# CUMULATIVE EFFECTS OF LIVING CONDITIONS AND WORKING CONDITIONS ON THE HEALTH, WELL-BEING, AND WORK ABILITY OF NURSES IN GRAHAMSTOWN EAST AND WEST

**BY**

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**THESIS**

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## ABSTRACT

Despite the many changes that have occurred in South Africa since the end of apartheid, there are still residual effects of it, as is evidenced in the disparity of living conditions between different racial groups. It is also evident that there are differences in the work tasks and working conditions of nurses working in different work environments. This project looks at how living conditions as well as working conditions interactively affect the health, subjective well-being, and work ability of nurses.

Questionnaires were completed by, and interviews were conducted with nurses from Settlers Hospital and seven municipal clinics within Grahamstown (n=152). The participation rate was approximately 71%. The questionnaires included self-report, forced-choice questions regarding basic demographics of the nurses, work conditions, living conditions, subjective satisfaction levels, as well as a simplified version of the Nordic Questionnaire of Musculoskeletal Strain (Kuorinka *et al.*, 1987), and the Work Ability Index (WAI) (Tuomi *et al.*, 2006). The questionnaires were translated into Afrikaans and IsiXhosa. One-on-one interviews were conducted with the participants, in order to obtain a 24-hour dietary recall, an indication of physical activity levels, as well as measurements of stature, mass, waist girth and hip girth. Factor analysis was performed to identify common variance from amongst the variables, while canonical correlations examined the interaction between the sets of factors.

It was found that variables relating to demographic factors, living conditions, and working conditions were closely linked to each other. Factors from each of these groups were associated with life, health, and job satisfaction, anthropometric measures, musculoskeletal strain, and WAI scores. Satisfaction levels appeared to be largely determined by socioeconomic status, while anthropometrics, WAI scores, and levels of musculoskeletal strain were associated with levels of smoking and drinking, race, age, stature, position and tenure.

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# CHAPTER 1: INTRODUCTION

## BACKGROUND TO STUDY

It is evident that there is a great disparity in access to basic services between groups within cities, across urban and rural areas, and between provinces in South Africa (Thomas *et al.*, 2002). Poverty and socio-economic forces underlie these disparities (Thomas *et al.*, 2002). Such disparities are also evident in the city of Grahamstown, where it is seen that certain people groups reside in specific geographical locations, based on factors including their socio-economic status, ethnicity, and culture. The living conditions within these communities differ in terms of access to water and electricity, social services and healthcare, number of people residing per household, sanitation, exposure to climatic elements and various other factors. In addition to this, members of the communities differ in terms of level of schooling, quality of education received, and means of employment. There are, furthermore, high levels of unemployment.

Basic amenities ordinarily incorporate water, electricity, waterborne sewerage, as well as access to healthcare facilities, communication, transport, emergency services, security, and recreation (Alebiosu, 2005). Access to services such as water and electricity tends to increase the level of productivity and psychological well-being of the people (Alebiosu, 2005). Ngwane *et al.* (2002) similarly add that access to basic needs, including a formal dwelling or housing structure, safe water, sanitation facilities, refuse removal, and electricity, impact people's quality of life, and may be a threat to life if deprived access to these services. Thomas *et al.* (2002) state that few comprehensive studies have been undertaken that focus on the links between environmental hazards and health outcomes, and that there is a need for policies to be informed by this type of research.

Jafry and O'Neill (2000) state that in order for sustainable development to be achieved, ergonomics issues must be faced alongside social and economic issues. Ergonomics aims to increase productivity in workplaces as well as to promote worker health, safety, and well-being, by promoting good compatibility between the worker, the work

performed, and the working environment (Oulu University, 2002; Jafry and O'Neill, 2000). Job tasks should be synchronised with the physical, social, cultural, and cognitive variations of the local workers (Oulu University, 2002).

O'Neill (2000) describes the “economic cycle of disease” as presented in Figure 1. This refers to how low income can lead to poor health levels due to inadequate food, housing and education. This in turn may decrease one's work capacity and productivity, hence reducing income generated, and as such the cycle continues. Conversely, this cycle may be broken, or even reversed, by suitable interventions made at any link of the cycle. Interventions in the form of governmental attempts to improve health and education are being pursued, yet are often not effective on the scale necessary for national change (O'Neill, 2000). O'Neill (2000) therefore suggests interventions made to improve work capacity and production, which may in turn result in slightly higher incomes, and associated improvements in health due to aspects such as better nutrition. This intervention may involve improved equipment and work methods in order for the worker's strength to be better applied (O'Neill, 2000).

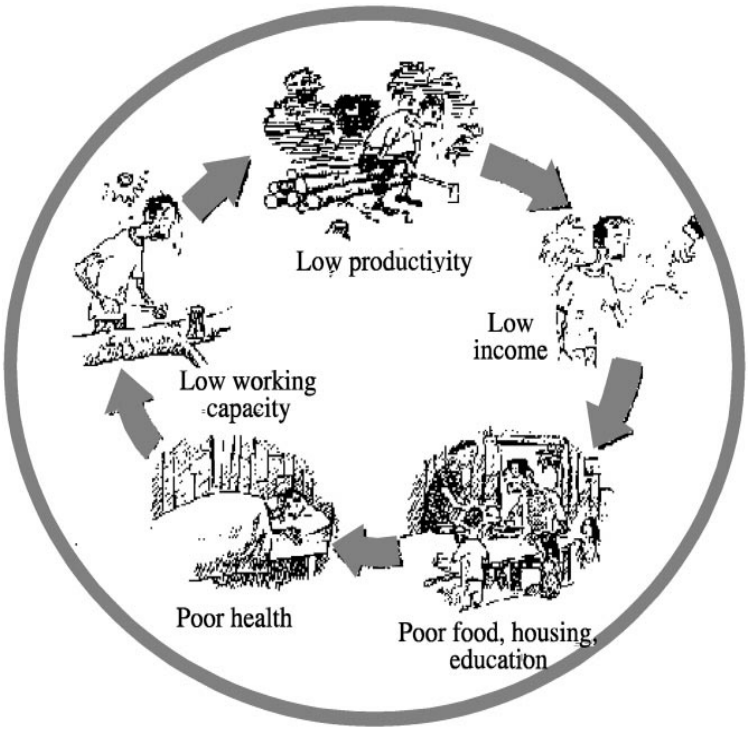



**Figure 1:** The economic cycle of disease (taken from O'Neill, 2000, p634)

Nurses in South Africa generally come from a variety of socio-economic backgrounds. The training of nurses may also differ. Nurses were chosen to be the subjects of this study, as the effects of their differing backgrounds and living conditions may be compared, while retaining similar job demands among workers. These aspects may, furthermore, interact with the demands from nursing work, as well as from differing work conditions, as nurses work in different environments (such as in town or in the township).

Challenges that face nursing personnel include staff shortages, high workloads, and stressors inherent to nursing such as high physical workloads, and mental or emotional demands (Piko, 2006). Growing occupational stress, declining job satisfaction, burnout, and emotional exhaustion are also evident problems (Sveinsdottir *et al.*, 2006). Furthermore, healthcare workers suffer from amongst the highest level of work related musculoskeletal disorders (WMSDs) compared to other professions (The Bureau of Labor Statistics, 2000). Nurses in South Africa may additionally face unique stressors, including challenges due to HIV/AIDS as well as political or socioeconomic factors (Hall and Erasmus, 2003; Hall, 2004).

## RESEARCH QUESTION

The aim of this study was to examine how personal factors, lifestyle factors, and living conditions interact with work conditions and work stressors, in terms of their effect on the health, well-being, and work ability of nursing personnel. Personal, lifestyle, and living condition variables include age, sex, physical activity levels, nutritional intake, as well as factors such as housing type, access to various amenities, and income received. Work-related considerations include the specific workplace where the nurses work, position held, and tenure. Aspects that are seen to be reflective of levels of health and well-being, are subjective satisfaction ratings, musculoskeletal strain, anthropometric measures such as Body Mass Index (BMI) and waist girths, as well as work ability levels, as inferred from responses on the Work Ability Index (WAI). All responses were gained using questionnaires, interviews, as well as anthropometric measures.

It is presumed that stress of work, as well as activities of daily living, have cumulative effects on the human body. It is therefore probable that individuals with high levels of responsibility at home – such as looking after children, fetching water, or washing clothes, may find work tasks more stressful to perform. Transport factors may also have an additional impact on work capacity. For example walking long distances to work and back may reduce daily energy levels; yet may simultaneously increase fitness levels and general levels of health compared to individuals with more inactive lifestyles. Dietary intake may also influence levels of health and well-being, as may housing type and conditions, as well as access to various services, amenities and resources. Personal or demographic factors such as age, sex, and educational level attained are also likely to affect worker responses. The background of the workers may also influence their subjective perceptions of the work they perform, rather than having a purely physical influence.

Furthermore, workers (specifically nurses in this case) may have similar job requirements, yet work in different environments. The effects of work settings may therefore alter worker responses regardless of worker background, as well as interacting with the effects of the background characteristics and living conditions of these workers. Work tasks and work organisation are also likely to alter according to the specific healthcare facility.

This study examines possible factors underlying associated alterations in health, well-being, and productivity, as well as possible links between different variables. These include, for example, the extent of the link between living conditions and working conditions, and levels of health and/or well-being. From the information received, the main risk factors impacting health and well-being will be high-lighted. The project aims to consider a range of factors including psychological, biomechanical, physiological, sociological, and macro-ergonomic factors. As such, a holistic analysis may increase the validity of the study, as well minimizing the neglect of important influencing factors.

## DELIMITATIONS

The subject sample comprised of 120 nursing staff from Settlers Hospital, and 32 nursing staff from seven municipal clinics in Grahamstown. Data collection consisted of the completion of questionnaires and interviews, as well as the measurement of basic anthropometrics. The questionnaires, which were translated into isiXhosa and Afrikaans, contained self-report questions regarding basic demographics, living conditions, working conditions, subjective satisfaction levels, a simplified version of the Nordic Questionnaire of Musculoskeletal Strain (Kuorinka *et al.*, 1987), and the Work Ability Index (Tuomi *et al.*, 2006). The interview was held confidentially with each of the participants, and consisted of a 24-hour dietary recall, questions regarding time spent performing various physical activities, as well as levels of smoking and drinking. Anthropometric measures were taken of stature, mass, waist girth, and hip girth.

## LIMITATIONS

This study focuses on the physical living and working environment, and does not consider various sociological and psychological factors which could, invariably, affect the responses of the participants. A multiplicity of factors, at work or at home, is likely to affect the health, well-being, and work ability of nurses. Although this project has aimed to incorporate as many representative factors as possible, it is likely that unconsidered factors also have a role to play. Aspects such as cultural background, religion, or personality, could also have an effect on the responses, as could the mood of participants when responding.

# CHAPTER 2: REVIEW OF LITERATURE

## CONTEXTUAL OVERVIEW

### South Africa as a developing nation

The legacy of Apartheid resulted in imbalances between communities in South Africa (Thomas *et al.*, 2002). Apartheid divided South Africa into race and class categories, resulting in the presence of two distinct economies within the country, and settlements are often still found to be isolated from access to social services as a result of Apartheid planning (Alebiosu, 2005). Apartheid was officially incorporated into South African government from 1948 until 1991, and featured laws that created restrictions based upon race (Spindle, 2008). Restrictions placed on black people in South Africa involved subjects such as land issues, living areas, housing, jobs, education, public facilities, personal relationships, constitutional rights, and general rights (Spindle, 2008). Transformation within the country is occurring to address resultant poverty and inequity that has arisen from the apartheid regime, however, large amounts of residual poverty, malnutrition, disease, and violence are still evident (Spindle, 2008). Thomas *et al.* (2002) add that large proportions of the population remain without adequate housing and associated environmental health services, and the provision of these impacts the quality of living environments and the health of communities.

As the population in South Africa is growing, informal settlements (or townships) on the periphery of cities and towns are expanding, and overcrowding in inner city areas is occurring due to the lack of housing (Thomas *et al.*, 2002). This, combined with an increase in industrial pollution, poor economic growth and limited scientific development, may lead to health problems in large parts of the country (Thomas *et al.*, 2002). Norman *et al.* (2007) refer to a “triple burden” in South Africa, which includes the high proportion of deaths from injuries; pre-transitional causes related to poverty and development; and the emerging burden of chronic disease. Furthermore, the burden of the HIV/AIDS epidemic should also be considered (Norman *et al.*, 2007).

**Table I:** Differences between IDCs and IACs (adapted from O'Neill, 2005)

| **Industrially developing countries (IDCs)** | **Industrially advanced countries (IACs)** |
|---|---|
| Underproduction | Overproduction |
| Low yields | High yields |
| Starvation | Overeating |
| Low body weight | Obesity |
| Poverty | Affluence |
| Crop product consumption | Meat consumption |
| Muscle-powered | Oil-powered |
| High percentage of young people | High percentage of old people |
| 79% of population rural | 22% of population rural |
| Poor hygiene | Good hygiene |
| Contaminated water | Clean water |
| Poor control (over conditions) | Good control (over conditions) |
| Food processed at home | Most food industrially processed |
| Poor infrastructure | Good infrastructure |
| Prevalence of agriculture and primary industry | Prevalence of manufacturing and service sector |
| Definition of work task by individual | Clearly defined work tasks, rationalised work |
| Work for subsistence | Works for social identification |

A common characteristic of industrially developing countries (IDCs), such as South Africa, is a rapidly increasing population size, which often overburdens the infrastructure (such as health and education services), and exacerbates unemployment issues (O'Neill, 2000). O'Neill (2000) explains that IDCs contain highly heterogeneous arrays of cultures, availability of resources, and levels of infrastructure. The Disease Control Priorities Project (2007) further note that people in developing countries bear more than 80% of the global burden of disease and injury. Furthermore, in IDCs, workers gaining the lowest incomes commonly endure the most physically demanding working conditions, yet are often the least able to sustain adequate energy-rich diets (Abeysekera *et al.*, 1990). Other factors with ergonomic implications include the HIV/AIDS pandemic which has reduced the economically active population in IDCs; the disproportionate workloads experienced by women; and the use of child labour (O'Neill, 2005). Table I contrasts attributes of IDCs and industrially advanced countries (IACs).

**Poverty and poverty-related diseases**

Thomas *et al.* (2002) state that poverty is a major factor impacting the health of individuals as well as the country as a whole. Alebiosu (2005) states that the basic forms of poverty include: food insecurity, crowded houses, usage of basic forms of energy, lack of access to social services, lack of adequately paid secure jobs, alienation from one's family, and family fragmentation. People vulnerable to poverty include those who live in sub-standard houses and are under-educated and unemployed (Alebiosu, 2005). Furthermore, it is women, children, the elderly, and the youth, that are hardest hit by poverty (Motloung and Mears, 2002).

