.

From the dairy group, which has nine different food items, a total of three items were most frequently consumed, with 113 respondents (28.4%) reporting this.

The legumes group appeared to be the least popular. There are five different food items in this group. One hundred respondents (25.1%) reported not having eaten anything from this group, with a further 151 respondents (37.9%) indicating having eaten only one item from the group.

The fruit groups had the greatest variety, namely 15 food items. One person reported having eaten all 15 items. The highest number of respondents n = 73 (18.3%) ate four different items from this group. Fifteen respondents (3.8%) reported not eating anything from this group.

Seventy one respondents (17.8%) ate six foods from the vegetable group, which has a variety of 12.

From the Vitamin A - rich group which had seven foods, the highest number of respondents n= 86 (21.6%) indicated eating three different food items from the group. Thirty five respondents (8.8%) indicated not having eaten anything

from this group. All respondents, however, reported having consumed at least one item from the other vegetable group, which is not rich in Vitamin A. As 15 respondents (3.8%) reported not having consumed any fruit from the fruit group, it is possible that some respondents did not eat any fruit from either the fruit group or the fruit in the Vitamin A-rich group.

Four different types of fats were consumed by 110 individuals (27.6%), and a further 94 respondents (23.6%) ate five different fats from a possible total of seven foods.

In the cereals group, which has a variety of nine different foods, 111 respondents (27.9%) ate six different foods. Only 11 (2.8%) indicated having eaten all nine foods.

Among this group of student nurse respondents a mean of 32.87 (SD ±8.471) was reported, indicating a medium food variety score (Medium= 30 to 60 individual foods). The highest individual food variety mean is found in the vegetable group ($\tilde{\chi}$ = 6.02 SD ±2.228), followed by the cereals group ($\tilde{\chi}$ = 5.91 SD ±1.486). In descending order thereafter were the flesh group ($\tilde{\chi}$ = 4.83 SD ±1.574), fruit ($\tilde{\chi}$ = 4.67 SD ±2.283), fats ($\tilde{\chi}$ = 4.08 SD ±1.353), dairy ($\tilde{\chi}$ = 2.99 SD ±1.316), Vitamin A group ($\tilde{\chi}$ = 2.86 SD ±1.419), legumes ($\tilde{\chi}$ = 1.74 SD± 0.902) and eggs $\tilde{\chi}$ = 1.00 SD ±0.000).

A summary of the food group variety is detailed in Table 4.21.

Table 4.21 ***Summary of Food Variety Score within the Food Groups (n=398)***

Food Group	Mean	± Standard Deviation	Range of Scores
Flesh	4.83	±1.574	1 - 10
Egg	1.00	±0.000	0 - 1
Dairy	2.99	±1.316	0 - 9
Cereals	5.91	±1.486	1 - 9
Legumes	1.74	±0.902	0 - 5
Vitamin A - rich	2.86	±1.419	0 - 7
Fruit	4.67	±2.283	0 - 15
Vegetables	6.02	±2.228	1 - 12
Oils and Fats	4.08	±1.353	1 - 7
Total Food Items	**32.87**	**±8.471**	**13 – 57**

Table 4.22 summarises the Food Group Diversity. The majority of the respondents have a high dietary diversity score with a total of 396 respondents (99 percent) eating foods from six to nine different groups, while two respondents ate from five groups, indicating a medium diversity.

Table 4.22 ***Summary of Food Group Diversity (n=398)***

Number of Food Groups Consumed (n=9)	Frequency	%
1	0	0.00
2	0	0.00
3	0	0.00
4	0	0.00
5	2	0.50
6	17	4.30
7	37	9.30
8	122	30.60
9	220	55.30
Total	**398**	**100.00**

In summary, there is a medium Food Variety score (32.87 food items) and a high Food Group Diversity score (6-9 groups) for this group of respondents.

The top twenty foods consumed by this group are given in Table 4.23. It is noticeable that carbohydrate-rich foods appear four times in the top ten foods consumed. Sunflower oil and processed meats also appear in the top ten, representing a high fat and salt intake. Fruit and vegetables appear seven times in the top twenty list, reflecting a good fruit and vegetable variety.

Table 4.23 ***Top twenty foods consumed (n=398)***

Rank	Food	Count
1	Chicken	386
2	All Bread	377
3	Onions	377
4	Sunflower Oil	347
5	Potatoes	340
6	All Rice	336
7	Tomatoes	332
8	Processed Meat	323
9	Maize	321
10	Carrots	317
11	Egg	312
12	All Milk	302
13	Banana	298
14	Orange	287
15	Frozen Vegetables	280
16	Apple	274
17	Beef	271
18	Butter	267
19	Scones/Biscuits	264
20	Margarine	257

4.7 OBJECTIVE 5: TO IDENTIFY IF THERE IS ANY RELATIONSHIP BETWEEN NUTRITION KNOWLEDGE AND DIETARY BEHAVIOURS OF STUDENTS

As well as identifying any relationship between the students' knowledge and dietary behaviour, a number of variables were considered for this objective to reflect dietary behaviours. These variables included the food variety score and food group diversity score which were considered according to gender, and according to the respondents' year of study. Correlations were also done between the amount spent on food, and food variety and diversity, and between BMI and food variety and diversity. The correlation between the respondents' year of study and BMI was also assessed.

Table 4.24 ***Food Variety Score and Food Group Diversity Score according to gender (n=396)***

Score	Gender	Number	Mean	±Standard Deviation
Food Variety Score	Female	293	8.39	±0.846
	Male	103	8.28	±0.890
Food Group Diversity Score	Female	293	33.04	±8.195
	Male	103	32.23	±9.208

There was no statistically significant difference between mean scores for Food Variety and Food Group Diversity for the genders. See Table 4.24.

Table 4.25 ***Food Variety Score and Food Group Diversity Score by Year of Study***

Diversity score	Year of study	Number	Mean	±Standard Deviation
Food Variety Score	First	98	8.38	±0.936
	Second	78	8.45	±0.695
	Third	139	8.27	±0.874
	Fourth	83	8.40	±0.868
	Total	398	8.36	±0.857
Food Group Diversity Score	First	98	33.78	±8.327
	Second	78	33.55	±8.059
	Third	139	32.56	±8.564
	Fourth	83	31.69	±8.826
	Total	398	32.87	±8.470

There were no statistically significant differences in mean scores for Food Variety and Food Group Diversity between different years of study. See Table 4.25.

There is also no statistically significant correlation between the respondents' knowledge scores and their Food Variety and Food Group Diversity scores.

Table 4.26 ***Correlations between Food Variety Score and Food Group Diversity Score and amount spent on food (N = 398)***

		Food Variety Score	Food Group Diversity Score	Amount spent on food each month
Food Variety Score	Pearson correlation (r)	1	0.549*	0.103**
	Significance (2-tailed) (*p*)		0.00	0.041
	n =	398	398	395
Food Group Diversity Score	Pearson correlation (r)	0.549*	1	0.163*
	Significance (2-tailed) (*p*)	0.000		0.001
	n =	398	398	395
Amount spent on food each month	Pearson correlation (r)	0.103**	0.163*	1
	Significance (2-tailed) (*p*)	0.041	0.001	
	n =	395	395	395

*Correlation is significant at the 0.01 level (2-tailed)

** Correlation is significant at the 0.05 level (2-tailed)

The calculated value for Food Variety Score is significantly positively correlated with the score for the amount spent on food each month (r = 0.103; p = 0.041). See Table 4.26. This means the higher the score, the higher the amount spent on food. The calculated value for the Food Group Diversity Score is significantly positively correlated with the score for the amount spent on food each month (r = 0.163; p = 0.001). There is, therefore, a statistically significant positive correlation between the food group diversity and food variety scores and the amount spent on food, which is expected.

The two scores are highly positively correlated (r = 0.549, $p < 0.0005$). This is an expected result.

Table 4.27 ***Correlations between Food Variety Score and Food Group Diversity Score, and BMI***

		Food Variety Score	Food Group Diversity Score	BMI Category
BMI Category	Pearson correlation (r)	0.118*	0.067	1
	Significance (2-tailed) (*p*)	0.019	0.185	
	n =	398	398	398

*Correlation is significant at the 0.05 level (2-tailed).

The calculated value for Food Variety Score is significantly positively correlated with the Body Mass Index score (r = 0.118; $p = 0.019$). There is no significant correlation of the calculated value for Food Group Diversity Score with the score for Body Mass Index. See Table 4.27.

Table 4.28 ***BMI and Year of study (n=398)***

Year of study	Number	Mean	±Standard Deviation
First	98	26.19	±5.668
Second	78	27.28	±5.287
Third	139	27.37	±0.910
Fourth	83	28.02	±7.385
Total	398	27.20	±6.090

Although the mean BMI appears to be increasing over the years as shown in Table 4.28, there is no statistically significant difference in BMI for the different years of study.

4.8 CONCLUSION

The socio-demographic features of student nurses at KZNCN were gathered, together with anthropometric measurements. The study has shown that a high percentage of student nurses are overweight. The overall nutritional knowledge score was low at 49.67%. The results of the Food Frequency Questionnaire showed a high Food Group Diversity Score and a medium Food Variety Score. The students' nutrition knowledge is not linked to Body Mass Index, or to the students' eating patterns.

CHAPTER 5

DISCUSSION OF RESULTS

In this chapter the findings of the research survey will be discussed in relation to relevant literature.

5.1 STUDENT RESPONSE

Four hundred and seven students consented to participate in the study, and 398 questionnaires were used in the analysis. The exception was for gender-based analyses where 396 questionnaires were used as two respondents did not indicate their gender.

5.2 SOCIO-DEMOGRAPHIC FACTORS

It was important to describe the socio-demographic profile of the student nurse population of the College. Background variables which include socio-demographic factors are an element of client singularity that can influence health practices, according to Cox's Interaction Model of Client Health Behaviour (Cox 1982:48). Other variables considered according to Cox's model were previous health experience which was measured by the respondents' level of training, and any weight changes experienced since starting nurse training. The variable of environmental factors was addressed when asking respondents how much they spent on food, and where they prepared and ate their meals.

The population of respondents was relatively evenly distributed between the four Campuses. The availability of students according to the particular Campus lecture block programme, and the variation in group sizes, influenced the distribution of student numbers across both years and Campuses.

The majority of the respondents reported being bursary students which means they receive a fixed study loan during training, as opposed to

students who are employees of their training hospital or on secondment from another hospital, who receive a salary and other benefits of employee status. Students receiving a study loan need to pay for accommodation, their uniforms, books, and travel costs among other expenses. This is in contrast to the National Department of Health's National Strategic Plan on Nursing Education, Training and Practice 2012/13 to 2016/17, which was launched by the Minister of Health in March 2013. A recommendation of this strategy is a national policy for student funding and support, in which it is stated that student nurses should have full student status rather than employee status. It also recommends that funding for tuition, books, living costs, medical aid and indemnity cover be paid monthly, that tuition fees will be paid directly to the Nursing Education Institution, and that accommodation, uniforms and transport be provided (South Africa, Department of Health 2013: 6).

The majority of the students were between 20 and 28 years of age, which is close to national statistics according to the South African Nursing Council (SANC), who reported that the average age of students across South Africa who commenced the 4-year course in 2012 was 25 years (South African Nursing Council, 2013a). Two hundred and ninety-three (73.6%) of the respondents were female, which was very similar to the number of female student nurses in training throughout KZN at 31 December 2012 as reported by the SANC. The SANC reported that 2 274 of 3 009 students were female (South African Nursing Council, 2013c), which calculates to 75.6%. Most of the students in the study sample, 76.6%, were Black. The researcher did not observe any White students at the Campuses visited, and none participated in the study. This is not entirely representative of the country's population as the South African mid-year population estimates for 2011 showed that 79.5% of the population was Black, with 9% Coloured people, 2.5% Indian and 9% White (Statistics South Africa 2011:6). In Okeyo's (2009) study of nursing students in the Eastern Cape, most students were Black, with a small percentage of Coloured students and no Indian students. White students comprised 1.2% of the student population in the Eastern Cape (Okeyo

2009:56). As expected in KwaZulu-Natal, 71% of students reported speaking Zulu as their home language. It was calculated from available statistics that in South Africa about 23.83% of the population speaks Zulu (Statistics South Africa 2012b: 2.18), but this is one of eleven official languages and so particular languages may be spoken more widely in one particular province than others.

While 330 respondents indicated that they were single, 221 respondents have children. Most respondents (n= 148) have one child, and 71 have between two and four children. Three respondents reported that they have more than four children. This statistic reflects responses from both male and female students and was considered relevant in terms of possible financial obligations this might have for the students.

The response to the question ”Where do you currently live while doing your nursing course?” showed an almost equal distribution between living at home, living in a hospital residence, and living in a rented room or flat. In contrast, 67.7% of nursing students who participated in a similar study in the Eastern Cape reported that they lived in university hostels, while 17.4% lived in rented accommodation and 14.3% lived at home (Okeyo 2009: 56). Only 61 (15.3%) of the respondents in the KZNCN study indicated that they eat meals in the hospital dining room or canteen, while the majority of students provide/prepare their own meals or eat meals that they share with their family at home. This implies that the majority of students would be involved in sourcing foods and making choices regarding meals eaten.

LaCaille, Dauner, Krambeer and Pedersen (2011:535) found that where the students lived could either contribute positively to healthy eating, or prevent it, depending on the individual. The choice of foods purchased, methods of preparation, and being able to bring food from home could have a positive impact. However, some students who move off-campus could buy more convenience foods, which may impact negatively on healthy food intake. A

study in America found that nearly half of normal weight university students and close to 72% of overweight students lived off Campus. Approximately a third of the students felt that the Campus offered healthy food options, and just over two thirds of the overweight students stated they were confident about choosing healthy foods (Boyle and LaRose 2008: 198). The availability of dining halls does not automatically ensure that healthy nutrition principles are followed. Boyle and LaRose (2009) cite Levitsky, Halbmaier and Mrdjenovic (2004) who state that buffet-style meals and serving excessive portions in dining facilities may contribute to overeating and poor nutrition. This is supported by LaCaille, Dauner, Krambeer and Pedersen (2011:534) who found that students reported a lack of healthy options on campus, generous amounts of food available (all-you-can-eat), the methods of food preparation and lack of cooking facilities, as barriers to healthy eating. It is not necessarily true that all students living away from home eat unhealthily, however. El Ansari, Stock and Mikolajczyk (2012) indicated that European university students who moved away from home, while decreasing the amount of healthy foods eaten such as fruits and vegetables, did not significantly increase the amount of fast foods or snacks they ate (El Ansari, Stock and Mikolajczyk 2012: 6). It appears from these findings that where the students live, and where they prepare or access their meals does not necessarily influence their body weight or their food choices.

The highest number of respondents (n= 129) stated that they spend between R401.00 and R600.00 per month on food for themselves. The students' study loan is currently R3 000.00 per month before any deductions such as accommodation costs (Province of KwaZulu-Natal Health Services n.d. b: 9). A student who spends R401.00 to R600.00 is thus spending between 13% and 20% of her gross income on food for herself. Those spending more than R800.00 are using more than 27% of their gross income, while students spending less that R200.00 are using 7%. This depicts a great variance in amounts spent by students on food for themselves. The results of the Income and Expenditure Survey 2010/2011 conducted by Statistics South Africa

showed that expenses for food and non-alcoholic beverages was the fourth biggest contributor to household consumption, with an average of 12.8% of the annual household expenses being used (Statistics South Africa 2012a: 2). While this study on student nurses asked for their personal food expenses rather than their household, the results for the biggest group of students is similar to the national household statistic.

When considering that many of the students have children, and the large percentage of students who live in rented accommodation or at home, with the implication that there are transport costs involved in getting to work, these statistics on food expenditure are not unexpected. It is not known whether any nursing students go hungry from one "payday" to the next, but there are reports of South African university students who go hungry because of inadequate finances (University of the Free State 2013). It is possible that despite receiving a bursary, there are nursing students who either go hungry or who spend a limited amount on food expenses because of financial constraints.

5.3 ANTHROPOMETRIC MEASUREMENTS

A fraction over half the students (50.8%) reported an increase in weight during nurse training. The period of time that the students had been in training was not considered, as this varied between the different groups of students. Previous studies reviewed have reported on weight gain over specific periods of time. Among students at Washington University participating in a study over a specified time period, 70% reported a weight gain from the beginning of their freshman (first) year to the end of their sophomore (second) year, while 26% reported weight loss, and 3% did not have any weight change (Racette, Deusinger, Strube, Highstein and Deusinger 2005:247). A group of 47 first year university students in Malawi whose weights were compared at the start of their first year, and again seven months later, had a mean weight gain of 8.5kg. Only one student from the

group of 47 lost weight (Takomana and Kalimbira 2012: 133). Racette *et al* (2005: 250) reported evidence of unhealthy eating habits, insufficient levels of physical activity and weight gain among students during the first two years at college. Gores (2008) agrees that a change in eating habits, and a decrease in physical activity are two factors likely to cause weight gain during the first few years of college life. Butler, Black, Blue and Greteback (2004:30) reported that weight gain in students was mostly due to a decrease in physical activity rather than the effects of diet.

The BMI statistics showed that 59.8% of students in the current study were above normal weight. The mean BMI was 27.2kg/m², which is in the overweight category. A small percent of students 4.3% (n= 17) were underweight. These findings are very similar to those of South African nurses in the Eastern Cape that showed that 31.7% of the respondents were overweight while 18% were obese and 4.4% of students were underweight. The median BMI for the Eastern Cape students was 24.9kg/m² (Okeyo 2009: 65), which is at the upper limit of the normal weight category. Recent statistics from a study among nurses over the age of 19 years in the Limpopo province of South Africa give the mean BMI as 31.7kg/m² (Goon, Maputle, Olukoga, Lebese, Khoza and Ayanwu 2013: 148).The prevalence of underweight was lower than the current study at 2% while 19% of respondents were of normal weight, 27.5% were overweight and a total of 51.6% were obese or severely obese (Goon *et al.* 2013: 148*)*. These statistics for overweight and obesity are higher that the findings of the current study. It must be noted, however that the mean age reported by Goon *et al* (2013) was 39.3 years (Standard Deviation ± 10.7 years) which was an older group than the students used in the current study. Goon *et al.* (2013: 148) reported that the prevalence of overweight and obesity increased with age, and the SANHANES-1 report (Shisana *et al.* 2013: 9) stated that BMI tended to increase with age. The nurses in the current study ranged in age from 19 years or below to 32 years and above, with about half in their early twenties. It is interesting to note that according to the SANHANES-1 report, (Shisana

et al. 2013: 140-141) in the age group 18 to 24 years, the mean BMI was 26.2 kg/m² for females and 21.3 kg/m² for males, which are both below the mean BMI reported in this study.

Previous studies in the United Kingdom and the United States of America indicate that many nurses are overweight or obese (Blake, Malik, Mo and Pisano, 2011; Zapka, Lemon, Magner and Hale, 2009; Miller, Alpert and Cross, 2008). This is confirmed in the present study where according to the BMI categories 59.8% of students are above normal weight. The BMI results correlate closely to the WHTR which show that 55% of students have a WHTR of 0.5 or above. Increased visceral adipose tissue is associated with various metabolic abnormalities which put people at risk for cardiovascular disease and diabetes mellitus type 2 (World Health Organisation 2011: 12). These results suggest that overweight among nurses continues to be a reality, and that with more than half the respondents having a WHTR risk, and more than half being overweight, this generation of nurses appears to be at risk for developing health problems associated with overweight.

A study was conducted on Japanese adults who had a BMI of less than 25kg/m² (in other words, within a normal weight range) to assess their risk of coronary disease. Even in this group of non-overweight people, WHTR equal to or above 0,5 identified more people at risk than the other anthropometric measurements (Hseih and Muto, 2005: 218). Previous studies such as this study by Hseih and Muto (2005) have confirmed the risk associated with an increased WHTR. Ashwell, Gunn and Gibson (2012) in their systematic review of WHTR as a screening tool for some metabolic diseases confirmed its value, showing that WHTR is a better predictor than waist circumference for predicting various cardiac and metabolic diseases, and that measures of abdominal obesity are superior to BMI (Ashwell, Gunn and Gibson 2012:284). According to Cox's Interactive Model of Client Health Behaviour, elements of Health Outcome include clinical health status indicators and the severity of the health care problem (Cox 1982: 53). The results of these

studies by Hseih and Muto (2005), and Ashwell, Gunn and Gibson (2012) may indicate that the students in the current study may be predisposed to metabolic and cardiac disease. In assessing the respondents' BMI and WHTR measurements, this gives some indication of the extent of the existence of obesity in this group of nurses, and the possible future health implications for these nurses. The impact of an increased WHTR on health is noted, especially considering the relatively young age of the students who participated in the study**.** In the SANHANES-1 report (Shisana *et al* 2013: 72) it was stated that non-communicable disease reported rates increased with age. An awareness of health risks associated with increased WHTR as well as with an increased BMI might motivate student nurses to make the necessary dietary changes for themselves.