Louw *et al.* (2007) reports that although Africa accounts for about 14% of the world's population, it is also the poorest continent, bearing 40% of the global burden of disease. Louw *et al.* (2007, p105-106) adds that, "A positive causal relationship between income and health is well recognised internationally, in which a higher income promotes good health by the economic ability to access clean water and sanitation, good nutrition, and good quality health services. Lack of access to these resources consequently predisposes communities to a greater prevalence of disease and disability." Furthermore, the global prevalence of general disability is highest in Sub-Saharan Africa (Murray and Lopez, 1997).

Lopez *et al.* (2006) report global and regional burdens of disease and risk factors for 2001. Sub-Saharan Africa had the highest reported death rate of children from 0-4 years, as well as substantially higher levels of adult (15-59 years) deaths occurring compared to other regions, and the predominant cause of death in these adults was HIV/AIDS (Lopez *et al.*, 2006). Ezzati *et al.* (2002) report that the leading causes of burden of disease in high-mortality developing regions are under-nutrition (which incorporates malnutrition, underweight, as well as iron, vitamin A, and zinc deficiencies) (14.9%); unsafe sex (10.2%); poor water, sanitation and hygiene (5.5%); and indoor air pollution from solid fuels (3.6%). In contrast, the leading causes of loss of healthy life in developed regions are tobacco (12.2%); high blood pressure (10.9%); alcohol (9.2%); high cholesterol (7.6%); and high BMI (7.4%) (Ezzati *et al.*, 2002).

The ten leading diseases globally, according to Lopez *et al.*'s study (2006), were perinatal conditions; lower respiratory infections; ischaemic heart disease; cerebrovascular disease; HIV/AIDS; diarrhoeal diseases; unipolar major depression; malaria; chronic obstructive pulmonary disease; and tuberculosis. Almost half of the disease burden in low-and-middle-income countries was due to non-communicable diseases (Lopez *et al.*, 2006). Five of the ten leading causes of death in low-and-middle-income countries include lower respiratory infections; HIV/AIDS; diarrhoeal diseases; tuberculosis; and malaria (Lopez *et al.*, 2006). 19 risk factors are listed in Figure 2 (Lopez *et al.*, 2006, p1755, in order of mortality risk). The joint effects of the risk factors considered may account for approximately 45% of global mortality, and 36% of the global burden of disease (Lopez *et al.*, 2006). Ezzati *et al.* (2002) similarly list global risk factors for mortality and burden of disease. These risk factors include those listed in the table; yet further include risks due to occupational airborne particulates, occupational risk factors for injury, as well as lead exposure.

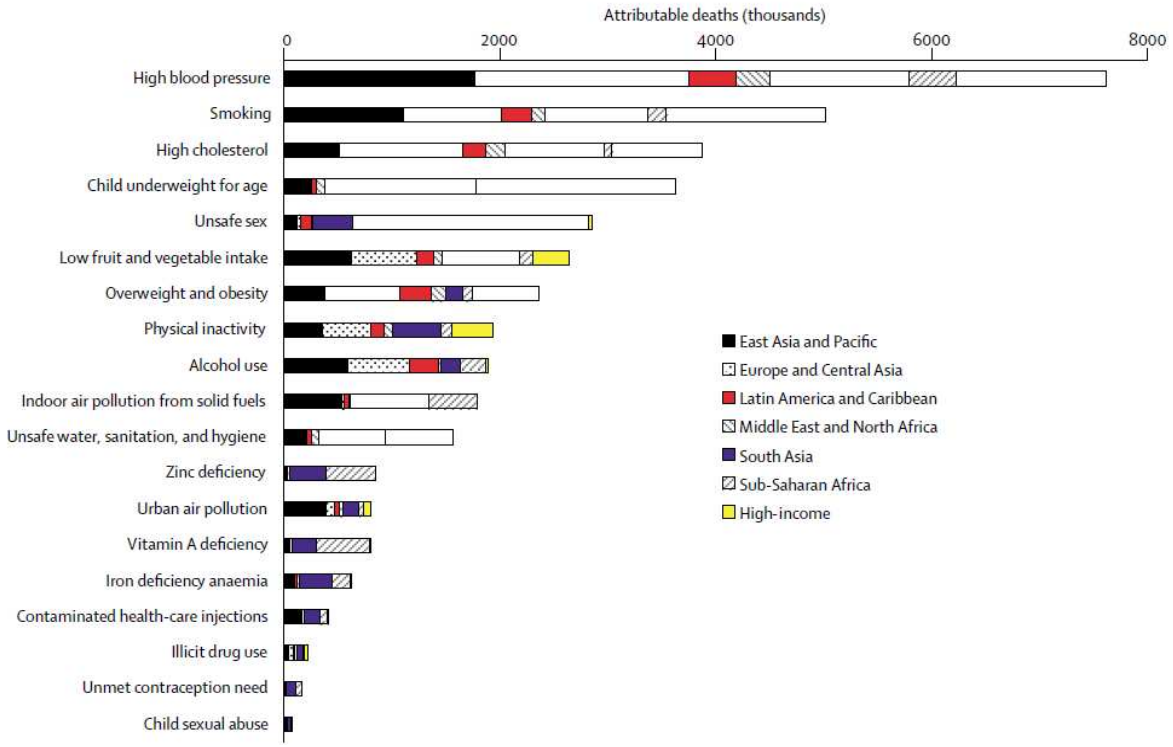



**Figure 2:** Mortality due to leading global risk factors (adapted from Lopez *et al.*, 2006)

Lopez *et al.* (2006) state that 15-59 year old adults in low-and-middle-income families have a 30% greater risk of death from non-communicable diseases than adults in high-income countries. Additionally, more than 90% of global deaths due to injuries occur in low- and middle- income countries (Norman *et al.*, 2007). Lopez *et al.* (2006) also state that people living in developing countries not only face shorter life expectancies, but also live a higher proportion of their lives in poor health. Louw *et al.* (2007) adds that the most apparent difference in disability prevalence is between the developed and the developing worlds, with the most frequent cause of disability being musculoskeletal disorders (MSDs). MSDs account for about 4.3% of disability life adjusted years (years living with disability) in the developed world, and only about 1% in developing nations (Louw *et al.*, 2007). The four major musculoskeletal conditions leading to disability include osteoarthritis, rheumatoid arthritis, osteoporosis, and low back pain (LBP) (Louw *et al.*, 2007).

**Population demographics**

In 2001 there were approximately 44.8 million individuals living in South Africa. Of these, around 6.44 million (14.4%) live in the Eastern Cape Province (Statistics South Africa, 2004). Approximately 79% of the South African population are Black Africans, 9.5% are White, 8.9% are Coloured, and 2.5% are Indian or Asian (Statistics South Africa, 2004). The mean age of death in South Africans by 1995 was 61 years (Kale, 1995). By 1999, however, particularly due to the rising AIDS epidemic, the expected lifespan dropped to 45 years (Logie, 1999). According to a national census taken in 1996 (Statistics South Africa, 1998), rural areas housed 46% of the country's population, with 76% of these people living below the poverty line. According to population groups, 61% of black Africans, 38% of Coloureds, 5% of Indians or Asians, 1% of whites, and 50% of the total population were living in poverty in 1995 (SAIRR, 2000). Walker *et al.* (2002) state that in Africa, the masses of people who are poor have generally remained this way.

The most common home language of South Africans, according to the South African Census, is isiZulu (23.8%), followed by isiXhosa (17.6%). Meanwhile, 13.3% of the population is Afrikaans-speaking, and 8.2% have English as a first-language. The other seven official African languages (Sepedi, Setswana, Sesotho, Xitonga, Siswati, Tshivenda, and isiNdebele), account for a further 36.5% of the populations' home languages (Statistics South Africa, 2004). Regarding race, 59% of Whites have Afrikaans as a first home language, while 39% are English speaking. Of the Coloured racial group, 79.5% are Afrikaans speaking, and 19% are English speaking. Of Indians or Asians in South Africa, 94% speak English as a first language. Of the Black African classification 30% speak isiZulu, 22% speak Xhosa as a first home language, while a further 46% speak another African language besides English and Afrikaans as a first home language (Statistics South Africa, 2004).

IRIN News (2004) states that the Eastern Cape is one of South Africa's poorest provinces, whose unemployment rate is consistently higher than the national average, and it contains a relatively large rural population compared to the other provinces in the country. Settlements in this region are commonly cut off from access to social services, because of lack of adequate roads, as a result of apartheid planning (IRIN News, 2004). It is reported that in 2001, 18% of all South Africans that were not economically active were from the Eastern Cape (IRIN News, 2004). The unemployment rate of this province is 32.5%, compared to the national rate of 28.3%, and those who are employed earn lower wages than in other parts of South Africa (Alebiosu, 2005). Motloung and Mears (2002) state that the very high unemployment rate is the main cause of poverty in South Africa.

The Makana Municipality area stretches over 4376km$^2$, and is situated within the Cacadu District of the Eastern Cape Province of South Africa (Makana IDP, 2008). The draft of the review of the Makana Municipality Integrated Development Plan (IDP) (2008) notes that the urban areas in Makana typify the spatial patterning of towns throughout South Africa, in that there are segregated economic classes residing in clusters. Population figures for Makana, as obtained from the 2001 Census, report that

it contains 82 682 individuals residing within 18 453 households. Meanwhile, results of the Cacadu District Municipality Survey (CDM) in 2005, report a population size of 140 120 people within 16 758 households. The CDM ranks Makana as first in its unemployment severity ranking of municipalities (Makana IDP, 2008).

Regarding the Makana Municipality as a whole, the number of people living in poverty was indicated from those household members whose income falls below a certain level. The level used in the Cacadu District Profile is based on data which used the Bureau for Market Research's Minimum Living Level (MLL), which ranges from R893 per single person, to R3314 for an eight-person household (Makana IDP, 2008). According to theses values, the percentage of those living in poverty in 2005 for the Eastern Cape, Cacadu District, and Makana Municipality, are 65%, 48%, and 52% respectively (Makana IDP, 2008). These figures have risen by over 10% for each of these areas since 1996 (Cacadu District Profile, 2007). The Makana IDP (2008) reported that 42% of the population in Makana (21 504 people) were not economically active in 2001. It was also reported here that the Makana Municipality has the largest proportion of unemployed potential workers compared to all other municipalities.

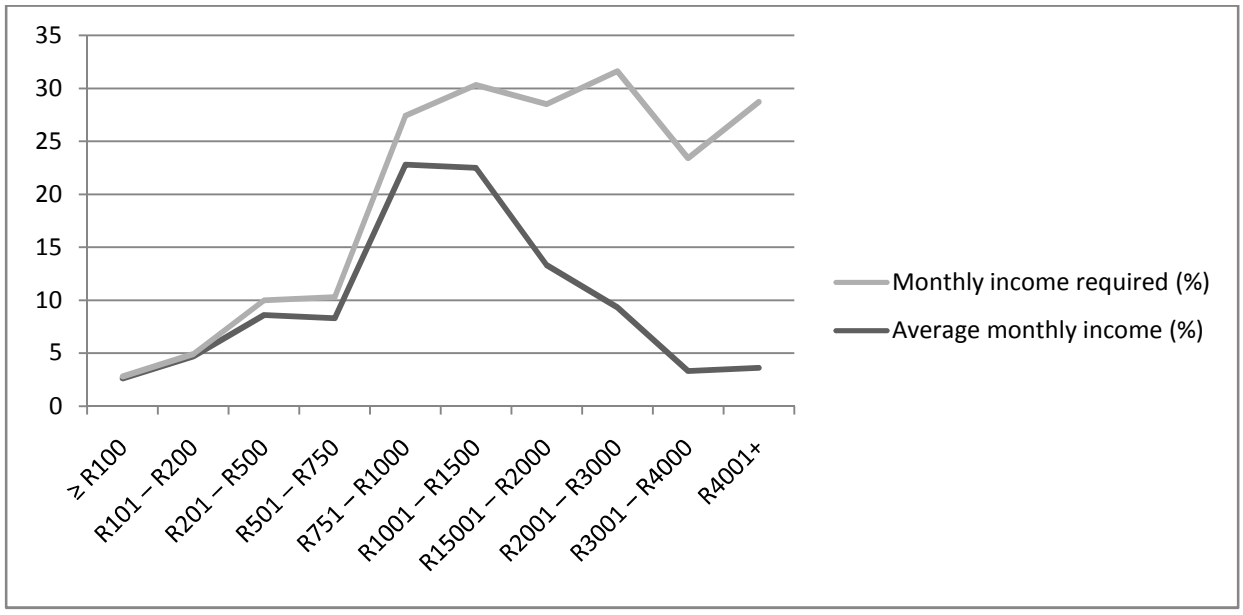



**Figure 3:** The average income received versus the average income required per month for households in Grahamstown East (Møller, 2008)

Grahamstown is the only significant urban centre in the Makana region, with Alicedale and Riebeeck East being two other small villages in this area (Alebiosu, 2005). Poverty is prevalent amongst a significant proportion of the Grahamstown community (Alebiosu, 2005). Alebiosu (2005) attributes the presence of poverty in Grahamstown to be a result of unemployment, underemployment, lack of access to basic infrastructure, living in shacks and sub-standard houses, as well as economic and social vulnerability. The city of Grahamstown may be seen to be divided into Grahamstown West and Grahamstown East (iRhini). Grahamstown West is the wealthier, more suburban sector of the city, while iRhini comprises of the location or township areas.

According to Alebiosu's (2005) data from township dwellers within Grahamstown, 34.4% of these households survive on less than R500 a month and 37.6% survive on a family income of between R500 and R999. The majority of these households contain between 4 and 6 people. More recently, Møller (2008) reported the median household income of residents in Grahamstown East to be R1100 per month. In contrast to this, half of the households included in the survey state they require at least R2900 to meet their basic needs (see Figure 3 for details) (Møller, 2008).

## LIFESTYLE, DISEASE, AND ACCESS TO AMENITIES

### Diet, obesity, and obesity-related diseases

In African countries in the past, many populations were poor, and hence tended to consume low amounts of food (Walker *et al.*, 2002). Lubbe (1971) reports a high intake of plant foods, and hence the intake of energy and fat were relatively low, with high amounts of fibre. These diets are still evident in many rural communities and among some still living traditionally (Walker *et al.*, 2002). However, in the past generation diets have altered, as intakes of energy and fat has increased, with simultaneous decreases in fibre consumption (Walker *et al.*, 2002). Prevalence of chronic diseases due to lifestyle were low in the past, however present dietary changes are associated with a rising prevalence of nutrition-related diseases such as obesity, hypertension and type II diabetes (Walker *et al.*, 2002).