5.4 GENERAL NUTRITION KNOWLEDGE OF STUDENTS

Assessment of the nutrition knowledge of the students was a key objective considered in this study. It was also considered as the element of cognitive appraisal in client singularity in Cox's model which was used in this study (Cox 1982: 50).

The mean percentage for the Nutrition Knowledge Questionnaire was 49.67%. This is cause for concern, particularly as the pass rate for tests and examinations at KZNCN is 50% (KwaZulu-Natal College of Nursing 2005: 14). Results show that in different countries and over an expanse of years, nutrition knowledge tests have never yielded particularly high scores, but that nurses have a relatively poor general nutrition knowledge (Yalcin, Cihan, Gundogdu and Ocakci 2013; Buxton and Davies 2012; Azizi, Aghaee, Ebrahimi and Ranjbar 2011; Parker, Steyn, Levitt and Lombard 2011; Okeyo, 2009; Kgaphola, Wodarski and Garrison 1997). The results are not unique to nurses. A nutrition knowledge questionnaire completed by Iranian university students in different disciplines showed that the Physical Education students who also studied nutrition, scored 55,36% (Azizi *et al* 2011: 354*).* An interesting comparison is the result of the Nutrition Knowledge Questionnaire

when used by Peltzer (2004: 30) among a group of South African adults who are not nurses, where the mean score of 53,5 out of a maximum of 110 was reported. This compares favourably to the scores obtained by students who have had some nutrition education.

The statistical tables of the present study showed that in three sections, the female students had a statistically significantly higher knowledge score than the male students. This is in contrast to the findings of Azizi *et al* (2011: 354), where knowledge among male students was higher than that of the females (55.76% of males, 53% of females). A study by Buxton and Davies (2012: 4) showed that only a few females but no male students had good nutrition knowledge, but a higher percentage of males (69.2 %) in comparison to females (59.6%) had an "adequate" nutrition knowledge (2012: 3).

With regard to years of study, the fourth year students had higher scores than the first year students for three of the sections. One would expect this higher result from senior students who were preparing for registration as professional nurses, but the low mean result remains a concern. A study by Alpar, Şenturan, Karabacak and Sabuncu (2008: 382-388) in which student nurses' knowledge of healthy lifestyle behaviours was evaluated, showed that there were significant differences in the students' scores from the beginning of their nursing course and the end of their fourth year of training. However, the increase in the nutrition score was not significant, and it was thought that the students had not transferred cognition to behaviour (Alpar *et al* 2008: 386). The previous studies mentioned which indicate that nurses generally do not have an adequate knowledge of nutrition, are supported by recent findings among senior nursing students at a university in Ghana (Buxton and Davies, 2012). Results of a nutrition knowledge questionnaire completed by third and fourth year nursing students showed that the mean score for correctly answered questions was 8.95, SD ±2.01, out of 20 (44.8%) (Buxton and Davies, 2012: 1, 3).

There are a number of areas of concern regarding the nutrition knowledge of respondents in the current study. In the first section, Dietary Recommendations, students scored the highest mean of the four sections (62%). In this section of the knowledge questionnaire, students were asked to state whether one should be eating more or less of certain types of foods. Most students correctly answered which foods should be eaten less, and which foods should be eaten more. While many students were able to give some correct answers, it appears that this knowledge was not transferred into related questions in the other sections of the questionnaire. The majority of respondents correctly stated that health experts recommend that people should be consuming more vegetables and more fruit but only 84 (21.1%) students said that five servings or six servings of fruit and vegetables should be eaten daily. Five servings or six servings were both accepted as correct answers. A total of 241 students (60.6%) gave responses ranging from one to four servings daily. Nursing students in the Eastern Cape scored better in their knowledge of this area as 45.3% of students knew the recommended vegetable servings per day, while 55.3% correctly gave the recommended number of fruit servings per day (Okeyo 2009: 64). Parmenter, Waller and Wardle's (2000) study among adults in the United Kingdom showed that 70% of respondents did not know the correct recommended daily intake of fruit and vegetables, with just over half responding that one to three portions were enough.

Section two of the questionnaire comprised 69 questions relating to sources of foods and nutrients. The mean score for this section was 52.5%. One area where students did not appear to have a good understanding was related to the types of fats and the fat content of different foods, as evidenced in a variety of questions. 348 students (87.4%) responded incorrectly that low fat spread was low in fat. This is a similar finding to that of Parmenter, Waller and Wardle (2000) who reported that 85% of the adults in their United Kingdom study didn't realise that low fat spread is high in fat.

It is interesting to note that in another South African study, 85% of the medical and nursing staff who participated gave the incorrect answer regarding the cholesterol content of margarine (Parker, Steyn, Levitt and Lombard 2011: 1433).There is further evidence that questions relating to fat content of foods have been poorly answered by primary care nurses (Lyon, Alho, Hillman and Colquhoun 2007: 397-403) and adult South Africans (Peltzer 2004: 26).

On the whole, student nurses answered correctly when asked about the added sugar content of different foods, except for a couple of questions. One question students were asked was whether brown sugar was a healthy alternative for white sugar. Most students n =344 (86.4%) incorrectly said that it was a healthy alternative. A question about health benefits of brown sugar compared to white sugar was incorrectly answered by 82% of the respondents from medical and nursing staff in the Western Cape (Parker, Steyn, Levitt and Lombard 2011: 1433).

Students' knowledge of foods rich in protein was mostly satisfactory, as was their knowledge regarding starchy foods, and foods high in salt. In the category dealing with fibre content of foods, most students answered incorrectly that cornflakes are high in fibre and that both bananas and baked beans are low in fibre. As results from the Food Frequency Questionnaire showed that the legumes group is the least popular group from which foods were eaten, it is possible that students do not eat baked beans or know their nutrient content.

Section three of the questionnaire asked questions relating to every day food choices. The mean for this section was 44.3%. While students correctly answered many questions in the previous section relating to food sources, the practical application of this knowledge in the section where foods had to be selected, showed poor understanding. When choosing a high fibre, low fat snack, 157 students (39.4%) chose a muesli bar and 117 (29.4%) chose

cheddar cheese on whole-wheat crackers. Both these choices are generally high in fat. Parmenter, Waller and Wardle (2000) reported that 47% of their respondents chose the muesli bar. In another question regarding the best choice of chips to eat if wanting to reduce fat, only 50 students (12.6%) correctly chose thick cut chips. This further appears to illustrate the students' lack of understanding of fat content in foods. The foods mentioned in this section should have been known to most students even if they were not foods regularly eaten by the students, but students did not score high marks. In contrast to the low marks scored in this section by nurses, the same section of Parmenter and Wardle's questionnaire which was adapted for use in Belgium (De Vriendt, Matthys, Verbeke, Pynaert and De Henauw 2009: 789) was answered well by a group of Belgian women with varying levels of education. They showed that they were aware of how to put dietary recommendations into practice (De Vriendt *et al.* 2009: 791).

Section four of the questionnaire consisted of questions regarding diet-disease relationships. It was the category with the lowest mean (35.8%) which is disconcerting as nurses should be able to link dietary intake to possible disease consequences. While the majority of students answered that they were aware of the diet-disease relationship, they did not always score well in naming the associated health problems. While 245 students said they were aware of an association between a low intake of fruit and vegetables and health problems, 73.5% did not name a disease. The response for lack of fibre was much better, with 71.6% correctly naming an associated health problem. It was interesting to note that of the 300 students who said they were aware that there were health problems related to how much sugar one eats, only 17 mentioned tooth decay, which was the recommended answer. After noticing a trend, the number of students who gave diabetes mellitus as an answer was recorded. A total of 242 (60.8%) students reported that diabetes is related to how much sugar is eaten. This is an area which needs to be addressed to ensure that students have a good understanding of diabetes mellitus. This is supported by results of Parker *et*

al (2011: 1433) who reported that a question relating to the consumption of sugar in a diabetic diet was incorrectly answered by 88% of medical and nursing staff. Peltzer's study among South African adults showed that about half the respondents related intake of sugar to the development of diabetes mellitus (2004: 27). According to the World Health Organisation, diabetes mellitus accounts for 3% of deaths in South Africa, and the 2008 statistics estimated the prevalence of raised blood sugar at 10.6% of the population (WHO 2011c). As nurses comprise a significant group of health care workers directly involved in patient care, it is important that student nurses develop a good understanding of this disease, including the dietary recommendations. Park, Cho, Song, Lee, Sung and Choi-Kwon (2011: 193) found that most registered nurses knew that diabetic patients could eat fruit, but that carbohydrates such as sugar and honey must be restricted. Many didn't know that complex carbohydrates could be eaten and do not have to be restricted like sugar and honey do (Park, Cho, Song, Lee, Sung and Choi-Kwon 2011: 193).

Students were asked whether eating more or less of certain foods helped to reduce the chances of cancer. For all six questions, the majority of students responded with a "yes" answer, demonstrating a lack of knowledge in this section (three answers were correct as "yes", and three as "no"). A similar pattern was noticed from questions relating to the prevention of heart disease. The low score for section four is similar to that reported by Buxton and Davies (2012) whose results suggested that Ghanaian nurses were not likely to have an adequate knowledge of foods needed in diets in the management of conditions such as obesity and cardiovascular disease (Buxton and Davies 2012: 4). However, a question, namely "Do fruit and vegetables help reduce chances of cancer?" was correctly answered by 287 students (72.1%) in the present study, while 92.8% of the Ghanaian students reported that fruit and vegetables can have a preventive effect against cancer (Buxton and Davies 2012: 3).

The Nutrition Knowledge Questionnaire developed by Parmenter and Wardle (1999), was used by Parmenter, Waller and Wardle (2000) among a group of adults in the United Kingdom. Their results showed poor knowledge of diet and disease, and they stated that it appeared that people were confused about the effects of different foods on health (Parmenter, Waller and Wardle 2000). Peltzer (2004) used the questionnaire in a group of South Africa adults and the results showed that while some areas of nutrition knowledge were reasonable, less was known about the diet-disease relationship, and how to make healthier choices regarding everyday foods (Peltzer 2004: 26).

Park, Cho, Song, Lee, Sung and Choi-Kwon (2011: 192-197) reported results from a study of nutrition knowledge among registered nurses to assess their ability to give correct information regarding diet to their patients. In contrast to the response rate of 35.8% in the current study among student nurses, the correct response rate overall was 58.4%. The rate was higher for nurses with more experience. The three areas where correct response rates were reported were questions on diabetes (67.6% correct), obesity (53.8%) and cardiovascular disease (57.7%) (Park *et al.* 2011: 193). This showed that even among these qualified nurses the level of nutrition knowledge was not particularly high in three important areas, with the authors reporting the nutrition knowledge level as “suboptimal” (Park *et al.* 2011: 194).

A more positive result of nutrition knowledge was reported by Warber, Warber and Simone (2000). A questionnaire to assess basic applied nutrition knowledge, including the role of nutrition in preventing cardiovascular disease, and nutritious food selection, was used among a group of qualified nurse practitioners, 81% of whom had master’s degrees (Warber, Warber and Simone 2000: 369). The overall mean test score was 66% correct. The authors did mention, however, that as the sample came from an organisation that sponsored continuing education, the respondents may have been more knowledgeable about nutrition, and so could given more positive results than from a representative population (Warber, Warber and Simone 2000: 369).

They suggested the need for nurse practitioners to have up to date nutrition knowledge to share with their patients (Warber *et al.* 2000: 370).

The positive impact of nutrition education relating to specific diseases was shown in a study carried out among undergraduate university students in Nigeria where students in an experimental group were given a series of lectures relating nutritional factors with stomach cancer. The results revealed that the students who were in the experimental group showed a significant difference in their nutrition knowledge after the teaching intervention, with a larger mean gain (13.81) than the control group (3.08) (Anetor, Ogundele and Oyewole 2012).

Other results from section four indicated that 291 students (73.1%) in the current study had not heard of antioxidant vitamins. Identifying antioxidant vitamins was particularly poorly answered. The highest correct score in this question was from 13.6% of the respondents who correctly identified Vitamin A as an antioxidant. This is possibly because students could be aware of Vitamin A supplementation which may be given at community health clinics where they work during their training. Many students did not respond to this question. Parmenter, Waller and Wardle (2000) reported a similar result with 22% of the adult population in their British study being aware of antioxidant vitamins. When asked which vitamins were antioxidants, fewer than half the respondents answered correctly for any vitamin (Parmenter, Waller and Wardle 2000: 163-174). They suggested the reason for this was due to the recent scientific findings about antioxidants (Parmenter, Waller and Wardle 2000: 163-174). In contrast, Okeyo (2009: 78) reported that most students (at least 71.4%) knew that carrots were a good source of beta-carotene, but there was no indication given of the students general knowledge of antioxidant vitamins.

It is noted that in two of the sections of the Nutrition Knowledge Questionnaire, namely food / nutrient sources and choosing everyday foods,

the fourth year students scored lower than some of their more junior colleagues. During the fourth year, students do their midwifery and psychiatric nursing modules (KwaZulu-Natal College of Nursing 2005:8). It may be that the emphasis on food intake does change during these modules e.g. diet during pregnancy, infant feeding, the effect of medicines used in psychiatry on appetite, and that general nutrition knowledge is neglected.

5.5 STUDENTS' NUTRITIONAL KNOWLEDGE AND BODY MASS INDEX

There was no statistically significant correlation between BMI and three areas of nutrition knowledge of the students (Table 4.19). This indicates that there could be reasons other than a lack of nutrition knowledge that account for the high percentage of students (a total of 59.8%) who are in the overweight, obese and very obese Body Mass Index categories. This suggests that knowledge is not necessarily linked to the students' food intake, which can influence body weight and therefore BMI. In addition, there is no statistical significance in the Body Mass Index across the different years, although the nutrition knowledge scores of the students are higher in fourth year than in first year, which also indicates a lack of correlation between BMI and nutrition knowledge. De Vriendt, Matthys, Verbeke, Pynaert and De Henauw (2009:791) who used Parmenter and Wardle's General Nutrition Knowledge questionnaire among Belgian women also found that there was a lack of association between the BMI of the women in the study and their nutrition knowledge.

The elements of intrinsic motivation (dietary diversity scores from the food frequency questionnaire) and cognitive appraisal (the results of the knowledge questionnaire), according to Cox's model (Cox 1982: 47) do not appear to have a strong interaction in the current study. No information was obtained in this study regarding methods of cooking, such as frying foods, or of other factors such as exercise, which could affect weight changes. The findings that BMI does not correlate with areas of nutrition knowledge is

similar to Okeyo's study on whether nutrition knowledge and eating practices influenced body weight amongst student nurses at a University in the Eastern Cape (Okeyo 2009: 95). She reported that both obese and non-obese students had a similar knowledge of nutrition and suggested that there may be reasons other than poor nutrition knowledge that caused a high Body Mass Index in students in this group who were above normal body weight. (Okeyo 2009:96). One possibility for nurses being overweight despite nutrition knowledge is that people don't necessarily see themselves as being overweight. Boyle and LaRose (2009: 199) reported that just over half of the respondents who were overweight did not perceive themselves as such. Zapka, Lemon, Magner and Hale (2009: 856) however, found that overweight nurses' perception of their body weight associated significantly with their BMI, and many were trying to lose weight. Blake *et al.* (2011: 238) highlighted the need for programmes to help nurses transfer what they had learned about healthy eating and physical activity to their own behaviour.

5.6. FOOD GROUP DIVERSITY SCORE (FGDS) AND FOOD VARIETY SCORE (FVS)

It is recognised that a variety of foods need to be included in the diet as no single food has all the nutrients needed for good health (Labadarios, Steyn and Nel 2011). Oldewage-Theron and Kruger (2008: 106) showed the use of dietary diversity as a means of identifying dietary inadequacies.

The Food Frequency Questionnaire completed by respondents allowed for both a Food Variety Score, which measured the number of different foods eaten, as well as a Food Group Diversity Score, which notes the number of food groups included in the diet, to be calculated.

The mean Food Variety Score for the students was 32.87 which indicated a medium food variety. As the medium category starts at 30 different foods the students only just qualify to be in this category. A low score equals 0 to 3 food groups or less than 30 individual foods, a medium score equals 4 to 5 food groups or from 30 to 60 individual foods. A high score equals 6 to 9 food

groups or more than 60 individual foods (Oldewage-Theron and Kruger 2008: 118). Possible reasons for this food diversity score could be linked to the amount of money the students reported that they spend on food (Table 4.26). As almost two-thirds of the students prepare their own meals in the residence or in rented accommodation there may also be an element of monotony or eating preferred foods. There could be limitations due to the facilities available for storing and cooking food (LaCaille, Dauner, Krambeer and Pedersen, 2011: 535).

Compared to the results reported below from previous South African studies the FGDS and FVS in this study are higher. The FGDS in the current study was high (6 to 9 food groups eaten). In a study by Labadarios, Steyn and Nel (2011: 4) which was conducted in all provinces in adults over the age of 16, the mean dietary diversity score was reported as 4.02 across the 9 food groups. KwaZulu-Natal (KZN) was the province with the fourth highest prevalence of poor dietary diversity. The recent South African National Health and Nutrition Examination Survey (SANHANES-1) report shows that in 2012 the mean dietary diversity score in KZN was 3.7 (Shisana *et al.* 2013: 169). The mean dietary diversity score for the South African population was 4.2, and nearly 40% of the population had a score of less than 4 (Shisana *et al.* 2013: 170).

In Oldewage-Theron and Kruger's study of an elderly population in Sharpeville, Gauteng, the FGDS was low for 55.1% of the respondents and medium for a further 37.6% of the population. The FVS was also low, with a variety of 22 food items generally eaten (Oldewage-Theron and Kruger 2008: 119). The population of elderly people all received a state pension, with most of the households getting a monthly income of R501 to R1000, and the pensioner being the only financial contributor (Oldewage-Theron and Kruger 2008: 110). The results of the study did indicate food insecurity as there was a shortage of money required to meet basic needs (Oldewage-Theron and Kruger 2008: 111). At present the Older Persons Grant in South Africa is R1

270.00 per month (South African Government Services: 2013), which is less than half the R3 000.00 study loan paid monthly to student nurses.

5.7 ASSOCIATION BETWEEN NUTRITION KNOWLEDGE AND THE FOOD FREQUENCY QUESTIONNAIRE

A few conflicting results emerged when comparing the respondents' nutrition knowledge with their food intake. In the knowledge questionnaire the majority of nurses knew that baked beans are high in protein, and half the respondents answered that baked beans on toast was a best choice for a high fibre, low fat meal. In practice, the food frequency questionnaire showed that the legumes group appeared to be the least popular among the students. One hundred respondents (25.1%) reported that they had not eaten anything from this group. By comparison, the study on nursing students in the Eastern Cape showed that many more students (45.7%) reported not having eaten legumes (Okeyo 2009:61), and Labadarios, Steyn and Nel (2011: 8) reported that one of the food groups most overlooked by South Africans was the legumes and nuts group.

Just over half the students knew that polony (luncheon meat) is high in fat and that it is not a healthy alternative to red meat. A total of 323 students (81.2%) indicated, however, that they had eaten from the processed meat group which includes polony and sausages. It is possible that because polony is relatively cheap, it is consumed regularly as a source of protein.
Three sources of fat, namely sunflower oil, butter and margarine were among the top twenty foods consumed by students. As reported earlier in this chapter, students did not have a good knowledge of fats. Two hundred and eighteen students (54.8%) had consumed coffee creamer. This is a similar finding to Okeyo's study where 48.2% of the students reported not having used a brand of coffee creamer in the period of her study (Okeyo 2009: 61). It is assumed that coffee creamer is being used instead of milk in tea and

coffee drinks. Although this is a high percentage of students using a non-dairy product, it is reassuring to note that 95% of the students did consume products from the dairy group. Evidence of consuming high fat foods such as polony, coffee creamer, sunflower oil, butter and margarine is not unique to this group of nurses as Blake, Malik, Po and Pisano (2011), and Zapka, Lemon, Magner and Hale (2009) reported nurses eating a diet with a higher fat content.