Obesity is an increasing problem throughout all sectors of society. In South Africa, it is white middle-aged men, as well as black women, who are most affected by this disease (Puoane *et al.*, 2002). Obesity increases one's risk of coronary heart disease and stroke, and is also associated with type II diabetes and hypertension. Overweightness and obesity also reduces one's mobility and general levels of well-being, and hence may reduce quality of life. Diseases such as coronary heart disease (CHD), hypertension and diabetes are traditionally known as diseases affecting rich populations. However, these diseases are increasingly also affecting even the poorest communities (Madlala-Routledge, 2007). Walker *et al.* (2002), report that there have been marked increases in the prevalence of obesity in women, hypertension and diabetes in both sexes, and cerebral vascular disease, in many Sub-Saharan African populations. These changes are particularly evident in urban-dwellers, and result from changes in diet and other environmental factors (Walker *et al.*, 2002). Walker *et al.* (2002) further note that changes in the epidemiology of communicable and non-communicable diseases will be affected by the increasing epidemic of HIV/AIDS, which is particularly evident in South Africa.

Obesity is defined by James (2004) as being the accumulation of adipose tissue to the extent that it impairs both physical and psychosocial health and well-being. An individual may be classified as obese when having a body mass index (BMI) {weight (kg)/height squared ($m^2$)} of 30 or over. A BMI of between 25 and 29.9 would place a person in the overweight category (Walker *et al.*, 2001). The normal BMI range for adults is considered to be from 18.5 to 24.9, where the optimum range is considered to be between 21.0 and 23.0 (James, 2004). The severity of obesity and associated health risk level can also be further categorised according to the BMI index, whereby a BMI of 30-34.9 represents class 1 obesity (moderate risk), a BMI of 35-39.9 is classified as class 2 obesity (severe risk), and class 3 obesity (very severe risk of comorbidities) is represented by a BMI of 40 or above (James, 2004).

James (2004) relates that the comorbidities linked to high BMI, including diabetes, hypertension, gallstones, and coronary heart disease, are linearly related to BMI over a BMI level of around 19 or 20kg/$m^2$. James (2004) explains that central or visceral obesity is associated with a greater prevalence of metabolic disease, including type II diabetes and dyslipidemia; and hence, waist circumference measures can also assist in assessing level risk, as well as giving rough estimates of overweightness or obesity. The South African Demographic and Health Survey (SADHS) of 1998 used waist circumference cut-off points of ≥102cm and ≥88cm for central obesity for men and women respectively (Puoane *et al.*, 2002).

Data from the South African Demographic and Health Survey (Department of Health, 2004) reveal that 9% of adult men, and 23% of adult women in South Africa are obese. Meanwhile, 21% of men, and 29% of women are overweight (have BMIs between 25 and 30). Puoane *et al.* (2002) reports that according to the 1998 SADHS, mean BMI values recorded were 22.9kg/$m^2$ and 27.1kg/$m^2$ for men and women respectively, with 29.2% of men, and 56.6% of women categorised as overweight or obese, as is similar to the 2004 results. Meanwhile, 12.2% of men, and 5.6% of women were found to be underweight (BMI<18.5) (Puoane *et al.*, 2002). Levels of obesity are greater in older men and women, as well as in urban rather than rural areas (Department of Health,

2004). 10.4% of urban men are considered obese, compared to 5.3% of rural men. For females, 31% of the urban population is obese, while a 20.9% obesity rate is present for their rural counterparts (Department of Health, 2004). Furthermore, there is a discrepancy in levels of obesity between population groups. For example, it is among white males (22.6%), and African females (28.4% obesity prevalence) that the highest percentages of obesity are evident (Department of Health, 2004). Refer to Tables II and III for details on obesity prevalence in South African men and women respectively.

**Table II:** Percent distribution of Body Mass Index of men aged 15 and above (adapted from the SADHS, Department of Health, 2004)

| | **Underweight (BMI<18.5)** | **Normal (18.5-24.9)** | **Overweight (25.0-29.9)** | **Obese (BMI 30.0+)** |
|---|---|---|---|---|
| **Residence:** | | | | |
| **Urban** | 11.7% | 57.7% | 20.2% | 10.4% |
| **Rural** | 13.8% | 58.1% | 22.8% | 5.3% |
| **Population Group:** | | | | |
| **Black African** | 13.1% | 59.4% | 20.4% | 7.1% |
| **Coloured** | 11.6% | 51.9% | 21.0% | 15.6% |
| **White** | 4.9% | 47.6% | 25.0% | 22.6% |
| **Asian** | 9.8% | 45.5% | 34.1% | 10.7% |
| **Total** | 12.4% | 57.8% | 21.1% | 8.7% |

**Table III:** Percent distribution of Body Mass Index of women aged 15 and above (adapted from the SADHS, Department of Health, 2004)

| | **Underweight (BMI<18.5)** | **Normal (18.5-24.9)** | **Overweight (25.0-29.9)** | **Obese (BMI 30.0+)** |
|---|---|---|---|---|
| **Residence:** | | | | |
| **Urban** | 5.6% | 36.3% | 27.9% | 31.0% |
| **Rural** | 6.8% | 43.9% | 28.4% | 20.9% |
| **Population Group:** | | | | |
| **Black African** | 5.6% | 38.2% | 27.8% | 28.4% |
| **Coloured** | 11.6% | 35.8% | 26.0% | 26.6% |
| **White** | 4.1% | 59.0% | 23.5% | 13.5% |
| **Asian** | 5.5% | 36.8% | 33.8% | 23.5% |
| **Total** | 6.0% | 41.3% | 29.0% | 23.3% |

Wyatt *et al.* (2006) state that the incidence of overweight and obesity involves a complex interplay between biologic, genetic, environmental, and psychosocial factors that influence how people store food and mobilise fat stores. Walker *et al.* (2001)

similarly attributes the factors of genetics, culture, ethnicity, diet, physical activity levels, as well as socioeconomic status to the incidence of obesity. Puoane *et al.* (2002) observe that 19% of the variation of BMI in men, and 34% of the variation in women, could be explained by age, level of education, population group, and living either in a rural of urban setting. Significantly higher BMI levels were found in older men, those living in the city, and white men, while men with more than eight years of schooling had a significantly higher BMI than those with less or no schooling (Puoane *et al.*, 2002). In women, significantly higher BMIs were found in those who were older rather than younger, urban rather than nonurban, and in Black African women (Puoane *et al.*, 2002). Cultural and traditional perceptions, preferences, and acceptance regarding body size have a role to play (Wyatt *et al.*, 2006). In the African community in South Africa, it is traditionally perceived as desirable to be overweight. This is because it is seen to be a reflection of affluence and the ability of the husband to provide for his wife and family, as well as being associated with people who are not suffering from HIV/AIDS (Puoane *et al.*, 2002).

Obesity is seen to have medical, social, and economic impacts (Wyatt *et al.*, 2006). Overweight and obesity have been linked to cardiovascular disease, hypertension, diabetes, dyslipidemia, metabolic syndrome, gallstones, osteoarthritis, sleep apnea, and certain forms of cancer. The risk of these conditions is positively correlated with BMI, and has a negative effect on longevity (Wyatt *et al.*, 2006). Walker *et al.* (2001) affirms that obesity is more life-threatening to some populations than others, and reports for example, that BMI was associated with all-cause mortality, as well as coronary heart disease mortality, in white but not in African women (Stevens *et al.*, 1992), yet more research in this field is necessary. Psychosocial impacts of obesity are also evident, and may be associated with higher rates of anxiety, depression, and low self-esteem (Wyatt *et al.*, 2006). Economic costs of the obesity epidemic include those due to the use of health services and medical treatment, as well as indirect costs associated with value of income lost due to reduced quality of life, decreased productivity, absenteeism, and premature death (James, 2004; Wyatt *et al.*, 2006).

**Hypertension** (high blood pressure) is seen to be present when a person has a systolic blood pressure of greater than 140mmHg, and a diastolic blood pressure of over 90mmHg (McArdle *et al.*, 2001). Normal systolic and diastolic blood pressures are 120mmHg and 80Hg, respectively, and tend to increase with age. Hypertension imposes chronic strain on the cardiovascular system, and places individuals at a greater risk of kidney failure, heart disease, or stroke (McArdle *et al.*, 2001). McArdle *et al.* (2001) states that one out of every three or four people experience chronic high blood pressure at some stage in life, that African Americans exhibit a two-to-three times higher risk of hypertension and ischaemic stroke than Caucasians. Furthermore McArdle *et al.* (2001) add that only two-thirds of hypertensives are aware of their condition, and only one-quarter have their blood pressure under control.

According to the South African Health and Demographic Survey, 8.8% of men, and 18.8% of women reported having high blood pressure (Department of Health, 2004). There is a discrepancy between rural and urban levels of hypertension, as 10% and 21% of urban men and women respectively reported having high blood pressure, while only 6% of rural men, and 15% of rural women reported this condition. According to population group, white men, and coloured women reported the highest levels of this condition. See Tables IV and V for further details regarding hypertension and other chronic conditions among the South African population.

**Diabetes mellitus** may be defined as a chronic disorder of sugar, protein and fat metabolism (Anderson *et al.*, 2007). This occurs primarily when a person's body is incapable of producing insulin (type I diabetes), or due to a body's inability to respond properly to insulin (type II diabetes) (Anderson *et al.*, 2007). It is the sixth leading cause of death in the United States, and is the leading cause of blindness, kidney failure, and limb amputation (McArdle *et al.*, 2001). Walker and Bersohn (1958) found that diabetes was nearly absent in rural dwellers in South Africa, and low prevalences were reported in urban dwellers. It is reported that diabetes is still absent in some rural areas (Walker *et al.*, 2002). The SADHS more specifically, reveals that 2.9% of urban, and 1.9% of rural men suffer from diabetes; while 4.3% and 3.0% of urban and rural women

respectively report having this condition (Department of Health, 2004) (refer Tables IV and V). Diabetes is most prevalent in Asian women, and among white as well as Asian men, as far as population group and gender are concerned (Department of Health, 2004).

**Table IV:** Percentage of self-reported chronic conditions: males (adapted from the SADHS, Department of Health, 2004)

| | **High Blood Pressure** | **Heart Attack or Angina** | **Stroke** | **High Blood Cholesterol** | **Diabetes** |
|---|---|---|---|---|---|
| **Residence:** | | | | | |
| **Urban** | 10.0% | 3.2% | 0.7% | 2.6% | 2.8% |
| **Rural** | 6.0% | 1.7% | 1.4% | 0.3% | 1.9% |
| **Population group:** | | | | | |
| **Black African** | 6.9% | 2.8% | 0.9% | 1.0% | 1.8% |
| **Coloured** | 15.3% | 2.1% | 1.5% | 3.8% | 3.1% |
| **White** | 23.3% | 0.9% | 0.3% | 9.8% | 8.6% |
| **Asian** | 14.1% | 8.1% | 0.8% | 8.4% | 11.4% |
| **Total** | 8.8% | 2.7% | 0.9% | 2.0% | 2.6% |

**Table V:** Percentage of self-reported chronic conditions: females (adapted from the SADHS, Department of Health, 2004)

| | **High Blood Pressure** | **Heart Attack or Angina** | **Stroke** | **High Blood Cholesterol** | **Diabetes** |
|---|---|---|---|---|---|
| **Residence:** | | | | | |
| **Urban** | 20.7% | 3.6% | 1.0% | 2.5% | 4.3% |
| **Rural** | 15.1% | 4.6% | 1.0% | 1.4% | 3.0% |
| **Population group:** | | | | | |
| **Black African** | 18.9% | 4.1% | 0.9% | 1.5% | 3.6% |
| **Coloured** | 24.0% | 2.8% | 1.0% | 2.9% | 5.5% |
| **White** | 9.9% | 3.2% | 2.4% | 7.9% | 1.1% |
| **Asian** | 20.3% | 6.3% | 0.8% | 6.9% | 12.5% |
| **Total** | 18.8% | 3.9% | 1.0% | 2.1% | 3.9% |

Walker *et al.* (2002) report that **coronary heart disease (CHD)** is nearly absent in rural South African populations, and remains uncommon in urban black populations, in comparison to their white counterparts. However, it seems likely that a significant increase in the occurrence of CHD will occur, as this trend has been evident in other populations, such as among African-Americans, Indians in the United Kingdom, and even among Aborigines – where levels of CHD in these populations has risen to levels

up to and even exceeding those of their associated white population (Walker *et al.*, 2002). Walker *et al.* (2002), however, explain that this response depends on factors such as the continuation of the present socioeconomic state, as well as increases in population size without simultaneous increases in natural resources.

**Smoking and alcohol usage**

Findings of the SADHS reveal that approximately 31% of men aged 15 years and above, and only 8% of women, smoke daily (Department of Health, 2004). This male-female ratio holds for all provinces in the country. These national rates of smoking have dropped since 1998, when it was quantified that 42% of men and 11% of women smoked daily. Smoking prevalence in 2003 in the Eastern Cape was reported to be 36% and 7% for men and women respectively.

Alcohol consumption in South Africa is reportedly on the increase, and is the country's most abused drug (Baleta, 1998). Although a low alcohol intake may help protect against certain cancers and CHD, a high intake is associated with liver cirrhosis and certain cancers (Gronbaek *et al.*, 2000, Walker *et al.*, 2002). The first SADHS (1998) exposed that alcohol consumption was reported by 45% of men and 17% of women. White men were the mostly likely (71%) to be current drinkers, while Asian women were the least likely to be current drinkers (9%). Furthermore, there were more reports of alcohol consumption among urban residents than in nonurban residents. It is also reported that symptoms of alcohol problems were significantly associated with lower socioeconomic status, no school education in women, and being older than 25 years (Parry *et al.*, 2005).

**HIV/AIDS**

Sub-Saharan Africa is the region, globally, that is most affected by HIV/AIDS (IRIN, 2008). Pembry (2008) states: “South Africa is currently experiencing one of the most severe AIDS epidemics in the world.” Statistics have shown that almost one in five adults in South Africa is infected by this virus (Pembry, 2008), which may translate to the current number of South Africans with HIV/AIDS being approximately 5 million (Hall,

2004). The annual number of deaths in South Africa due to AIDS was expected to peak at approximately 487000 deaths by 2008 (Hall, 2004). In 2006 it was estimated that almost half of the deaths in South Africa were caused by AIDS, with 71% of the deaths of people between the ages of 15 and 49 being AIDS-related (Pembry, 2008). The Makana IDP (2008) reports the number of people tested for HIV/AIDS in Makana for the period from July 2006 – June 2007. Results display that of the 880 antenatal clients tested for HIV, 158 (18%) were found to be HIV positive. 3152 HIV clients, excluding antenatal clients, were tested in this period, with 512 of these patients obtaining newly HIV positive results, accounting for 1% of the total population in Makana.

The AIDS epidemic is seen to impact the lives of infected individuals, as well as their families, friends, and wider communities. It has also impacted South Africa's social and economic progress (Pembry, 2008). In workplaces it is manifest in aspects such as a reduction in the skilled workforce, increased worker absenteeism, high labour turnover, and higher employee benefit costs (Hall, 2004). The Department of Social Development (2007) states that the social impact of HIV and AIDS is evidenced by the increase in the number of orphans and child-headed homes, which manifests itself in the disintegration of families and communities. Many children are also infected with the virus, by contracting it from infected mothers during the birth process (Pembry, 2008). The AIDS pandemic has also placed a burden on hospitals dealing with high numbers of HIV-infected patients. Poverty, social instability and a lack of governmental action are some of the possible reasons why South Africa has been so affected by AIDS (Pembry, 2008).

**Tuberculosis**

Tuberculosis (TB) is a bacterial infection, and is spread in the same way as colds or influenza, such as by coughing or sneezing (Richter, 2008). The Health Systems Trust (2000) states that tuberculosis (TB) remains the most important communicable disease in the world. Furthermore, they state that it accounts for 80% of all notifiable diseases in South Africa (AIDS is not a notifiable disease). Many factors have contributed to the epidemic of TB in South Africa. These include poor living conditions, unjust legislation,

dangerous working environments, the practice of banishing those with the disease to their original homes, and finally, poor health service provision (Health Systems Trust, 2000). Furthermore, the co-existence of the HIV virus has increased the risk of developing TB to 10% per annum, as opposed to 10% per lifetime for people without HIV (Health Systems Trust, 2000). According to the results of the South African Demographic and Health Survey, 3.4% of men, and 2.2% of women in the country report having TB. This disease is more prevalent in urban rather than rural populations, and is more common in coloured men and women compared to other population groups in the country (Department of Health, 2004).

Richter (2008), reports that according to World Health Organisation estimates, over 100 000 South Africans died from tuberculosis (TB) in 2006 alone. The antibiotic treatment for it is relatively inexpensive, however the drug courses can last over 6 months (Richter, 2008). Furthermore, when TB medication is not taken exactly as prescribed, the bacteria can mutate and become resistant to many anti-TB drugs. The Health Systems Trust (2000) states that presently, patients may only receive effective drugs through a programme which standardises the diagnosis and treatment according to international regulations, and provides the necessary health service and infrastructure.

**Housing**

Type of housing, and access to basic amenities and various social services are taken into consideration for the purposes of this study. Nakajima (1997, p257) of the World Health Organisation stated, “The basic human need for a safe environment -one which provides clean water, and adequate food and shelter, and in which different people can live together in peace- is the same for all of us... The dreams and aspirations of a healthy future for the next generation can be accomplished only if we use our current knowledge wisely and take action in solidarity.” Møller (2008, p39), additionally, states, “Living conditions, of course, merely provide the environment in which healthy communities can grow in the social fabric and opportunities to realise the potential of residents.”

As can be seen in Table VI, 55.7% of South African households reside in free-standing houses, 14.8% live in traditional dwellings, and 16.4% live in shacks (Statistics South Africa, 2004). Free-standing houses are the most lived-in dwelling places for each of the four population categories included in the South African census. While flats and semi-detached houses were the next most popular dwelling places for the coloured, Indian or Asian, and white population groups, Black Africans were more likely to live in traditional dwellings or shacks (Statistics South Africa, 2004). Ngwane *et al.* (2002) report that in 1995, of the wealthiest 10% of households in the country, 98% were living in brick or cement structures; while of the 10% of households with the lowest per capita income, only 45% were living in such structures. Hirschowitz and Orkin (1997) explain that inequality and type of housing are closely related, with people living in traditional dwellings, hostels and shacks generally being poorer than those living in formal dwellings.

**Table VI:** Type of dwelling by population group (percentage of households): South Africa, 2001 (taken from the South African census, Statistics South Africa, 2004)

| | **Black African** | **Coloured** | **Indian or Asian** | **White** | **Total** |
|---|---|---|---|---|---|
| **House on separate stand** | 50.7% | 73.1% | 66.4% | 73.2% | 55.7% |
| **Traditional dwelling** | 18.7% | 2.8% | 1.4% | 1.1% | 14.8% |
| **Flat in block of flats** | 3.8% | 6.7% | 14.1% | 11.7% | 5.3% |
| **Town/Cluster/Semi-detached house** | 1.0% | 5.9% | 12.3% | 10.2% | 2.9% |
| **House/flat/room in backyard** | 4.0% | 3.0% | 3.9% | 2.2% | 3.7% |
| **Informal dwelling/shack in backyard** | 4.9% | 3.4% | 0.3% | 0.2% | 4.1% |
| **Informal dwelling/shack elsewhere** | 15.5% | 4.0% | 0.7% | 0.3% | 12.3% |
| **Room/flatlet on shared property** | 1.2% | 0.7% | 0.6% | 0.8% | 1.1% |
| **Caravan or tent** | 0.3% | 0.3% | 0.2% | 0.3% | 0.3% |
| **Private ship/boat** | 0.1% | 0.1% | 0.1% | 0.1% | 0.1% |

Regarding housing quality, over half (51%) of the households surveyed in iRhini in 2007 report that the roof of their house leaked in the past year, and 42% report that their house had flooded in the past year (Møller, 2008). This leaking and flooding was most evident in traditionally built houses and shacks (73%-77% for leaking, and 55%-67% for

flooding, respectively); with about 41% and 34% of formally built dwellings experiencing leaks and floods respectively (Møller, 2008). Reconstruction and Development Programme (RDP) houses refer to those provided or subsidised by the local government, for those who qualify for free basic housing (Alebiosu, 2005). RDP houses are reportedly more likely to have been flooded than non-RDP houses (53% and 36%), with no reported differences found regarding leaking roofs (Møller, 2008).

Nxamileko (2005), from the Housing Department of the Makana Municipality stated that the municipality had almost managed to fulfil its housing delivery goals. The maintenance of the bulk infrastructure after housing has been provided has, however, proved to be a major concern, due to a limited budget from the municipality (Alebiosu, 2005). Furthermore, Alebiosu (2005) reports some complaints regarding IDP (Integrated Development Plan) (or RDP) housing being of sub-standard quality. Complaints from residents have included that cheap materials being used for the housing projects, that the houses were not cemented and painted, that they leak when it rains, and that facilities in some of the houses were not completed, such as kitchen sinks and toilets (Alebiosu, 2005). The size of the houses is another concern, as overcrowding may occur in large families (Alebiosu, 2005). Thomas *et al.* (2002) states that housing policy has failed to prescribe minimum building standards for health.

**Overcrowding**

The size of South African households can contribute to the level of poverty, due to the high dependency ratio within poor households (Motloung and Mears, 2002). Alebiosu's study (2005), surveying a sample of township dwellers on Grahamstown, revealed that 60% of the respondents came from a family of 4 to 6 members. 10% of the respondents had 7 or more people in their family, while 20% had between 1 and 3 members in their family. Of the houses included in the 2007 ISER survey of residents in Grahamstown East, the average household size was 4 people, with a range of 1 to 17 (Møller, 2008).

## Water

Safe water is one of the most basic commodities that people cannot do without, and lack of such access may be linked to the prevalence of diseases such as cholera (Ngwane *et al.*, 2002). Legislation exists regarding the access that people have to clean water. The South African constitution (1996, section 27), states that everyone has the fundamental right to have access to sufficient food and water. Legislation has also been generated in order to ensure the appropriate use and management of water in the country. In 2001, the Policy of Free Water established the provision of 6000 litres of free water per household per month. This provision is calculated based on the number of 8 people per household, and the World Health Organisation's recommendation that each individual requires a minimum of 20-25 litres of water per day for personal use (WaterAid, 2008). In this way, those without adequate income may still have access to basic water supply. The South African Department of Water Affairs and Forestry reported that by March 2007, 75.81% of the total population had access to this Free Basic Water, while it was available to 68.86% of the poor population (WaterAid, 2008).

**Table VII:** Main water supply by population group of the household head (percentage of households): South Africa, 2001 (Statistics South Africa, 2004)

| | Black African | Coloured | Indian or Asian | White | Total |
|---|---|---|---|---|---|
| **Piped water inside dwelling** | 17.9% | 66.8% | 87.5% | 87.2% | 32.3% |
| **Piped water inside yard** | 33.8% | 22.4% | 8.1% | 8.4% | 29.0% |
| **Piped water on community stand: distance < 200m** | 13.3% | 4.1% | 1.0% | 1.1% | 10.7% |
| **Piped water on community stand: distance > 200m** | 15.2% | 4.5% | 2.6% | 2.7% | 12.4% |
| **Borehole** | 3.1% | 0.3% | 0.1% | 0.3% | 2.4% |
| **Spring** | 2.4% | 0.1% | 0.0% | 0.0% | 1.9% |
| **Rainwater tank** | 0.7% | 0.3% | 0.2% | 0.1% | 0.6% |
| **Dam/pool/stagnant water** | 1.3% | 0.3% | 0.0% | 0.0% | 1.0% |
| **River/stream** | 8.4% | 0.5% | 0.1% | 0.0% | 6.5% |
| **Water vendor** | 1.0% | 0.1% | 0.1% | 0.0% | 0.7% |
| **Other** | 3.0% | 0.8% | 0.2% | 0.2% | 2.4% |

According to the 2001 Census, the percentage of households with access to piped water increased from 81.2% in 1996 to 84.5% in 2001 (Statistics South Africa, 2004).

Ngwane *et al.* (2002) state that Black Africans, and rural households were the groups that were most commonly lacking access to safe water. The main water supply to different population groups in South African in 2001 are detailed in Table VII, and as can be seen, the Black African households had the lowest percentage of access to piped water within their dwellings of all population groupings. According to the 2001 Census, 76% of houses in Makana had access to water on site and 19% made use of a community stand; while approximately 5% make use of water from other sources such as a borehole or tank, natural water or dam, as well as from water vendors.

Problems associated with communal water supply schemes in certain areas include that soak-away facilities have not been installed, and pools of stagnant water are associated with increased risk of disease transmission (Thomas *et al.*, 2002). Furthermore, users are not always educated regarding the safe handling, storage, and disposal of water, despite evidence that in various areas there is a rapid deterioration in water quality between the supply point and its eventual place of use (Thomas *et al.*, 2002). The use of water from unsterilized cups or containers may cause clinical infections, and even serious health effects (Thomas *et al.*, 2002).

**Sanitation**

An association between poor housing and poor sanitation is commonly present, and the lack of sanitation facilities can threaten peoples' lives and health due to exposure to infections (Ngwane *et al.*, 2002). The government has made a commitment to ensure that all citizens have access to basic sanitation by 2010 (Department of Water Affairs and Forestry, 2001). This was necessitated due to the backlog of people without adequate sanitation facilities, particularly in rural areas, peri-urban areas, and informal settlement areas (WaterAid, 2008). Møller (2009) reports that 2007 was pronounced the target year for eradicating bucket toilets from all of South Africa's formal settlements, and by March 2008 the bucket system had been eradicated in all formal housing regions of Grahamstown except Ndancama. Potential challenges faced, however, regarding the implementation and use of flush toilets within impoverished communities include that households may not be able to afford to pay for water for the whole month,

that toilets may become blocked, and that households are not always able to pay for maintenance and repair of these structures.

**Table VIII:** Percentage of access to toilet facilities within South Africa as a whole, the Makana municipality, and in Grahamstown East

| | Flush | Bucket | Pit latrine | Other* | None |
|---|---|---|---|---|---|
| **South Africa (2001 Census)** | 53.6% | 4.1% | ? | ? | 13.6% |
| **Makana (RSS, 2006)** | 57.1% | 17.5% | 2.9% | 1.6% | 20.8% |
| **Grahamstown East (Møller, 2008)** | 64.0% | 6.0% | 26.0% | 0.0% | 4.0% |

*"Other" includes: septic tanks and chemical toilets

The South African census reveals that the percentage of people using flush or chemical toilets increased from 50.5% in 1996, to 53.6% in 2001. The proportion of black African-headed households with access to a flush or chemical toilet increased from 31.1% to 41.9% over this 5 year period (Statistics South Africa, 2004). In 2001, access to flush toilets per population group in South Africa, were 39.4%, 84%, 97.7%, and 98.6% for black Africans, coloureds, Indian or Asians, and whites, respectively (Statistics South Africa, 2004). A further 36.4% of black African households use pit latrines, of which 29.3% were unventilated. Ventilated pit latrines are regarded as meeting minimum health standards (Statistics South Africa, 2004). In 1996, approximately 1 in every 8 households in South Africa did not have access to any toilet facility. This value had in fact decreased to 1 in every 7 households (13.6%) by 2001 (Statistics South Africa, 2004). The unavailability of toilet facilities were most evident (16.9%) within the Black African households, compared to the other main population groups. It is further quantified that 4.1% of the population made use of bucket toilets in 2001 (Statistics South Africa, 2004). See Table VIII for percentages of access to sanitation facilities within South Africa as a whole, Makana Municipality, and in Grahamstown East.

## Refuse removal

The 2001 Census shows that of the 11.2 million households in South Africa, 6.2 million (55.4%) had a regular refuse removal service. 3.7 million households (34%) used their

own, or a communal refuse dump, while 972 700 (9%) had no method of refuse disposal (Statistics South Africa, 2004). In Grahamstown East, about 87% of households reported that their refuse was removed from their neighbourhood (Møller, 2008). Ngwane *et al.* (2002) explain that lack of refuse removal facilities is especially dangerous to the lives of children who may naively play with disposed material.

It has been observed that littering and illegal dumping occur throughout the urban areas in Makana. The Makana IDP (2008) further reports that this affects the urban areas themselves, in terms of health and aesthetics, as well as affecting property values and the quality of rivers and streams around the towns. Municipal skips in limited areas serve to contain waste to be collected, yet are reportedly often badly sited, that waste spills out of skips, and that skips meant for garden refuse only are used extensively for general refuse too (Makana IDP, 2008). Three permitted landfill sites are found in Makana, namely in Grahamstown, Alicedale, and Riebeeck East (Makana IDP, 2008).