The daily number of servings of fruit and vegetables that should be eaten was underestimated by the majority of students (n= 241, 60.6%), and only a small percentage of students (21.1%) had responded that one should eat the recommended five or six servings of fruit and vegetables daily. The number of fruit and vegetable portions eaten by students on a daily basis is not known. Nevertheless, fruit and vegetables appear seven times in the top twenty list, reflecting a good fruit and vegetable variety. Pre-registration nurses in the United Kingdom who participated in a study regarding healthy lifestyles showed that while 58.5% of the participants responded they ate healthily, 76.8% didn't eat the recommended daily quantities of fruit and vegetables, and 53.9% ate food with high quantities of sugar and fat daily (Blake *et al* 2011: 237). Takomana and Kalimbara (2012: 136) reported that the consumption of fruit and vegetables declined during the first year of university life, while a cross-sectional study in Europe by El Ansari, Stock and Mikolajczyk (2012: 4) showed that university students living away from home ate fruit, vegetables and meat less frequently than those who lived at home. The authors suggested that this may be due to the fact that the students living at home had food prepared for them, or did not have to pay for their food (El Ansari, Stock and Mikolajczyk 2012: 5). Wardle, Parmenter and Waller (2000) found evidence of an association between respondents' knowledge of nutrition and their intake of vegetables, fruit and fats. They found that respondents in the highest scoring nutrition knowledge group were nearly 25 times more likely to eat a healthy diet than respondents whose scores were lowest in the nutrition knowledge category (Wardle, Parmenter

and Waller 2000: 273). This shows a definite link between nutrition knowledge and dietary intake.

5.8 "TOP TWENTY" FOODS

The top twenty foods eaten by the students represent eight of the nine food groups used on the food frequency questionnaire (Table 4.23). The food group not in the top twenty is the legume group, but as reported earlier in the chapter this is a group which is overlooked by South Africans (Labadarios, Steyn and Nel 2011: 8). Despite not having all food groups in the top twenty, there is a medium food variety score and a high food group diversity score for this group of respondents. Carbohydrate-rich foods appear four times in the top ten foods consumed (Table 4.23). Sunflower oil and processed meats also appear in the top ten, representing a high fat and high salt intake. These could possibly contribute to the high percentage of students who are overweight or obese. It also raises concerns about the foods students eat regularly, and whether foods such as processed meats, scones and biscuits are staple foods in the diet. If so it would be ideal for these to be replaced with healthier alternatives. It is not surprising to see chicken at the top of the list, as this is thought to be a popular food in South Africa. The presence of different fruits and vegetables in the list reflects a good representation of these groups of foods.

5.9. FOOD VARIETY AND FOOD GROUP DIVERSITY SCORES AND THE AMOUNT SPENT ON FOOD

There is a positive correlation between the food scores and the amount that students spend on food each month (Table 4.26). The student who is able to spend more on food is likely to be able to enjoy a diversity of foods. As a group the respondents had a high food group diversity score. Only two respondents were in the medium group, eating from five groups. It is not known whether this was due to limited food expenditure or personal food

preferences, but as this is a 0.5% representation of students it was not considered significant.

5.10 FOOD VARIETY AND FOOD GROUP DIVERSITY SCORES AND BMI

There was no significant positive correlation of the calculated value for Food Group Diversity Score with the score for Body Mass Index. As 95.5% of students had a high food group diversity score, the results showed that students were eating from a healthy number of food groups irrespective of their anthropometric measurements. There is a positive correlation between the BMI and the Food Variety score, suggesting that students who weigh more do eat from a greater variety of different foods. In a study on Tehranian adults, Azadbakht, Mirmiran, Esmaillzadeh and Azizi (2006: 728-736) used five different categories of foods to assess dietary diversity. Results of the study showed that there was an inverse association between Dietary Diversity Scores (DDS) and cardiovascular risk factors including hypercholesterolaemia, diabetes and hypertension. The higher DDS was linked to a lower cardiovascular disease risk (Azadbakht *et al.* 2006*:* 734). Although the people with higher DDS were more obese, it was thought that their higher energy intake was due to healthy eating patterns such as increased consumption of fruit and vegetables, and a decrease in cholesterol and meat (Azadbakht *et al.* 2006: 733). They suggested that if increased dietary diversity is encouraged, an emphasis on fruit and vegetable groups and controlled energy intake must be considered (Azadbakht *et al.* 2006:735). Students in the current study did display good dietary diversity. Different fruit and vegetables appeared seven times in the top twenty list (Table 4.26). Nevertheless their WTHR risk and levels of obesity put them at increased risk of metabolic diseases. Obesity is one of the factors that contribute towards non-communicable disease (Bourne, Lambert and Steyn 2002: 157). Increased visceral adipose tissue is associated with various metabolic abnormalities which can put one at risk of developing cardiovascular disease and diabetes mellitus type 2 (World Health Organization 2011e: 12).

5.11 SUMMARY

The study has shown that a high percentage of student nurses are overweight. In addition, more than half the students have a Waist to Height Ratio which puts them at risk of developing metabolic disease. Both these factors may have a negative impact on the health of this group of young future health professionals. The mean overall score in the Nutrition Knowledge Questionnaire was low at 49.67%. The students did not appear to have a good knowledge of diet - disease relationships. Students in their first year of training do not have lectures on specific disease processes included in the curriculum, which could possibly account for the low mean score for this section among first year students. The more senior students, however, would be expected to have a higher score as the curriculum includes the study of different diseases and dietary adaptations. The more senior students did have better knowledge than the first year students, confirmed by the higher scores they achieved.

The students' nutrition knowledge is not linked to Body Mass Index, or to their eating patterns. The results of the Food Frequency Questionnaire reflected the students' eating patterns, showing a high Food Group Diversity Score and a medium Food Variety Score.

It would be reasonable to suggest that while nutrition knowledge of students is necessary for their professional role, it does not appear to be directly related to their own dietary behaviours, or to influence individuals' body weights.

In conclusion, there are gaps in the nutrition knowledge of student nurses. It is possible, given the results of this study, that in the absence of a dietician in a health care facility where patients rely on the nurse, some nurses may give incorrect nutrition education.

5.12 RECOMMENDATIONS

5.12.1 Nursing research

Elements of Cox's Interaction Model of Client Health Behaviour were used to guide this study. This topic has the potential for further research using elements of Cox's model that were not used in this particular study. These could include further aspects related to the nurses' wellbeing. This might include the individual's perception of their nutritional health status in relation to their BMI, and questions about physical exercise. With regard to the Client-Professional relationship, the role of the nurse educator could be assessed, as well as decisional control taken by the individual regarding their nutritional health status. The Health Outcomes variables not used, such as utilisation of health care services, and adherence to a recommended health care regimen, could follow up nurses' dietary patterns once they were made aware of their knowledge of nutrition and their health status. A longitudinal study measuring the effect of nutrition education interventions on students is an example.

5.12.2 Nursing education

Previous studies have showed a lack of knowledge in different areas of nutrition (Bakre, Akodu and Akodu 2012; Parker, Steyn, Levitt and Lombard 2011; Okeyo 2009). Not many studies have been conducted among South African nurses to assess the general nutrition knowledge of student nurses or their knowledge about different aspects of nutrition, and no studies had been conducted among students at the KZNCN. It was important to identify any gaps in such knowledge in order to give input regarding the curriculum. The results of this study could influence curriculum development in the future, by highlighting areas where more emphasis could be given, as well as considering possible ongoing nutritional support for nurses

Certain areas have been identified where nutrition knowledge is lacking, and it is recommended that the nutrition component of the current curriculum or future curricula be modified or emphasised in these areas.

Areas where reinforcement of knowledge is suggested include the role of foods containing sugar in the diet of patients with diabetes mellitus. This is one topic which needs to be addressed to ensure that students have a good understanding of the dietary management of diabetes mellitus so to help patients who have to adjust their eating patterns. The sugar content and fat content of foods is another subject that needs to be highlighted when teaching students, particularly when one considers the rate of obesity in student nurses, and also in the South African adult population. The different types of fat found in food needs attention. The results suggest that the area of diet-disease relationships is one that needs to be addressed among nurses, particularly to reinforce nutrition education. The link between diet and cancer, as well as the relationship of nutrients to heart disease could be given more attention.

The South African Food Based Dietary Guidelines, which are part of the current curriculum, are the basis of healthy eating (South Africa. Department of Health, Directorate : Nutrition. 2004: 1). The updated guidelines referred to in Chapter Two would need to replace the older guidelines. These guidelines should be emphasised for the students' own benefit, as well as that of their patients.

The nutrition curriculum could include an additional section on how to measure and calculate Body Mass Index and Waist to Height Ratio, and the interpretation and significance of the measurements. An awareness of health risks associated with increased WHTR as well as with an increased BMI might motivate student nurses to make the necessary dietary changes for themselves, as well as increasing their awareness of the significance of knowing their patients' BMI and WTHR measurements.

5.12.3 Nursing practice

As the results show that a significant percentage of the nurses were overweight or obese, possible interventions could include a health awareness assignment for nurses to address individual health issues. The SANHANES-1 report (Shisana *et al.* 2013: 9) stated that BMI tended to increase with age. This fact could be an important reason to encourage student nurses to ensure they adopt a healthy eating pattern and maintain a normal body weight early in life in order to control possible weight gain as they get older. The poor knowledge in the section on choosing everyday foods is an indication that more attention needs to be paid to choosing the best foods from commonly available or eaten foods. Practical guidelines regarding purchasing of healthy foods on a limited budget could also form part of a curriculum or a continuing education programme. Information on easily prepared meals and snacks to bring to work could also form part of the advice given at first year level.

Nurses' nutrition knowledge is an important health promotion factor, and as such more awareness of healthy nutrition principles should be emphasised and encouraged within the practice of health care. Many hospitals have a regular staff wellness day event focussing on different aspects of health promotion. Students and other nurses can be encouraged to attend these occasions and make use of the opportunity to get advice related to their diet and to check their body weight, cholesterol levels and blood pressure readings. Staff should be encouraged to make use of exercise classes, which may be offered in hospitals. Another possibility outside the curriculum could be the initiation of a support programme for students and hospital staff so that healthy food choices and eating patterns are reinforced.

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Enquiries: Mrs. S. Maharaj
Telephone: 033 – 264 7806
Date: 23 May 2012

Principal Investigator: Ms. J. Wirth
School of Nursing
University of KwaZulu-Natal

Dear Madam

RE: PERMISSION TO CONDUCT RESEARCH AT THE KZN COLLEGE OF NURSING

TITLE: EXPLORING FACTORS RELATING TO NUTRITION PATTERNS/KNOWLEDGE AMONGST STUDENT NURSES

Please note that permission will only be granted once an ethical clearance has been received. The Principal of the KZN College of Nursing however will grant you provisional permission to conduct your background study to your research.