**Electricity**

In South Africa as a whole, electricity is the most commonly used fuel used for cooking, followed by wood and paraffin. According to Thomas *et al.* (2002), approximately 47% of households used electricity in 1996, while 23% and 22% used wood and paraffin respectively. Thomas *et al.* (2002), further add that the fuel used for cooking was highly differentiated by race, as 98% of whites, and only 42% of Africans, used electricity for cooking. The 2001 census reveals that the overall proportion of households that use electricity for lighting increased from 57.3% to 69.7% from 1996 to 2001 (Statistics South Africa, 2004). For Black African-headed households, this increased from 44% to 62% in the same time period. The proportions of households using electricity for cooking and heating also increased from 1996 to 2001, but to a lesser extent (Statistics South Africa, 2004). Table IX, taken from the 2001 census, illustrates the energy sources used for cooking and lighting, by different population groups in South Africa.

**Table IX:** Energy source used for cooking and lighting by population group (percentage of households) (Statistics South Africa, 2004)

| | Black African | Coloured | Indian or Asian | White | Total |
|---|---|---|---|---|---|
| **Cooking:** | | | | | |
| **Electricity** | 39.3% | 82.3% | 97.1% | 96.6% | 51.4% |
| **Gas** | 2.5% | 3.4% | 1.4% | 2.3% | 2.5% |
| **Paraffin** | 27.1% | 6.0% | 0.7% | 0.2% | 21.4% |
| **Wood** | 25.7% | 7.5% | 0.2% | 0.3% | 20.5% |
| **Coal** | 3.5% | 0.4% | 0.1% | 0.2% | 2.8% |
| **Other** | 1.8% | 0.5% | 0.4% | 0.4% | 1.4% |
| **Lighting:** | | | | | |
| **Electricity** | 62.0% | 88.8% | 98.8% | 99.2% | 69.7% |
| **Gas** | 0.3% | 0.2% | 0.1% | 0.2% | 0.2% |
| **Paraffin** | 8.5% | 2.3% | 0.2% | 0.1% | 6.8% |
| **Candles** | 28.6% | 8.3% | 0.7% | 0.3% | 22.7% |
| **Other** | 0.6% | 0.5% | 0.2% | 0.2% | 0.5% |

Møller (2008) reports that 83% of the houses in Grahamstown East are electrified. Problems associated with electricity provision include, importantly, that many households cannot afford the cost of paying electricity fees, despite having adequate structures for this service (Ngwane *et al.*, 2002). Poor households are entitled to 6000 watts of free electricity per month to meet their basic needs, yet only about 25% of households in the Grahamstown East region report that they receive this (Møller, 2008). Many households are unable to afford services such as electrification, and such households often make use of alternate sources of energy, such as candles for lighting, and wood for cooking and heating (Ngwane *et al.*, 2002).

## Social services (healthcare)

Inequalities between public and private healthcare and legal sectors are acknowledged. This is due to reasons including that people in the private sectors can afford to pay for good services, as well as because many graduates choose to work in the private rather than the public sector (Madlala-Routledge, 2007). Alebiosu (2005) reports that there are 6 clinics in Grahamstown where people can go for screening, and to receive services such as anti-natal care, post-natal care, and the treatment of minor ailments and illnesses. These services are provided at no cost in order to make healthcare more

accessible to all people (Alebiosu, 2005). Regarding the municipality as a whole, there are seven clinics that offer a comprehensive service, particularly concerning HIV/AIDS care, as well as 3 satellite clinics and 2 mobile clinics (Makana IDP, 2008). The Makana IDP (2008) further notes that household access to hospitals, clinics, and ambulances in Makana is 64%, 90%, and 55% respectively.

Challenges faced by the healthcare department include that clinics are under-staffed, and there is a shortage of space, buildings, and resources (Alebiosu, 2005). Furthermore, patients often have to wait a long time before they are attended to in the clinics, and clinics do not always have a sufficient supply of medication (Alebiosu, 2005). Some other challenges currently faced in the health sector are also listed in the Makana IDP (2008). These include those of staff issues such as rapid turnover, staff shortages, and absenteeism; as well as problems on the patient's side, including lack of stability, non-compliance to health advice, and socio-economic conditions that result in alcoholism which further leads to non-adherence to programmes. Housing and sanitation are also noted as challenges, while potentials of the health sector include up-to-date equipment, well-trained and motivated staff, effective programmes, and the meeting of targets and standards of the Health Department (Makana IDP, 2008).

**Recreational facilities**

Alebiosu (2005) notes that there are limited sports and recreation grounds in Grahamstown East. A recent sports project underway is the indoor sport centre located between Extensions 5 and 6, and contains basketball equipment, netball equipment, as well as a gymnasium (Alebiosu, 2005). It is reported in the Makana IDP (2008) that there are considerable disparities in the provision and maintenance of recreational facilities between different socio-economic zones. Most people in higher income zones viewed the existing facilities to be adequate, while more in lower income zones felt there was a need for further developments in the recreational facilities and green areas in their communities (Makana IDP, 2008). Such facilities are seen to improve aesthetic quality of the communities and improving people's perceptions of the communities in

which they live; as well as having job creation and poverty alleviation benefits (Makana IDP, 2008).

## Education

The South African census reveals that in 2001, approximately 18% of the population had received no schooling, 6.4% had completed primary school as their highest level of education, 20.4% had a Grade 12 (Matric) level of education, and 8.4% had some form of tertiary education (Statistics South Africa, 2004). Table X illustrates the level of education received by different population groups. The population groups with the greatest proportion of people without education, and with the lowest percentages of tertiary education remain the Black African and coloured groups. In terms of gender, females are seen to have higher levels of illiteracy than males (20% and 15.5% respectively), and lower tertiary education levels (8.2% and 8.7% respectively) when considering all population groups collectively (Statistics South Africa, 2004).

**Table X:** Level of education amongst those 20 years and above by population group (percentages): South Africa, 2001 (taken from Statistics South Africa, 2004)

| | Black African | Coloured | Indian or Asian | White | Total |
|---|---|---|---|---|---|
| **No schooling** | 22.3% | 8.3% | 5.3% | 1.4% | 17.9% |
| **Some primary** | 18.5% | 18.4% | 7.7% | 1.2% | 16.0% |
| **Complete primary** | 6.9% | 9.8% | 4.2% | 0.8% | 6.4% |
| **Some secondary** | 30.4% | 40.1% | 33.0% | 25.9% | 30.8% |
| **Std 10/ Grade 12** | 16.8% | 18.5% | 34.9% | 40.9% | 20.4% |
| **Higher** | 5.2% | 4.9% | 14.9% | 29.8% | 8.4% |

Regarding educational levels for the Makana region specifically, it was indicated that approximately 12% of the school-going population had received no schooling and 21% had received some primary education, while 31% had some secondary education and 17% had a matric qualification (complete secondary education) (Makana IDP, 2008).

Accessibility to schools, especially in rural areas, employment opportunities, and wellness, may contribute to the levels of those without basic levels of literacy (Makana IDP, 2008). The IDP reports that only 67% of the people in Makana have access to

schools, and this is in comparison to 88% access for the district, and 87% for the province as a whole. Furthermore, it is not uncommon for young children to be taken out of school to contribute to the family's income, or to care for parents when both are sick with HIV/AIDS (Makana IDP, 2008). The low levels of education among potential workers may further be reflected in the levels of those in elementary employment, as 36% of the employed population work in the elementary occupation category.

## Social grants

By March 2006, social grants were received by 11 million South Africans (Department of Social Development, 2007). These grants include foster care grants, care dependency grants, war veterans' grants, old-age grants, disability grants, and child support grants. The Old-Age Pension Grant is the second most commonly received social grant (after the child support grant), and is redeemable by women over the age of 60, and by men over 65 years of age. Research has confirmed that these grants reduce the occurrence of hunger and extreme poverty, as well as facilitating household access to basic services and economic opportunities (Department of Social Development, 2007). The Department of Social Development (2007) states that social grants contribute to over half of the income of the poorest 20% of households in South Africa. The values of these grants are listed in Table XI.

**Table XI:** Grant values per month as of 1 April 2006 (Department of Social Development, 2007)

| **Grant type** | **Amount** |
|---|---|
| Old-age grant (pension) | R820 |
| Disability grant | R820 |
| War veterans' grant | R758 |
| Foster care grant | R590 |
| Care dependency grant | R820 |
| Child support grant | R190 |
| Grant-in-aid | R170 |

According to the South African Demographic and Health Survey (Department of Health, 2004), 16% of people across South Africa reported receiving some form of grant.

Children and the elderly are the most likely to be grant recipients, with child support grants and old-age pensions accounting for almost 40% of grant recipients each. Women were reported to be slightly more likely than men to be receiving a grant (18% versus 14%). Those living in rural rather than urban areas were also most likely to be receiving a grant (approximately 20% and 14% respectively); as well as those in the Eastern Cape (23%) and Limpopo Province (21%) over the other provinces in the country (Department of Health, 2004).

**Violence, crime, and safety**

South Africa is one of the most violent countries of the world. It is estimated that 46% of the injury deaths in the country in the year 2000 were homicides (Norman *et al.*, 2007). Interpersonal violence has caused around one million (6.5% of all) DALYs (Disability Adjusted Life Years). A survey conducted in Grahamstown East found that 22.5% of households reported a break-in or burglary in the year prior to the survey, 12% reported a member of the household was victim of a serious personal crime such as murder, rape, or assault in the past year, and 6% of households had experienced both a housebreaking and a serious crime in the past year (Møller, 2008). Norman *et al.* (2007, p3) states: "The underlying determinants of violence, many of which are a legacy of the apartheid era, are intertwined with the disintegration of the social fabric. Income inequality and poverty, high unemployment, rapid social change, corruption and poor rule of law, gender inequalities and family breakdown, have contributed to this climate of violence". Drugs and alcohol are also major contributors to this violence (Norman *et al.*, 2007).

The World Health Organisation (WHO, Sminkey, 2002) reported on research indicating that the health sector is at the forefront as far as workplace violence is concerned, and that violence increases stress, and compromises the retention of health personnel and the delivery of quality healthcare globally. When it came to developing and transition countries, it was evident that more than half of the surveyed health sector personnel had experienced one or more incidents involving physical or psychological violence in the previous year, and that this rate reached 61% in South Africa (Sminkey, 2002).

## THE NURSING PROFESSION

Nurses are essential to the health, safety, and well-being of patients across all facets of healthcare (Thompson and Burns, 2004). They are the largest group of healthcare professionals in all countries (Chiu *et al.*, 2007). Nurses are often the healthcare providers who spend the greatest amount of time with the patients, and nurses' ability to provide care can critically affect patient outcome (Thompson and Burns, 2004). Despite this, it is reported that the typical nursing environment is characterized by multiple threats to patient safety, including failure to follow management practices, unsafe workplace deployment, and unsafe work and workspace design (Thompson and Burns, 2004). Thompson and Burns finally add that human error can be reduced if nursing staff are supported by redesigned work processes, safe environments, and a culture that is not afraid of reporting errors.

Nurses are at a higher risk of experiencing low-back pain, burnout, and emotional exhaustion than other professionals (Sveinsdottir *et al.*, 2006). Janowitz *et al.* (2006) explain that when performing patient-related functions, jobs or tasks with poor ergonomics characteristics may result in higher levels of work-related musculoskeletal disorders (WMSDs), absenteeism, as well as lower levels of patient safety. Yorio and Ferguson (2002) state that reducing the number of musculoskeletal disorders (MSDs) experienced by healthcare professionals is one of the most challenging safety issues facing healthcare establishments. Across the US in 1999, nearly 10% of the MSDs that resulted in days away from work were from nursing personnel (Yorio and Ferguson, 2002).

Nursing work is characterised by physical as well as psychological or emotional stress (Piko, 2006). Sveinsdottir *et al.* (2006) add that increased workload among nurses, growing occupational stress, and declining job satisfaction are also major concerns. Job satisfaction is a determinant of nursing performance, quality of care, and cost containment (Keuter *et al.*, 2000). Alterations in organizational climate, furthermore, may cause changes in nurses' job satisfaction. As nurses are integral components of

hospitals, and the delivery of patient care, these factors are worthy of consideration (Keuter *et al.*, 2000).

Additional strain is placed on healthcare workers due to the global shortage of nurses. Due to insufficient staffing, nurses become frustrated about their inability to complete their work as well as possible, and experience difficulties in meeting patients' needs (Sveinsdottir *et al.*, 2006). This nursing shortage may also compromise the quality and safety of patient care (Shipman, 2008). Workload and work-associated stress may be causes of increased turnover rate of nurses (Sveinsdottir *et al.*, 2006). It is stated that inadequate working conditions, low wages, lack of resources to work effectively, and limited career and educational opportunities are important factors driving nurse migration (Sveinsdottir *et al.*, 2006). These conditions of inadequate staffing, heavy workload, and high levels of occupational stress appear to be universal (Sveinsdottir *et al.*, 2006). Nurses in South Africa additionally face situations and challenges which may be unique to certain countries, such as the divide in healthcare between the public and private sphere, as well as the impact of the HIV/AIDS epidemic (Hall, 2004).

**The nursing profession and work tasks**

The nursing workforce comprises of various positions, which include, amongst others, Registered Nurses, Nurse Practitioners, Head Nurses, Licensed Practical Nurses, Home Health Nurses, and Nursing Aides (Studentdoc, 2008). Head nurses (or "nurse supervisors") perform duties such as setting up work schedules, and are ultimately responsible for the performance of a nursing team (Studentdoc, 2008). Registered Nurses (also known as "Professional Nurses"), make up the largest group of healthcare workers, and tasks performed include planning, patient evaluations, monitoring and tracking of vital signs, procedures such as intravenous tube placement, phlebotomy, and administering medications (Yorio and Ferguson, 2002; Studentdoc, 2008).

Licensed Practical Nurses (called "Staff Nurses" or "Enrolled nurses" in South Africa) provide patient care under the supervision of Registered Nurses, and tasks performed may include checking the vital signs of patients, monitoring in-and-out volumes, treating

bedsores, and preparing or performing procedures such as dressing wounds and giving enemas (Yorio and Ferguson, 2002; Studentdoc, 2008). Nursing Aides are also known as Nursing Assistants, and provide basic nursing care under the supervision of nursing and medical staff. This includes tasks such as helping patients to eat, dress, and bathe; moving patients; as well as tasks such as taking patients' temperatures, pulse, respiration, and blood pressure (Studentdoc, 2008). Due to the similarity in job descriptions among Registered Nurses, Licensed Practical Nurses, and Nursing Aides, these job titles may be unitarily grouped as "nursing personnel" (Yorio and Ferguson, 2002).

In South Africa, work tasks of nurses in hospitals compared to those working in clinics differ to some extent, as clinics generally provide basic healthcare, and do not look after patients overnight. Hospitals, on the other hand, provide 24-hour care for patients, and as such, these nurses would have to perform more manual patient handling tasks than clinic nurses, such as moving and feeding patients. Regarding differences between public and private spheres, the nursing tasks within the same type of workplace are seen to be similar, while working conditions vary more substantially.

**The situation of nursing in South Africa**

There are approximately 155 484 nurses employed in South Africa, and therefore approximately 343 nurses for every 100 000 people in the population (Hall and Erasmus, 2003). The World Health Organisation (WHO) recommends a minimum ratio of nurses to total population to be 200:100 000 for adequate nursing service in developing countries, and hence South Africa compares favourably to this guideline (Hall and Erasmus, 2003). The nurse to population ratio is, however, expected to drop to 305:100 000 over the next ten years (Hall and Erasmus, 2003). Regarding provincial nurse to population ratios, provinces with large rural areas such as the Northern Cape, Mpumalanga, Limpopo, and the Eastern Cape, have ratios below the average for South Africa (Hall and Erasmus, 2003). The nurse to population ratio in the Eastern Cape was 261:100 000 at the time (Hall and Erasmus, 2003).

Provincial as well as sectoral imbalances exist regarding the distribution of nursing skills. In 2001 it was indicated that about 63% of practicing nurses were employed in the public sector (noting that approximately 84% of the population rely on public healthcare), and 37% in the private health sector (serving about 16% of the population) (Hall and Erasmus, 2003). In 2001, only about 75% of available nursing positions within the public health sector were filled (Hall and Erasmus, 2003). Regional imbalances include that the majority of healthcare workers are still concentrated in urban areas (Hall and Erasmus, 2003). This shortage of nurses may be attributable to unsatisfactory working conditions at public health facilities, as they are expected to provide healthcare to increasing numbers of patients, with insufficient resources, outdated or faulty equipment, and a lack of proper incentives (Hall, 2004). Hall adds that the combined effect of healthcare transformation, skills shortages, and the impact of HIV, will increase stress and burnout among healthcare workers.

**Table XII:** Demographic characteristics of the nursing workforce in South Africa (Taken from Hall, 2004. Percentages may not add up to 100 owing to rounding)

| | | **Total (%)** |
|---|---|---|
| **Gender** | Male | 6.4 |
| | Female | 93.0 |
| **Race** | African | 69.6 |
| | Coloured | 11.0 |
| | Indian | 4.8 |
| | White | 14.1 |
| | Other | 0.4 |
| **Age** | 30 years and younger | 15.7 |
| | 31-40 years | 37.8 |
| | 41-50 years | 32.8 |
| | 51 years and older | 13.5 |
| | Unknown | 0.2 |
| **Highest qualification** | First degree/ higher diploma and higher | 17.8 |
| | Diploma/Occupational certificate | 62.1 |
| | Grade 12 | 12.8 |
| | Grade 10-11 | 5.8 |
| | Lower than Grade 10 | 1.5 |

The majority of South African nurses are female (approximately 93%), in contrast to the majority of all economically active people in South Africa being male (Hall and Erasmus,

2003). The racial distribution of practicing nurses in South Africa reflects the demographic profile of South Africans in general, with approximately 78% of nurses in the public health sector being black Africans, 13% being coloured, 7% white, and 2% Indian (Hall and Erasmus, 2003). Regarding occupational distribution of nursing staff in South Africa, the South African Nursing Council register (2001), indicates that 49.6% of nurses in South Africa are nursing professionals, 40.9% are enrolled nurses and nursing auxiliaries, while 9.5% are students. See Table XII for demographic characteristics of the nursing workforce in South Africa.

Various factors contribute to the growing demand of nurses, such as population growth, changes in the population's healthcare needs, and the shortage of medical practitioners (Hall and Erasmus, 2003). Furthermore, since the mid-1990s, large proportions of the population who previously had no access to healthcare are now entitled to free healthcare, and as such, an increased demand for health services, a reduced number of nursing corps, and unsatisfactory work conditions are additional challenges faced by nurses (Hall, 2004). The supply of nurses depends on factors influencing enrolment and graduation from various institutions, and furthermore, career decisions are influenced by various socio-economic factors such as incentives, work environments, and opportunities for further development (Hall and Erasmus, 2003). It is noted that healthcare workers in the public sector experience high levels of tension due to general staff shortages, unhygienic working conditions, poor or outdated equipment, poor remuneration, and long shifts (Hall and Erasmus, 2003). The previous political system has also had an effect on the supply of nurses, for reasons including the lack of equal opportunities for black people in the past, which may affect the ability to fulfil criteria for admission to higher education institutions, as well as the ability for successful completion of studies (Hall and Erasmus, 2003).

The AIDS pandemic has added to the challenges faced by health workers in South Africa (Hall, 2004). Zelnick and O'Donnell (2005) report that nurses in the developing world face a 'triple threat' from HIV/AIDS, namely: increased workloads; exposure to HIV infection; and stressed morale. Hall (2004) similarly states that the physical and

emotional stress of dealing with AIDS patients, the lack of organizational support, and the prevalence of HIV among nurses, may lead to reduced productivity, increased attrition, lower morale, and more accidents, which may threaten the quality of healthcare in South Africa. South Africa is reported to have the largest number of people living with HIV out of any country in the world, and as such, much of the care South African nurses provide is focused on taking care of those infected with HIV/AIDS (Zelnick and O'Donnell, 2005; Hall, 2004). Additionally, it is reported that 16.2% of South African nurses would consider alternative employment, and 7.7% alternative professions, if they perceived their risk of infection to be increasing in their current work environment (Hall, 2004).

**The nursing shortage**

A nursing shortage is evident worldwide, and has been referred to as the "global crisis of nursing" (Sveinsdottir *et al.*, 2006, p884). Aiken *et al.* (2001) add that the current nursing shortage, high hospital nurse job dissatisfaction, and reports of uneven quality of hospital care are evident in different countries with distinctly different health care systems. Aiken *et al.* (2001) further found that more than three in ten nurses in England and Scotland, and more than two in ten in the United States were planning to leave nursing within the following year. It was additionally reported that percentages of nurses planning to leave their jobs in the next year were higher for those under 30 years of age than the general population in all five countries surveyed (Aiken *et al.*, 2001). South Africa has also lost many professional nurses due to emigration, as well as the decision to change profession (Hall, 2004).

Regarding the shortage of healthcare workers in Africa, Maphosa (2008) reports that more African doctors and nurses are working abroad than in their home countries, thus contributing to the heightening shortage of healthcare professionals in Africa. A study by Clemens and Pettersson (2008) reports that by the year 2000 approximately 70000 (one in ten) African-born professional nurses were working overseas in developed countries. It is acknowledged that working conditions, as well as training and salaries of African medical professionals, must be improved to motivate them to remain in their

original countries (Maphosa, 2008). Evidently, in South Africa in the 1980s, there was a nurse-patient ratio of 1:4, yet currently it is 1:8 and sometimes up to 1:12, which is to a large extent due to emigration of healthcare workers (Matutu and Mahlengeni, 2008).

The nursing shortage, in general, may be attributed to several factors, including long hours, non-competitive pay, administrative tasks that take time away from patients, and high patient-to-nurse ratios (Windle, 2008). Turnover at an organisational level appears to be a major contributor to the shortage of nurses, and as a consequence of high turnover increasing pressure is placed on the remaining staff, which may result in decreased morale and the possibility of further turnover as many nurses leave the profession in order to seek better working conditions in other fields (Coomber and Barriball, 2007). Factors that nurses reported as being reasons for intent to leave were centred on issues known to affect job satisfaction, such as ineffective supervisory relationships and poor opportunities for professional development (Coomber and Barriball, 2007). Coomber and Barriball (2007) conclude that factors related to the work environment, rather than individual or demographic factors, continue to exert the greatest influence on nurses' job satisfaction and turnover intentions. A study on nurses in Iceland reports that their shortage of nursing personnel in the healthcare sector is more evident within hospitals than for nurses working outside of hospital settings (Sveinsdottir *et al.*, 2006). Meanwhile, US nurses have reported that cost-cutting by hospitals was reducing nurse staffing to unsafe levels (Aiken *et al.*, 2001). Furthermore, it is reported that there may be a lack of comprehensive strategies designed to retain aging nurses (Windle, 2008).

Nurses experience difficulties in meeting patient needs due to insufficient staffing (Sveinsdottir *et al.*, 2006). Inadequate staffing may result in decreased quality of patient care, and increased mortality rate of patients (Sveinsdottir *et al.*, 2006). It has been reported, for example, that the shortage of nurses is the single greatest threat to providing HIV/AIDS treatment in South Africa (Zelnick and O'Donnell, 2005). Windle (2008) further affirms that hospitals with lower nurse staffing levels, nurses who spend less time with patients, and practice settings with fewer Registered Nurses compared to

Licensed Practical Nurses or Nursing Aides, tend to have higher rates of poor patient outcome. Shipman (2008) reports that the increased workload, with corresponding fatigue levels in nurses, increases the probability of medical and medication errors. Aiken *et al.* (2002) found that the odds of patient mortality increased by 7% for each additional patient in the average nurse's workload, and that the difference from 4 to 6 and from 4 to 8 patients per nurse would result in 14% and 31% increases in mortality respectively. Aiken *et al.* (2001) mention other threats to the provision of care, namely work design and workforce management.

High emotional exhaustion and greater job dissatisfaction in nurses is also found to be significantly associated with patient-to-nurse ratios (Aiken *et al.*, 2002). Aiken *et al.* (2002) found that after adjusting for nurse and hospital characteristics, each additional patient per nurse was associated with a 23% increase in the chances of burnout, and a 15% increase in job dissatisfaction levels. Recommended patient to nurse ratios range from three to ten patients for each nurse in medical and surgical units, and laws in California, for example, recommend five to six patients per nurse (Aiken *et al.*, 2002). High levels of burnout and job dissatisfaction, in turn, are associated with a greater intention of nurses to leave their jobs (Aiken *et al.*, 2002). In this regard, Aiken *et al.* (2002) also state that improving staffing levels may not only save patients' lives and decrease nurse turnover, but may additionally reduce hospital costs.

Shipman (2008) surmises that the nursing shortage is likely to continue to worsen due to factors such as the aging Registered Nurse workforce, fewer new recruits, and low retention rates. Camerino *et al.* (2006) propose that attempts to alleviate nursing shortages may include institutional policies to sustain work ability though better working conditions, improving the quality of the working environment, and finding suitable alternative nursing work for those who are unable to continue in their current post. Obtainment of funding for training new recruits, the development of more public-private partnerships, and the development of personnel policies and benefits in hospitals that are comparable to those in other lines of work and businesses (Shipman, 2008; Windle, 2008; Aiken *et al.*, 2001).

## Job satisfaction, stress, and burnout

Aiken *et al.* (2001) report that nurses' job satisfaction and levels of burnout experienced are particularly important in the current context of nurse shortages. Job satisfaction and work stress are major contributing factors to intent to leave and turnover rates in the nursing profession (Coomber and Barriball, 2007). Furthermore, high numbers of dissatisfied and emotionally exhausted nurses may have significant impacts on patient care and patient outcomes (Aiken *et al.*, 2001).

Job satisfaction, according to Keuter *et al.* (2000), refers to the perceptions and attitudes that individuals have and exhibit regarding their work. Many factors can impact the job satisfaction of nurses (Coomber and Barriball, 2007). Hertzberg's (1966) Theory of Worker Motivation identifies factors that cause dissatisfaction when not sufficient, including pay and associated benefits, organizational policies and working environment; while factors that increase motivation when present include recognition, achievement, and self-satisfaction. A model of nurse turnover behaviour by Irvine and Evans (1995) notes factors affecting job satisfaction, including economic factors (such as pay, job market and training), structural factors (including work environment and work context), as well as psychological factors (individual and demographic).

Tzeng (2002) report various factors that influence job satisfaction and intention to leave nursing work, including demands from patients/relatives, perceived job image, levels of job enrichment, personal growth opportunities or promotional opportunities, workload, dissatisfaction with work hazards, relationships with co-workers and medical staff, autonomy, leadership styles, and time for patient care. Individual nurse characteristics were not found to be related to job satisfaction. Liou *et al.* (1997) report similar as well as additional factors influencing job satisfaction, namely: the indirect working environment, the direct working environment, salary and promotion, self-growth, challenging work, interaction with and feedback from patients and family members, leadership style, working atmosphere, as well as family support and religion.

Keuter *et al.*'s study (2000), found that nurses rated both the structural components of the organization, as well as professional recognition and working relationships, as important correlates of job satisfaction. Restructuring or changes in healthcare delivery may result in reduced job satisfaction in nurses (Keuter *et al.*, 2000). Heavy workloads, mandatory overtime, and inadequate staffing, are further factors leading to job dissatisfaction of nurses (Unruh and Fottler, 2005). Coomber and Barriball (2007) found that stress and leadership issues seem to exert influence on dissatisfaction and turnover for nurses. Level of education achieved and pay have also been found to correlate to job satisfaction, although results of studies on these topics have not been consistent (Coomber and Barriball, 2007). Blegen (1993) and Irvine and Evans (1995) found that the factors most strongly related to job satisfaction were work content and environment.

Burnout may be defined as a type of prolonged response to job-related stressors, and along with the other negative aspects of healthcare work, has significant behavioural and health implications (Piko, 2006). Associations have also been made between burnout and nurses' intention to quit their jobs, while work support and job stress have been reported to be predictors of nurses' burnout (Tzeng, 2002). Occupational stress and burnout are negatively correlated with job satisfaction among nurses (Blegen, 1993; Piko, 2006). Sveinsdottir *et al.* (2006) state that nurses' occupational stress decreases job satisfaction, increases turnover rate, and reduces nursing quality. Coomber and Barriball (2007) state that stress is consistently cited as a major predictor of anticipated turnover, with studies conducted in the US, Singapore, Australia, and Taiwan yielding similar results. Occupational stress has furthermore been found to be one of the major work-related health problems (Sveinsdottir *et al.*, 2006).