The data needed for the above research will have to be collected at the identified Campuses and Sub Campuses of the KwaZulu-Natal College of Nursing

Please note the following:

1.1 Please ensure that you adhere to all policies, procedures, protocols and guidelines of the Department of Health with regards to this research.
1.2 This Research will only commence once this office has received confirmation from the Provincial Health Research Committee in the KZN Department of Health.
1.3 Please ensure this office is informed before you commence your research.
1.4 The KwaZulu-Natal College of Nursing and its NEI's will not provide any resources for this research.
1.5 You will be expected to provide feedback on your findings to the Principal of the KwaZulu-Natal College of Nursing.

Thank You

[redacted]

Dr. LL. Nkonzo-Mtembu
Principal: KwaZulu-Natal College of Nursing

DURBAN UNIVERSITY of TECHNOLOGY

ANNEXURE B

INSTITUTIONAL RESEARCH ETHICS COMMITTEE (IREC)

26 March 2013

IREC Reference Number: **REC 15/13**

Mrs J D Wirth
P O Box 13309
Cascades
3202

Dear Mrs Wirth

An assessment of dietary diversity and nutrition knowledge of student nurses at the KwaZulu-Natal College of Nursing

I am pleased to inform you that Full Approval has been granted to your proposal REC 15/13.

The Proposal has been allocated the following Ethical Clearance number IREC 020/13. Please use this number in all communication with this office.

Approval has been granted for a period of one year, before the expiry of which you are required to apply for safety monitoring and annual recertification. Please use the Safety Monitoring and Annual Recertification Report form which can be found in the Standard Operating Procedures [SOP's] of the IREC. This form must be submitted to the IREC at least 3 months before the ethics approval for the study expires.

Any adverse events [serious or minor] which occur in connection with this study and/or which may alter its ethical consideration must be reported to the IREC according to the IREC SOP's. In addition, you will be responsible to ensure gatekeeper permission.

Please note that any deviations from the approved proposal require the approval of the IREC as outlined in the IREC SOP's.

Yours Sincerely

Dr D F Naude
Chairperson: IREC

health
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Enquiries: Mrs. S. Maharaj
Telephone: 033 – 264 7810
Date: 12 April 2012

Principal Investigator:
Janet D. Wirth
Student Number: 21242580
C/O Durban University of Technology

Dear Madam

RE: PERMISSION TO CONDUCT RESEARCH AT THE KZN COLLEGE OF NURSING

TITLE: An Assessment to dietary diversity and nutrition knowledge of students nurses at the KwaZulu-Natal College of Nursing

I have the pleasure in informing you that permission has been granted to you as per the above request by the Acting Principal of the KZN College of Nursing

The data needed for the above research will have to be collected in the following Campuses of the KwaZulu-Natal College of Nursing:-

- Prince Mshiyeni
- RK Khan
- Madadeni
- Portshestone

Please note the following:

1.1 Please ensure that you adhere to all policies, procedures, protocols and guidelines of the Department of Health with regards to this research, including the obtaining of permission from the Provincial Health Research Committee.
1.2 This Research will only commence once this office has received confirmation from the Provincial Health Research Committee in the KZN Department of Health.
1.3 Please ensure this office is informed before you commence your research.
1.3.1 Permission is therefore granted for you to conduct this research at the above identified KZN College of Nursing Campuses
1.4 The KwaZulu-Natal College and its NEI's will not provide any resources for this research.
1.5 You will be expected to provide feedback on your findings to the Principal of the KwaZulu-Natal College of Nursing.

Thanking You

[redacted]

Ms JT Makhathini
Acting Principal: KwaZulu-Natal College of Nursing

health

Department:
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Reference : HRKM 081/13
Enquiries : Mr X Xaba
Tel : 033 – 395 2805

Dear Mrs JD Wirth

Subject: Approval of a Research Proposal

1. The research proposal titled **'An assessment of dietary diversity and nutrition knowledge of student nurses at the KwaZulu Natal College of Nursing'** was reviewed by the KwaZulu-Natal Department of Health.

   The proposal is hereby **approved** for research to be undertaken at Port Shepstone, Prince Mshiyeni, RK Khan, Madadeni nursing college campuses.

2. You are requested to take note of the following:
   a. Make the necessary arrangement with the identified facility before commencing with your research project.
   b. Provide an interim progress report and final report (electronic and hard copies) when your research is complete.

3. Your final report must be posted to **HEALTH RESEARCH AND KNOWLEDGE MANAGEMENT, 10-102, PRIVATE BAG X9051, PIETERMARITZBURG, 3200** and e-mail an electronic copy to hrkm@kznhealth.gov.za

For any additional information please contact Mr X. Xaba on 033-395 2805.

Yours Sincerely

[redacted]

Dr E Lutge
Chairperson, Health Research Committee
Date: 09/05/2013

ANNEXURE E

R425 STUDENT NURSES-

THIS IS YOUR OPPORTUNITY TO PARTICIPATE IN A RESEARCH PROJECT!

I am a M.Tech:Nursing student at the Durban University of Technology, and am inviting you to participate in a research study about nutrition awareness among student nurses.

The aim of the research is to determine nutritional status and nutrition knowledge among student nurses, and I hope that this study will increase awareness of the importance of healthy eating and nutrition knowledge among nurses.

I plan to visit your campus during your college block.
On the day of the study you will be given a letter of explanation, and will have the opportunity to ask any questions. You will be asked to sign a consent form, and will be given a questionnaire to complete which relates to socio-demographic factors, diet, and general nutrition knowledge.

During the time allocated to completing the questionnaire, your height, weight and waist circumference will be measured by the researcher, and so you are asked to wear lightweight clothing on the day of the study.

Taking the measurements will be done in a screened area in the venue so that your privacy is maintained. Only one student at a time will be in this area, and only the researcher taking the measurements will be with you. The measurements will be recorded on your questionnaire.

Your name will not appear on the questionnaire, so the data will not be able to be linked to you.

Participation in this research study is voluntary, and you may withdraw from the study during the process if you wish.

If you have any questions, please contact me by telephone (033 8973558) or by via my email address which is janet.wirth@kznhealth.gov.za, or my supervisor, Ms P.M.Orton who can be contacted at 031 3732537 or via email at pennyo@dut.ac.za

I LOOK FORWARD TO YOUR PARTICIPATION IN THIS STUDY!

Mrs J.Wirth (R/N)

ANNEXURE F

DURBAN UNIVERSITY of TECHNOLOGY

FOOD AND NUTRITION CONSUMER SCIENCES

FFQ LIST OF FOODS AND FOOD GROUPS DIVERSITY

Subject number: _____ Interviewer: _____

Date: _____

PLEASE INDICATE THE FOOD YOU ATE DURING THE PAST SEVEN (7) DAYS BY AN (X)

GROUP 1: Flesh Foods (Meat, Poultry, Fish) Diversity	Y	N
Meat (Chicken)		
Meat (Beef)		
Meat (Mutton)		
Meat (Pork)		
Meat (Goat)		
Dried Meat (Biltong)		
All Mince		
All Tripe/Offal/Runners and Heads		
Fish (fresh / whole)		
Tinned Fish (Pilchards/Tuna)		
Processed Meats (Viennas / Polony, Russians, Boerewors Sausage)		
Seafood (Prawns, Mussels, Calamari, Crab, Shrimp, Crayfish)		
GROUP 2: Eggs Diversity	**Y**	**N**
Eggs		
GROUP 3: Dairy Products Diversity	**Y**	**N**
All Milk		
Evaporated milk (Unsweetened)		
Condensed milk		
Maas/ Inkomasi		
All Cheese		
Custard		
Ice Cream		
Yogurt		
Buttermilk		

GROUP 4: Cereals, Roots and Tubers Diversity	Y	N
All Rice		
Maize (Pap, Mealie Rice, Mealie Meal, Samp, Porridge, Corn on the cob, Popcorn, Sweet Corn)		
Macaroni/Pasta/Spaghetti		
All Bread (White/ Brown/ Whole Wheat)		
Dumpling/Steamed Bread/Fat Koek		
Scones/Biscuits		
Mageu		
Breakfast Cereals (Corn Flakes, Oats, Weet Bix, Maltabela)		
All Tubers/Roots (Amadumbe, Sweet Potato)		
Potatoes		
GROUP 5: Legumes and Nuts	**Y**	**N**
All Beans dried including bean sprouts		
Dried Peas		
Lentils		
Peanuts and Nuts		
Soya		
GROUP 6: Vitamin A Rich Fruits and Vegetables Diversity	**Y**	**N**
Pumpkin		
Carrots		
Wild Leafy Vegetables Fresh and Dried – includes fresh herbs		
Spinach		
Butternut		
Apricots (Appelkoos)		
Peach (yellow cling)		
Mango		
GROUP 7: Other Fruits (and juices) Diversity	**Y**	**N**
Deciduous Fruits		
Apple		
Peaches		
Pear		
Grapes (black/green)		
Plum		

Sub – Tropical Fruit	Y	N
Lemon		
Orange		
Naartjie		
Banana		
Pineapple		
Avocado		
Kiwi fruit		
Watermelon		
Guava		
Paw- Paw		
Juices	**Y**	**N**
Juice (100% pure juice e.g. Ceres/Liquifruit)		
GROUP 8: Other Vegetables Diversity	**Y**	**N**
Onions		
Cabbage		
Beetroot		
Tomatoes		
Green beans (fresh)		
Peas (fresh)		
Cauliflower		
Chili (red/green)		
Lettuce		
Green\ Yellow\ Red Pepper		
Frozen Vegetables (Mixed)		
Ginger & Garlic (Fresh)		
Gem squash		
GROUP 9: Oils and Fats Diversity	**Y**	**N**
Butter		
Sunflower oil		
Olive oil		
Margarine		
Lard (animal fat)		
Salad dressing/oil - mayonnaise		
Potato Crisps		
Coffee Creamer (Cremora, Ellis Brown)		

NUTRITION KNOWLEDGE QUESTIONNAIRE

NUTRITION SURVEY.

This is a survey, **not** a test.
Your answers will help identify which dietary advice nurses find confusing or are not sure of.
Please complete this **by yourself**.
Your answers will remain anonymous
If you do not know the answer, please mark "not sure", rather than guessing.
Thank you for your participation

Section 1. Dietary recommendations.

1.1. Do you think health experts recommend that people should be eating more, the same amount, or less of these foods? Tick one box per food.