Occupational stress among nurses is associated with a variety of personal and institutional factors, such as the physical environment, workload, personal responsibility, role conflicts, work relationships, the home/work interface, work experience, and education (Sveinsdottir *et al.*, 2006). Sveinsdottir *et al.* (2006) notes that various factors within nurses' workplaces are seen to be "family unfriendly", and that in order for society

to benefit from women's participation in the workforce, society needs to recognize that women are still considered responsible for the household and the welfare of the family. Inherent job stresses for nurses involve the responsibility of taking care of sick people, the physical challenges of providing patient care, and psychological challenges such as coping with human suffering and the death of patients (Hall, 2004). Work-related stress among nurses is also influenced by organizational and management attributes of the work and working environment (Sveinsdottir *et al.*, 2006). A study by Jones (1996) found that organizational climate, and particularly the employees' perceived support from the organization, to be strongly associated with work stress. Sveinsdottir *et al.* (2006, p877) state, "…it has been indicated that stressors related to organizational structure and institutional culture matter rather than stress from nursing tasks." The sources of stress, furthermore, are seen to vary both in nature and in frequency across nursing specialties (Sveinsdottir *et al.*, 2006). Sveinsdottir *et al.* (2006), further adds that in order to structure any preventative measures, it is necessary to identify sources of job-related workloads specific to each occupational group.

Shader *et al.* (2001) found that the main stressor, among a sample of US nurses, was found to be a lack of stability in work schedule, with greater schedule stability associated with less work-related stress and lower anticipated turnover. Higher job stress was also shown to reduce job satisfaction through the lowering of group cohesion (Shader *et al.*, 2001). Work stress additionally found to be more of a problem for younger nurses (20-30 years), than the older nurses of the sample, which may be due inexperience, and greater stress from the work schedule (Shader *et al.*, 2001). Yin and Yang (2001) reported that the second most frequently reported reason for the leaving the previous nursing position was work stress due to high workload. Aiken *et al.* (2002) found that lower nurse retention, or increased patient to nurse ratio, affected work stress. Stress has also been found to be related to factors such as low autonomy, low recognition, and poor communication with colleagues (Coomber and Barriball, 2007). Results of Sveinsdottir *et al.*'s (2006) research found that the greatest support received by nurses on a daily basis was from co-workers (such as staff nurses, head nurses, and

licensed practical nurses), yet low satisfaction with head nurses contributed significantly to work-related stress (Sveinsdottir *et al.*, 2006).

Coomber and Barriball (2007) note that the subjective nature of stress perception makes it difficult to assess the specific contributing factors, and additionally, assessing stress in an occupation as diverse as nursing, is challenging. Stressful conditions are prevalent in the nursing profession, and although being universal in nature, occupational stress differs between cultures and countries due to different working conditions, education, social status, and the autonomy of nurses in different cultures (Sveinsdottir *et al.*, 2006).

**Work conditions**

Disch (2000, p75) defines a healthy work environment as, “a work setting in which the policies, procedures, and systems are designed so that employees are able to meet organisational objectives and achieve personal satisfaction in their work.” The working environment may refer to the natural as well as artificial elements contained in a workplace; including the physical design, processes, temperatures, heat and humidity (SAQA, 2008). Piko (2006) states that various social, political, and economic factors also shape the healthcare environment. Milisen *et al.* (2006) state that the context and environment in which nurses practice, are sources of tension, dissatisfaction, and weariness. They add that measures targeting problems in the nursing industry should emphasize integrated system changes rather than singular issues, and should consider the multiplicity of factors and their compounding interactions. Berland *et al.* (2008) state that a working environment that is characterized by a rapid pace and stress can have negative consequences for the patient, as well as consequences for the caregiver’s health.

Milisen *et al.* (2006) state that nurses across different healthcare systems experience similar concerns regarding work environment and quality of care. Disch (2000) adds that stress, abuse, and unhealthy work environments can exist in any setting in which nurses practice, although the signs of stress and abuse may differ according to the

setting. Nurses face challenges due to verbal as well as physical abuse, and also face upheaval caused by financial pressures, integrations, and downsizing (Disch, 2000). Milisen *et al.* (2006) state that improving the work environment would require attention to the factors of time, collaboration, and economics. Various intrinsic factors may also contribute to a stressful work environment, including the desire to provide comprehensive physical and psychosocial care yet not being able to do so, as well as the high level of responsibility nurses experience despite high volumes of work and the number of other care providers and patients (Milisen *et al.*, 2006).

Berland *et al.* (2008) describe an interaction that exists between the work demands and the employees' influence and control over these work responsibilities. Evidently, the problems generated by workload are multiplied by the employees' lack of control over the work situation (Berland *et al.*, 2008). Berland *et al.* add that in situations of great stress, both social support and employee control over their work situation can act as buffers to lessen the negative influences of stress. It has been reported that managerial factors may affect employees' attitudes, job satisfaction, organisational commitment, and motivation to perform well; which may in turn influence organisational outcomes (Bjorvell and Brodin, 1992). Additionally, Bjorvell and Brodin's (1992) study reports that a supportive institution may reduce turnover in hospitals, and Tzeng (2002) adds that social support and improved team cooperation could protect nurses against burnout.

Leadership, which incorporates satisfaction with supervisors, such as with their competency, fairness, recognition, communication, and collaboration, in Fang's (2001) study, was one of the most significant predictors of turnover intention. Tzeng's (2002) research, however, suggested that leadership style had no influence on job satisfaction. Coomber and Barriball (2007) state that nursing leadership style, or supervisory relationship, has international relevance and is linked to the work environment. Job dissatisfaction may arise when nurse managers fail to provide due recognition and support, disregard staffing issues, and do not address problems (Fletcher, 2001). It is also reported in Zelnick and O'Donnell (2005) that enabling workers to take part in

decision making is an important factor in creating a respectful and responsive work environment.

Role conflict also is reported to be an important organisational factor that influences psychosocial work climate and generates job-related stress (Piko, 2006). A lack of congruent expectations and demands from various people in the workplace is seen to be psychologically uncomfortable, and may induce negative emotional reactions, diminish effectiveness and job satisfaction, and increase the intention to leave the current organisation (Piko, 2006).

Factors influencing job satisfaction vary according to the different levels of the profession (such as between ward managers and staff nurses), as well as in different environments (such as in different hospitals, communities, and geographical regions) (Coomber and Barriball, 2007). Furthermore, differing labour markets and population densities within different regions may affect opportunities for alternative employment or workloads (Coomber and Barriball, 2007). Different work tasks and working conditions, which face nurses in different workspaces, produce different sources of stress (Sveinsdottir *et al.*, 2006). Sveinsdottir *et al.*'s study, researching Icelandic nurses, found that although working conditions were more strenuous at hospitals than in workplaces outside of the hospital setting, similar levels of occupational stress and job satisfaction were reported by nurses working within and outside of the hospital setting. The hospital nurses however did reported higher staff turnover rates than nurses outside of the hospital setting.

Chiu *et al.* (2007) reported that work ability of nurses in their study varied among hospital type and department, and was closely related with the quality and safety of the work environment and leisure time management. The average Work Ability Index (WAI) score for nurses in medical centres did not differ significantly from those in regional hospitals. However, when considering WAI compared to age, it is evident that after the age-group of 31-35 years, nurses working in medical centres had significantly higher WAI scores (i.e. greater work ability) than those working in regional hospitals (Chiu *et*

*al.*, 2007). This may be due to the “healthy worker effect”, as regional hospital nurses had higher average age and work experience than the medical centre nurses. However, Chiu *et al.* (2007) report that medical centres tend to be better organised and managed, with more training programmes than regional hospitals, and this is likely to help maintain work ability of senior nurses.

Chiu *et al.* (2007) also studied quality of life variables of these nurses, and found no significant differences in scores between nurses in regional hospitals versus those in medical centres. However, self-reported differences in quality of life were evident between different work departments, with nurses working in the department of outpatient services showing higher quality of life scores, followed by nurses in the supply units and operating rooms. Chiu *et al.* (2007) add that nurses working ward and ER/ICU sections tend to require shift work, direct patient care, and high time pressure, hence resulting in lower quality of life. Additionally, significant correlations were found between the WAI score and domains of the quality of life questionnaire, including the environmental domain, physical domain, psychological domain, and the social domain (Chiu *et al.*, 2007). Nurses working in outpatient department services, and supply units, furthermore had significantly higher average age, work experience, and WAI scores than the nurses working in operating rooms, emergency or intensive care units (ER/ICU), and medical and surgical wards (Chiu *et al.*, 2007). Work ability of nurses was therefore seen to be influenced by working conditions, as it is lessened by factors including direct patient care, working with patients with higher physical demands, and unsafe environments (Chiu *et al.*, 2007).

Many workplaces require nurses to perform shift work. Ahasan (2002) explains that in order to ensure effective work regimes that involve shift work, it is necessary to consider the local economic and competitive environment, as well as the psychophysical, social, and cultural characteristics of the workers themselves. A good work design can cause improvements to workers’ health, safety, and well-being; as well as reducing the chance of errors resulting from long and arduous working hours (Ahasan, 2002). The workers’ response to shift work is affected by their tolerance to a particular shift pattern, and a

lack of tolerance may result in a general malaise, accumulated fatigue, loss of harmony in circadian rhythm, as well as digestive and neurological problems (Ahasan, 2002). Human adaptation to shift work, according to Ahasan, is additionally influenced by individuals' cognitive, psychosocial, economic, and cultural characteristics. Furthermore, factors such as environmental conditions, job content, tasks, and work organisation affects levels of fatigue experienced (Ahasan, 2002).

Rest breaks during work periods are designed in order to allow workers to overcome fatigue arising from work, and may furthermore influence workers' physical and psychological well-being, which in turn may influence productivity levels (Ahasan, 2002). Ahasan (2002) also notes that when designing work patterns, it is necessary to identify the effects of a particular schedule or shift pattern on workers' eating and sleeping patterns, as well as on their social and family life. Evening time as well as weekends, for example, is the most common time for social contacts with family and friends, and hence prolonged periods of evening or night shift work, or work on weekends may hinder social contact and hence cause stress and possibly resentment (Ahasan, 2002). These effects may further vary with the nature of the work; and the training of workers, levels of decision-making, work-related hazards, and work regulations should also be considered (Ahasan, 2002). Shift work may further affect a worker's sensitivity to physical, chemical or biological substances, dust, or noise, especially at night (Ahasan, 2002). Ahasan reports that inter-related and inter-individual differences, as well as factors outside the workplace, also affect health, hygiene, safety, and performance at work, as well as sleep patterns and tolerance to environmental factors.

On another note, the importance of pay or salary to nurses, according to Coomber and Barriball (2007), is related to culture, and is difficult to determine without detailed knowledge of the wider social and economic climate in which it functions. Cowin (2002), found that among a sample of Australian nurses, the issue of pay, although not ranked as highly important, ranked among the least satisfying factors of their job. Pay, however, was not significantly associated with intention to leave in Cowin's (2002), or Fang's (2001) research. A source of concern for nurses was the perceived inequality of pay

with high levels of responsibility and their workloads (Cowin, 2002). Nurses also reported inadequate reward, and unfairness of pay compared to other professions, in Fletcher (2001).

According to Aiken *et al.*'s (2001) research, more than 75% of U.K. nurses felt that their salaries were inadequate; while nearly 60% of U.S. nurses and 70% of nurses from Canada felt that their salaries were adequate. Nurses in the U.S. or Canada, at least, are more likely to be dissatisfied with working conditions than with their wages (Aiken *et al.*, 2001). In the South African context, low salaries are commonly viewed as the primary reason for nurses seeking work overseas (Zelnick and O'Donnell, 2005).

**Individual characteristics of nursing personnel**

Camerino *et al.* (2006) report that demographic changes in the American as well as European population structure have significant impacts for healthcare provision. These changes include a reduction in the numbers of younger people of working age, and an increase in the numbers of older people who are no longer in paid employment. It is reported that regardless of the national age of retirement, few nurses continue to practice after the age of 60 years, and this may be due to the physically and emotionally demanding nature of nursing work resulting in lower work ability, which in turn leads to early retirement (Camerino *et al.*, 2006).

Camerino *et al.*'s (2006) study, on nurses from 10 European countries, revealed a significant relationship between age and low perceived work ability, whereby older nurses had significantly lower work ability compared to younger nurses. Additionally, low work ability was significantly associated with intention to leave nursing, and this was most evident among younger nurses. Differences in perceived work ability between countries for staff nurses of different age groups were considered to be attributable to differences in nursing work and employment conditions (Camerino *et al.*, 2006). Factors such as attitudes towards older nurses, professional and career opportunities, occupational health policies, and age at which pension may be drawn, may also influence the relationship with workload and ability to cope with work demands of

different age-groups in various countries (Camerino *et al.*, 2006). Unfavourable working conditions may contribute to premature depletion of work capacity, according to Camerino *et al.* (2006), and furthermore, countries adopting solutions such as more flexible work schedules for older nurses show higher perceived work ability.

It is reported that the average age of employed nurses in UK and Germany is 41 and 39 years respectively, while Chiu *et al.* (2007) report an average age of 31 years for the Taiwanese nurses in their study. In Chiu *et al.*'s (2007) study of clinical nurses in Taiwan, 81% of those in the sample were less than 35 years old, and only 8% were older than 40. Work ability of these nursing professionals gradually increased with age until after 45 years, after which it rapidly decreased with increasing age. WAI scores of the age groups of 21-25, 26-30, 46-50, and 51-55, were significantly lower than those for the age groups of 31-35, 36-40, and 41-45 years.

Personal health condition and physical workload were evidently the main factors contributing to the reduction of work ability for senior nurses, while for young nurses, mental demands of work critically affected their work ability (Chiu *et al.*, 2007). When considering items of the Work Ability Index independently, the scores of items relating to health and disease (such as "number of current diseases diagnosed by physician", "estimated work impairment due to disease", and "sick leave during the last year"), gradually decreased with increasing age, thus indicating a poorer health condition (Chiu *et al.*, 2007). However, it is also indicated that increasing age, professional experience, and occupational education, was positively related with subjective working competence and mental health of nurses (Letvack, 2005; Tzeng, 2004).

Chiu *et al.* (2007) found that nurses' work ability was associated with the multiple demands of work as well as daily life, including factors such as financial resources, freedom, physical safety and security, health and social care, home and physical environment (i.e. pollution, noise, traffic, and climate), opportunities for acquiring new information and skills, and participation in and opportunities for recreation/leisure. Chiu *et al.* (2007, p325) states: "the result of this study suggests that a nurse's work ability

was closely related to the quality and safety of the work environment as well as his or her lifestyle."