	More	Same	Less	Not sure
1.1.1 Vegetables				
1.1.2 Sugary foods				
1.1.3 Meat				
1.1.4 Starchy foods				
1.1.5 Fatty foods				
1.1.6 High fibre foods				
1.1.7 Fruit				
1.1.8 Salty foods				

1.2. How many servings of fruit and vegetables a day do you think experts are advising people to eat? (one serving could be an apple, or a handful of chopped carrots, for example)

……..servings.

1.3. Which fat do experts say is most important for people to cut down on? Tick one.

Monounsaturated fat	
Polyunsaturated fat	
Saturated fat	
Not sure	

1.4. Which version of dairy foods do experts say people should eat? Tick one.

Full fat	
Lower fat	
Mixture of full fat and lower fat	
Neither. Dairy products should be cut out	
Not sure	

Section 2. Sources of Foods / Nutrients

2.1. Do you think these are high or low in added sugar? Tick one box per food.

	High	Low	Not sure
2.1.1 Bananas			
2.1.2 Unflavoured yoghurt			
2.1.3 Ice cream			
2.1.4 Orange squash e.g. Oros			
2.1.5 Tomato sauce			
2.1.6 Tinned fruit in natural juice			

2.2. Do you think these are high or low in fat? Tick one box per food.

	High	Low	Not sure
2.2.1 Pasta without a sauce			
2.2.2 Low fat spread			
2.2.3 Baked beans			
2.2.4 Luncheon meat (e.g. polony)			
2.2.5 Honey			
2.2.6 Scotch egg (egg cooked with sausage meat)			
2.2.7 Nuts			
2.2.8 Bread			
2.2.9 Cottage cheese			
2.2.10 Polyunsaturated margarine			

2.3. Do you think experts put these in the starchy foods group? Tick one box per food.

	Yes	No	Not sure
2.3.1 Cheese			
2.3.2 Pasta			
2.3.3 Butter			
2.3.4 Nuts			
2.3.5 Rice			
2.3.6 Porridge			

2.4. Do you think these are high or low in salt? Tick one box per food.

	High	Low	Not sure
2.4.1 Sausages			
2.4.2 Pasta			
2.4.3 Haddock (smoked fish)			
2.4.4 Red meat			
2.4.5 Frozen vegetables			
2.4.6 Cheese			

2.5. Do you think these are high or low in protein? Tick one box per food.

	High	Low	Not sure
2.5.1 Chicken			
2.5.2 Cheese			
2.5.3 Fruit			
2.5.4 Baked beans			
2.5.5 Butter			
2.5.6 Cream			

2.6. Do you think these are high or low in fibre / roughage? Tick one box per food.

	High	Low	Not sure
2.6.1 Cornflakes			
2.6.2 Bananas			
2.6.3 Eggs			
2.6.4 Red meat			
2.6.5 Broccoli			
2.6.6 Nuts			
2.6.7 Baked potato with skin on			
2.6.8 Chicken			
2.6.9 Baked beans			
2.6.10 Fish			

2.7. Do you think these fatty foods are high or low in saturated fat? Tick one box per food.

	High	Low	Not sure
2.7.1 Pilchards (tinned fish)			
2.7.2 Whole milk			
2.7.3 Olive oil			
2.7.4 Red meat			
2.7.5 Sunflower margarine			
2.7.6 Chocolate			

2.8. Do you think experts call these a healthy alternative to red meat? Tick one box per food.

	Yes	No	Not sure
2.8.1 Liver pate / spread			
2.8.2 Luncheon meat (e.g. polony)			
2.8.3 Baked beans			
2.8.4 Nuts			
2.8.5 Low fat cheese			
2.8.6 Quiche (savoury pie made with eggs and milk)			

2.9. Saturated fats are mainly found in: (tick one)

Vegetable oils	
Dairy products	
Both of the above	
Not sure	

2.10. Which of these breads contain the most vitamins and minerals? (tick one)

White	
Brown	
Whole wheat	
Not sure	

2.11. Which do you think is higher in kilojoules / calories: butter or regular margarine? (tick one)

Butter	
Margarine	
Both the same	
Not sure	

2.12. A type of oil which contains mostly monounsaturated fat is: (tick one)

Coconut oil	
Sunflower oil	
Olive oil	
Palm oil	
Not sure	

2.13. Which one of the following has the most calories / kilojoules for the same weight: (tick one)

Sugar	
Starchy foods	
Fibre / roughage	
Fat	
Not sure	

2.14. Harder fats contain more: (tick one)

Monounsaturates	
Polyunsaturates	
Saturates	
Not sure	

2.15. Polyunsaturated fats are mainly found in: (tick one)

Vegetable oils	
Dairy products	
Both of the above	
Not sure	

2.16 Indicate your agreement with the following statements:

	Agree	Disagree	Not sure
2.16.1 Some foods contain a lot of fat but no cholesterol.			
2.16.2 A glass of unsweetened fruit juice counts as a helping of fruit			
2.16.3 Brown sugar is a healthy alternative to white sugar.			
2.16.4 There is more protein in a glass of whole milk than a glass of skimmed milk.			
2.16.5 Polyunsaturated margarine contains less fat than butter.			
2.16.6 There is more calcium in a glass of whole milk than a glass of skim milk.			

Section 3. Choosing Everyday Foods.

Please answer what is being asked, and not whether you like or dislike the food! For example, suppose you were asked…

"If a person wants to cut down on fat which cheese would be best to eat?"

Cheddar cheese	
Gouda cheese	
Cream cheese	
Cottage cheese	

If you *don't like* cottage cheese but you know it's *the correct answer*, you would still tick cottage cheese.

3.1. Which would be the best choice for a low fat, high fibre snack? (Tick one)

Diet strawberry yoghurt	
Raisins	
Muesli bar	
Whole wheat crackers and cheddar cheese	

3.2. Which would be the best choice for a low fat, high fibre light meal? (Tick one)

Grilled chicken	
Cheese on whole wheat toast	
Baked beans on whole wheat toast	
Quiche (savoury pie made with eggs and milk)	

3.3. Which kind of sandwich do you think is healthier? (Tick one)

Two *thick* slices of bread with a *thin* slice of cheddar cheese filling	
Two *thin* slices of bread with a *thick* slice of cheddar cheese filling	

3.4. Many people eat spaghetti bolognaise (pasta with a meat and tomato sauce). Which do you think is healthier? (Tick one)

A *large* amount of pasta with a *little* sauce on top	
A *small* amount of pasta with a *lot* of sauce on top	

3.5. If a person wanted to reduce the amount of fat in their diet, which would be the best choice? (Tick one)

Grilled steak	
Grilled sausages	
Grilled chicken	
Grilled pork chop	

3.6. If a person wanted to reduce the amount of fat in their diet, but didn't want to give up chips, which would be the best choice? (Tick one)

Thick cut chips	
Thin cut chips	
Crinkle cut chips	

3.7. If a person felt like something sweet, but was trying to cut down on sugar which would be the best choice? (Tick one)

Honey on toast	
A cereal snack bar	
Plain Digestive biscuit	
Banana with plain yoghurt	

3.8. Which of these would be the healthiest pudding? (Tick one)

Baked apple	
Strawberry yoghurt	
Whole wheat crackers and cheddar cheese	
Carrot cake with cream cheese topping	

3.9. Which cheese would be the best choice as a lower fat option? (Tick one)

Plain cream cheese	
Plain cottage cheese	
Gouda / Sweet milk	
Cheddar	

3.10 If a person wanted to reduce the amount of salt in their diet, which would be the best choice? (Tick one)

Ready made frozen cottage pie (mince with potato topping)	
Smoked pork with pineapple	
Mushroom omelette	
Stir fry vegetables with soy sauce	

Section 4. Diet-disease relationships.

4.1. Are you aware of any major health problems that are related to a low intake of fruit and vegetables?

Yes	
No	
Not sure	

If yes, what diseases or health problems do you think are related to a *low intake of fruit and vegetables?*

……
……

4.2. Are you aware of any major health problems that are related to a *low intake of fibre?*

Yes	
No	
Not sure	

If yes, what diseases or health problems do you think are related to a low intake of fibre?

……
……

4.3. Are you aware of any major health problems that are related to *how much sugar* people eat?

Yes	
No	
Not sure	

If yes, what diseases or health problems do you think are related to sugar?……
……

4.4. Are you aware of any major health problems that are related to *how much salt* or sodium people eat?

Yes	
No	
Not sure	

If yes, what diseases or health problems do you think are related to salt?
……
……

4.5. Are you aware of any major health problems that are related to *the amount of fat* people eat?

Yes	
No	
Not sure	

If yes, what diseases or health problems do you think are related to fat?
……
……

4.6. Do you think these help to reduce the chances of getting certain kinds of cancer? (answer <u>each one</u>)

	Yes	No	Not sure
4.6.1 Eating more fibre			
4.6.2 Eating less sugar			
4.6.3 Eating less fat			
4.6.4 Eating less salt			
4.6.5 Eating more fruit and vegetables			
4.6.6 Eating less preservatives / additives			

4.7. Do you think these help prevent heart disease? (answer <u>each one</u>)

	Yes	No	Not sure
4.7.1 Eating more fibre			
4.7.2 Eating less saturated fat			
4.7.3 Eating less salt			
4.7.4 Eating more fruit and vegetables			
4.7.5 Eating less preservatives / additives			

4.8. Which one of these is more likely to raise people's blood cholesterol level? (Tick one)

Antioxidants	
Polyunsaturated fats	
Saturated fats	
Cholesterol in the diet	
Not sure	

4.9. Have you heard of antioxidant vitamins?

Yes	
No	

4.10. If yes to the above question, do you think these are antioxidant vitamins? (answer each one)

	Yes	No	Not sure
4.10.1 Vitamin A			
4.10.2 B Complex vitamins			
4.10.3 Vitamin C			
4.10.4 Vitamin D			
4.10.5 Vitamin E			
4.10.6 Vitamin K			

SOCIO-DEMOGRAPHIC QUESTIONNAIRE

Participant instructions:

This questionnaire covers work and personal details.

The answers to the questions will be kept strictly confidential and your information will not be identifiable from any reports or publications.

Please fill in the information where asked, and cross or tick the appropriate answer.

1. At which Campus are you studying? ……

2. Which year of training are you in? (Tick one)

First	
Second	
Third	
Fourth	

3. Are you : (Tick one option only)

An employee at this hospital. e.g. Addington Hospital employee and student at Addington Campus.	
On secondment from another hospital / clinic for duration of the course. e.g. Rietvlei Hospital nurse studying at Addington Campus	
A bursary student	

4. How old are you? (Tick one)

19 years or younger	
20 to 22 years	
23 to 25 years	
26 to 28 years	
29 to 31 years	
32 years or older	

5.What is your gender ?

Female	
Male	

6. What is your race group?

Black	
Coloured	
Indian	
White	

7. What language is spoken in your home?

Afrikaans	
English	
Xhosa	
Zulu	
Other (Specify)…….	

8. Where is your family home? (area/town). .....

9. Where do you currently live while doing your nursing course? (Select one option).

With family at my family home	
Hospital residence	
Rented flat/ room	
Other (specify) …….	

10. What is your marital status?

Married or living as married	
Single	
Divorced or separated	
Widowed	

11. How many children do you have?

0	
1	
2	
3	
4	
+4	

12. Where do you eat most of your meals during a working week? (Select one option)

In the hospital dining room / canteen	
With my family at home	
At hospital residence where I provide/prepare my own meals	
In my rented accommodation where I provide/ prepare my own meals	
Other (please specify)……	

13. Approximately how much money do you spend on food for yourself each month? (tick one)

R200 or less	
R201 – R400	
R401- R600	
R601- R800	
R801 or more	

14. Since starting nursing has your weight:

Increased	
Stayed about the same	
Decreased	

15. What do you weigh at the moment? ……..kg

16. What is your height? ……cm

17. What is your waist circumference measurement?.....cm

THANK YOU FOR YOUR PARTICIPATION

Reference: Parmenter, K and Wardle. J. 1999. Development of a general nutrition knowledge questionnaire for adults. European Journal of Clinical Nutrition, 53, 298-308.

Permission for use obtained 3 August 2012

ANNEXURE H

Wirth Janet

From: Carin Napier <carinn@dut.ac.za>
Sent: 16 October 2012 09:15 AM
To: Wirth Janet
Subject: RE: Re :FFQ request
Attachments: permission letter J Wirth.doc

I Janet

The scale that you have is fine, you can use the stadiometer attached to it. Please see attached a note that you can use the Food frequency questionnaire.

Regards
Carin

To: J Wirth

10 October 2012

Use of Food Frequency Questionnaire

I hereby give permission for you to use the FFQ questionnaire currently being used in the Department of Food and Nutrition.

Kind regards

Prof. Carin Napier
Department of Food and Nutrition
Durban University of Technology

ANNEXURE I

Dear Janet,

Thank you for your letter and interest in the Nutrition Knowledge Questionnaire. You are welcome to use the questionnaire as part of your research, although we would ask that you keep us up to date with any publications arising from your work.

For access to the questionnaire, including scoring information and correct answers, please see our website:

http://www.ucl.ac.uk/hbrc/diet/resources.html

Good luck with your studies.

Best wishes,

Laura

-----Original Message-----
From: Admin [mailto:wirthgw@telkomsa.net]
Sent: 03 August 2012 11:53
To: Wardle, Jane
Cc: Penelope Margaret Orton
Subject: request to use questionnaire

Dear Professor Wardle.
Please find attached letter.
Thank You
Janet Wirth

ANNEXURE J

INSTITUTIONAL RESEARCH ETHICS COMMITTEE (IREC)
LETTER OF INFORMATION

Title of the Research Study: AN ASSESSMENT OF DIETARY DIVERSITY AND NUTRITION KNOWLEDGE OF STUDENT NURSES AT THE KWAZULU-NATAL COLLEGE OF NURSING

Principal Investigator/s/researcher: MRS J.D.WIRTH (R.N.,R.M. B.CUR)

Co-Investigator/s/supervisor/s : MS P.M.ORTON (M. Nursing),

PROFESSOR C. NAPIER (D.Tech. FSM).

Brief Introduction and Purpose of the Study:

I am inviting you to participate in a research study about nutrition awareness among student nurses.

The aim of the research is to establish nutritional status, dietary diversity and nutrition knowledge among students.

It is hoped that this study will increase the awareness of the importance of healthy eating and nutrition knowledge among nurses and determine whether nutrition knowledge needs to be highlighted more during training.

Outline of the Procedures:

It is anticipated that approximately 400 student nurses at selected Campuses of KZNCN will be invited to participate in the study which will take place over a period of about six months.

You will be required to complete a questionnaire comprising different sections, relating to your socio-demographic factors, food intake, and other nutrition knowledge items. It is anticipated that this will take about 45 minutes.

Your height, weight and waist circumference will be measured so that Body Mass Index and waist- to-height ratio can be calculated for statistical purposes. This information will be written onto your questionnaire. The measurements will be taken using a screened-off area in the venue, or a separate room, so that confidentiality is maintained. The measurements will be taken by the researcher or her assistant. You are asked to wear lightweight clothing on the day on which you participate in the study. You will be asked to remove your shoes, and any jacket / jersey in order to measure your height and weight. You will also be asked to remove any items such as wallets or cell phones from your pockets.

It is anticipated that a facility at the Campus will be made available for the researcher to use to explain the questionnaire to the group of students before you are asked to complete it.

The information on the completed questionnaires will be analysed using statistical programs to give the results of the survey from the students at the participating Campuses of KZNCN.

There will not be any individual feedback or follow-up after the questionnaires have been collected. The results of the research will be published and made available to the Principal of KZNCN

Risks or Discomforts to the Participant: As far as can be determined there should be no risks or discomfort to you in participating in the study. However you agree to participate in this study at your own risk and there will be no compensation for any research related injury or adverse event.

Only the person taking your measurements will be present while your measurements are taken and recorded. This will take place in a screened area or a separate room to maintain your privacy.

Benefits: While you may not benefit directly from the study, it is anticipated that the study will increase the awareness of the importance of healthy eating among nurses**.**

Reason/s why the Participant May Be Withdrawn from the Study: Participation in the study is voluntary, so you are not obliged to participate. You also have the right to withdraw during the study if you wish. There will be no adverse consequences to you should you decide to withdraw from the study

Remuneration: There will be no remuneration given for participating in the study.

Costs of the Study: You are not required to cover any costs towards the study

Confidentiality: Only the name of your Campus will appear on the questionnaire for statistical purposes. Your name will not appear on the questionnaire, so the data will not be able to be linked to you. Measurements will be taken in a screened area in the venue. All the data will be stored in a safe place under lock and key, and only the researchers will have access to it. After a specified time all the questionnaires will be destroyed by being shredded.

Persons to Contact in the Event of Any Problems or Queries:

Please contact the researcher (033 897 3558), my supervisor (031 373 2537) or the Institutional Research Ethics administrator on 031 373 2900.

Complaints can be reported to the DVC: TIP, Prof F.Otieno on 031 373 2382 or dvctip@dut.ac.za.

INSTITUTIONAL RESEARCH ETHICS COMMITTEE (IREC)
CONSENT

Statement of Agreement to Participate in the Research Study:

- I hereby confirm that I have been informed by the researcher, Mrs J.D.Wirth, about the nature, conduct, benefits and risks of this study - Research Ethics Clearance Number: 020/13,
- I have also received, read and understood the above written information (Participant Letter of Information) regarding the study.
- I am aware that the results of the study, including personal details regarding my sex and age will be anonymously processed into a study report.
- In view of the requirements of research, I agree that the data collected during this study can be processed in a computerised system by the researcher.
- I may, at any stage, without prejudice, withdraw my consent and participation in the study.
- I have had sufficient opportunity to ask questions and (of my own free will) declare myself prepared to participate in the study.

_____	_____	_____
Full Name of Participant	**Date**	**Time**

Signature / Right Thumbprint

I, _____ (name of researcher) herewith confirm that the above participant has been fully informed about the nature, conduct and risks of the above study.

_____	_____	_____
Full Name of Researcher	**Date**	**Signature**

_____	_____	_____
Full Name of Witness (If applicable)	**Date**	**Signature**

_____	_____	_____

Please note the following:

Research details must be provided in a clear, simple and culturally appropriate manner and prospective participants should be helped to arrive at an informed decision by use of appropriate language (grade 10 level - use Flesch Reading Ease Scores on Microsoft Word), selecting of a non-threatening environment for interaction and the availability of peer counseling (Department of Health, 2004)

If the potential participant is unable to read/illiterate, then a right thumb print is required and an impartial witness, who is literate and knows the participant e.g. parent, sibling, friend, pastor, etc. should verify in writing, duly signed that informed verbal consent was obtained (Department of Health, 2004).

If anyone makes a mistake completing this document e.g. wrong date or spelling mistake a new document has to be completed. The incomplete original document has to be kept in the participant file and not thrown away and copies thereof must be issued to the participant.

References:

Department of Health: 2004.*Ethics in Health Research: Principles, Structures and Processes* http://www.doh.gov.za/docs/factsheets/guidelines/ethnics/

Department of Health. 2006. *South African Good Clinical Practice Guidelines*. 2nd Ed. Available at: http://www.nhrec.org.za/?page_id=14

ANNEXURE K

Letter of Confirmation: Proofreading

Student's name		Title of dissertation
Janet Wirth	April 2014	AN ASSESSMENT OF DIETARY DIVERSITY AND NUTRITION KNOWLEDGE OF STUDENT NURSES AT THE KWAZULU-NATAL COLLEGE OF NURSING

This is to confirm that I have proofread Janet Wirth's dissertation.

Regards, Bronwyn Jones

And Please sign attached disclaimer

Disclaimer:

I, (PLEASE INSERT YOUR NAME)...Janet. .Wirth.....student number .....21242580..... have received editorial and proofreading feedback and understand that feedback is given in order to improve the document and as such it's my responsibility along with my supervisor to consider all changes and implement them as we feel appropriate even after plagiarism policies and other policies are considered that govern and regulate publication of such intellectual property.

Name	Janet Wirth Student number: 21242580
Title	AN ASSESSMENT OF DIETARY DIVERSITY AND NUTRITION KNOWLEDGE OF STUDENT NURSES AT THE KWAZULU-NATAL COLLEGE OF NURSING

PLEASE SIGN YOUR NAME: .....[redacted]..... DATE: May 2014.....

ANNEXURE L

Gill Hendry B.Sc. (Hons), M.Sc. (Wits)
Mathematical and Statistical Services

Cell: 083 300 9896
email : hendryfam@telkomsa.net

19 May 2014

To whom it may concern

Please be advised that Janet Wirth (student number 21242580) who is presently studying for a Master of Technology: Nursing has consulted me regarding the sampling process, questionnaire development and statistical analysis of her data.

Yours sincerely

Gill Hendry (Mrs)