The gender of workers may also be worth considering. As a generalisation, particularly relevant in rural settings, woman are usually the ones responsible for water collection, fetching wood for fuel, watering and milking livestock, and performing domestic activities including child care (Bryceson and Howe, 1993; Mies, 1986). Jafry and O'Neill (2000), expound that women's contributions and responsibilities can have serious health consequences, including backache, chest pains, and miscarriage. For this reason it has been argued that the impact of work on family life is higher for women than for men (Chavalitsaulchai and Shahnavas, 1990). The Department of Social Development (2007) adds that there is concern that the inequality that exists between men and women in South Africa is deeply entrenched, and that it has characterised society for many decades.

In Piko's (2006) study, it was found that it was female workers, as well as those with higher educational levels that reported lower levels of job satisfaction. Yet at the same time, it was also found that females and better educated workers tended to report lower levels of depersonalisation and higher levels of personal accomplishment (Piko, 2006). Hence, schooling may be a valuable protective factor against some negative job-related experiences (Piko, 2006). On another subject, Aiken *et al.* (2003) studied the effects of education levels on patient outcomes, and found that a 10% increase in nurses educated at a baccalaureate level (4 years of university), was linked to a 5% decrease in 30-day mortality, and failure-to-rescue rates.

Inconsistencies have been found regarding the relationship of level of education and job satisfaction (Coomber and Barriball, 2007). Studies performed by Rambur *et al.* (2003) and Yin and Yang in Taiwan (2002), found that job dissatisfaction decreased with higher educational level, and that nurses with lower education are less satisfied with their jobs. This is possibly due to enhanced understanding empowering nurses to influence the macro-factors of their work, hence reducing job dissatisfaction (Coomber and Barriball,

2007). However, Lu *et al.* (2002), for example, found a significant negative correlation between educational attainment and job satisfaction. Other studies have concluded that there were no significant associations in this regard (Fang, 2001; Larrabee *et al.*, 2003).

Associations may be made between body size, or anthropometry of nurses, and injury prevalence. In a study by Botha and Bridger (1997), both stature and abdominal depth displayed significantly positive associations with lower backache; while negative associations were found between stature and grip reach and the prevalence of shoulder/arm pain. Findings of this study indicate that problems caused by the working environment, including lumbar backache, and other bodily discomfort, were caused or amplified by body size variability and not simply general usability problems which would affect all nurses irrespective of their bodily dimensions. They further speculate that many of the pains or problems experienced at work are caused by occupational factors, yet are exacerbated by body weight and level of fitness. The dimensions and characteristics of the users should be properly considered in the design of objects and environments for human use (Botha and Bridger, 1997). Much of the equipment used in developing countries is imported from industrialised nations, and therefore many of the products are not compatible with the users due to factors including variations in body size. It was reported that imported goods, while compatible with 90% of users in ICs, were only physically compatible with 57% of South African users (Abeysekera and Shahnavaz, 1989).

Botha and Bridger (1997) sampled 100 general ward and theatre nurses in three private hospitals in the Western Cape of South Africa, and obtained various anthropometric measurements of them. The average stature for this sample was 1630mm, average weight was 72kg, and Body Mass Index (BMI) was 26.67. Over a quarter of this sample had BMIs of over 30, and therefore may be considered obese. This study also notes increasing levels of variability in body size within working populations, which may in part be due to differences in ethnic and biological origin of populations, along with increased levels immigration of workers from other parts of the world, as well as migration from rural to urban areas. Botha and Bridger (1997) add that urbanisation and migration are

often accompanied by an improvement in living conditions, socio-economic status, as well as a decrease in disease and malnutrition; all of which may cause large changes in the anthropometry of the population.

**Musculoskeletal disorders**

The South African Demographic and Health Survey reports that across all industries and businesses, 8% of working men, and 4% of working women reported a work-related illness or injury within the previous year (Department of Health, 2004). These prevalences are higher among men in the Western Cape and Limpopo Provinces (14% and 10% respectively), and among women in the Eastern Cape (6.5%). When considering population groupings, for men it is Black African and Coloured groups that have the highest rates (8.8% and 9.8%), while for women the white and Asian groups reported the highest injury and illness rates (8.7% and 5.2% respectively, compared to 3.9% for Africans, and 2.7% for coloured women). Furthermore, work-related injury and illness generally shows a decline as level of education increases (Department of Health, 2004).

It is reported that workplace injury rates among healthcare workers are as high as in the industrial sector (Furlow, 2002). The US Department of Labor (2002) reports an incidence rate of 8.8 per 100 full-time healthcare workers, compared to 5.7 out of 100 for all industries combined. The MNA (2006) add that, with respect to lifting and handling-related injuries, nursing is the highest risk occupation in the United States (US); and that it is the profession most associated with work-related musculoskeletal disorders (WMSDs) and back injuries. The Bureau of Labor Statistics (2000) states that the nursing profession ranked first in terms of frequency and severity of work-related musculoskeletal disorders. Menzel *et al.* (2004) adds that direct care-nursing personnel across the world report high numbers of work-related musculoskeletal disorders.

A musculoskeletal disorder (MSD) may be defined as being any condition that involves the nerves, tendons, muscles, and supporting structures of the body (NIOSH, 1997). These disorders include a range of problems, and can differ in severity from mild,

periodic symptoms, to severe, chronic, and debilitating problems (NIOSH, 1997). MSDs experienced by nurse practitioners and other healthcare employees include low back pain (LBP), sciatica, rotator cuff injuries, epicondylitis, and carpal tunnel syndrome (CTS) (Weber, 2006). Daraiseh *et al.* (2003) note that most of the reported WMSDs among nursing personnel are back injuries, although neck, shoulder, arm, wrist, and knee disorders are also prevalent. These injuries cause many healthcare workers to leave the field either temporarily or permanently, and manual patient handling is the major cause of these injuries (Menzel *et al.*, 2004). Most MSDs occurring in the workplace are due to repeated local tissue microfailures rather than single catastrophic tissue failures such as bone fractures (Furlow, 2002). Cumulative trauma, which may be long-term or short-term, is related to the long working hours of nurses, and increases the risk of musculoskeletal injury (MNA, 2006). The daily potential for slips, trips and falls are further physical hazards in the workplace (Furlow, 2002).

Various studies have been performed regarding musculoskeletal pain experienced by nurses. Menzel *et al.*'s study (2004), for example, using the Cornell Musculoskeletal Discomfort Questionnaire (CMDQ), found a 7-day prevalence rate of 62% for musculoskeletal discomfort in at least one body part. Other studies using the Nordic Musculoskeletal Questionnaire (NMQ) (Kuorinka *et al.*, 1987), from which the CMDQ is adapted, found prevalence rates of 69% for moderate ongoing symptoms of the neck, shoulder, upper and lower back in Swedish nurses (Josephson *et al.*, 1997), and 61.2% for back pain for German nurses (Hofman *et al.*, 2002). Another survey of 1163 nurses across the US, using a modified version of the NMQ, found the 1-year prevalence rate of musculoskeletal pain in at least one body part (neck, shoulder, or back) to be 72.5% (Trinkoff *et al.*, 2002). Josephson *et al.* (1997) studied musculoskeletal disorders of nursing personnel over 4 consecutive years. Prevalence of MSD symptoms was reported by 33%-36% of nursing personnel respondents over these 4 years. After the first survey, the highest prevalence (20%) for ongoing MSD symptoms occurred in the shoulder region, and a high proportion of symptoms in the neck and back region were also reported.

A further study, by Botha and Bridger (1997), found that of the 100 South African nurses in their study, 63% reported backache at present or during the past year, followed by cervical/shoulder region pain (41%), painful feet (40%), thoracic backache (31%), pain in the shoulder/arm region (24%), painful legs (23%), and painful hands (8%). 77% of the subjects reported that the pain they experienced was work-related. These nurses attributed their lumbar backache to factors including standing for long periods of time (82%), moving patients (75%), and static forward flexion (71%). Thoracic backache was attributed by all the subjects to flexion and rotation of the spine, and 92% attributed the pain to fixed, stooped postures. Meanwhile, 82% of subjects experiencing cervical or shoulder pain attributed it to sustained fixed postures, and 75% attributed it to lifting/moving patients and/or equipment. Stress (47%) as well as fatigue (31%) also had reported roles to play, noting that most of the shifts worked were 12 hours long.

Buckle (1987) reported the annual risk of back pain for the nursing profession to be approximately 400-500 nurses per 1000. Furthermore, it is reported that around 8 of 1000 of nurses leaving the profession cited lower back pain to be the sole reason, and 3.5% reported back pain to be the primary, or contributory factor (Buckle, 1987). Highnett (1996) reports that back injury is considered to be one of the most widespread occupational hazards in the nursing profession, with approximately one out of every six nurses being likely to suffer from back pain each year. It is also reported that nurses have almost 30% more days off due to back pain than the general population (Pheasant and Stubbs, 1992). The MNA (2006) states that worldwide, back injuries to nurses have a point prevalence of approximately 17%, an annual prevalence of 40-50%, and a lifetime prevalence of between 35-80%. Lee and Chiou (1994) report the one-year prevalence of LBP to be as high as 69.7% in a study of young nurses in Taiwan. The MNA (2006) additionally reports that more than a third of back injuries among nurses are attributed to patient-handling tasks, along with the frequency at which nurses are required to manually move patients. Lee and Chiou (1994) found that risk factors for low back pain included lifting heavy objects, work experience, age, and sitting habits; and that with each increase in the “lifting heavy objects” risk factor, there was a 2.81 times increased risk of LBP when all other factors remained constant.

Risk factors for gaining an MSD as listed by NIOSH (1997), include repeated or sustained exertions, forceful exertions, stressful postures, mechanical stress, temperature extremes, and/or vibration. Weber (2006) lists risk factors faced, more specifically, by healthcare workers. These include forceful lifting in transferring or repositioning patients, the frequent or continual repetition of tasks, and work in awkward postures that places stress on the body, such as kneeling on the floor, working overhead, bending forward, or twisting (Weber, 2006). Yorio and Ferguson (2002) explain that globally all nursing professionals, regardless of their level of education, administer direct physical patient care, which can place considerable loads on the spine. Patient handling can place loads on the spine that are up to two times the acceptable level from humans (Metules *et al.*, 2001).

Patient-handling tasks are common within the nursing profession, and most MSDs experienced by nursing personnel are directly related to patient handling (Yorio and Ferguson, 2002). Botha and Bridger (1997) report that lifting a patient does not only require overcoming a heavy weight, as the size, shape, lower limb function, balance, mental competence, physical dependence, coordination as well as cooperation of the patients also play important roles. Other risk factors regarding WMSDs in healthcare include the frequency of handling and moving patients, and the level of postural awkwardness necessitated by a task, particularly in tasks with longer durations (Menzel *et al.*, 2004). The availability of patient handling equipment, and patient-to-nurse ratios are further factors to be taken in to consideration (Menzel *et al.*, 2004). Botha and Bridger (1997) add that not all back injuries can be prevented simply by applying proper lifting techniques and body mechanics, as injuries may occur even when circumstances are perceived to be correct, due to the inherent stress of the task.

Time pressure, as well as insufficient staffing, has additionally been linked to musculoskeletal injuries and stress of manual handling (Menzel *et al.*, 2004; Owen *et al.*, 2001). It has been reported, for example, that nurses working in units with high patient-to-nurse ratios had more back pain and injury than nurses working in units with lower ratios (Larese and Fiorito, 1994). Job strain has also been indicated to be a risk

factor for musculoskeletal symptoms, and this risk is evidently higher when it is combined with high physical exertion (Josephson *et al.*, 1997). Psychosocial job factors, such as high mental demands, as well as low decision latitude, have also been related to musculoskeletal symptoms (Josephson *et al.*, 1997). Stress due to organisational change, is also reported to be a risk factor, and may involve nurses working as temporary workers, or being exposed to units with unfamiliar or unrecognised manual handling risks, unfamiliar patients, or unfamiliar lifting equipment (MNA, 2006).

Age and sex of nurses may also affect the level and extent of WMSDs gained. Menzel *et al.*'s study (2004) on 113 nursing staff members within the United States, revealed that for this sample, although age was not correlated with the prevalence of musculoskeletal discomfort, the prevalence of musculoskeletal discomfort was significantly higher in females (66%) than in males (31%). Occupational classification may also influence WMSD risk, as it is recorded that NAs, who had significantly heavier workloads than RNs, had both a higher number and higher rate of first-time claims for WMSDs than either RNs or LPNs in the US (Menzel *et al.*, 2004). Menzel *et al.*'s study found no predictive effect of patient-to-nurse ratio, patient dependency level, or the availability of patient-handling equipment, on musculoskeletal discomfort frequency or severity. The study also revealed no significant differences in musculoskeletal pain between high risk (66%) and low risk (57%) units. Regarding the use of patient-handling devices, it is possible that this equipment shifted the load from the back to other body parts, such as the hands/wrists or knees (Menzel *et al.*, 2004).

Menzel *et al.* (2004) states that one of the main difficulties in reducing WMSDs is their multifactorial aetiology, with their associated causes including physical work, organizational, psychosocial, as well as sociocultural factors. The risk factors for musculoskeletal disorders are only partially understood, and both physical and psychosocial stressors are contributors to overall injury risk (Janowitz *et al.*, 2006). Menzel *et al.* (2004) state that psychosocial factors (such as job satisfaction, stress, social support, and second jobs) may be identified as possible predictors of WMSDs, and should be assessed along with cumulative load. Furlow (2002) further adds that

biomechanical stress is not purely the physical response of bone and muscle to strain, but psychosocial factors and circulating levels of stress hormones are also believed to affect the muscle's ability to respond adaptively to physical strain. Furthermore, the observation of basic precautions, and awareness of daily routine, posture, and work habits by employees, can help reduce the biomechanical stress placed on their bodies during work (Furlow, 2002).

**Psychosomatic indicators**

Psychosomatic health complaints are reported to be quite frequent among nurses (Piko, 2006). Piko (2006) reports that the frequency of psychosomatic symptoms seems to be a good indicator of health problems that commonly arise due to challenging psychosocial processes such as job-related stress and dissatisfaction. Psychosomatic symptoms may also be considered to be indicators of professional burnout. Such symptoms may include lower-back pain, tension headaches, sleeping problems, chronic fatigue, stomach pyrosis, tension diarrhoea, and heart palpitations (Piko, 2006). The results of Piko's study showed that emotional exhaustion, as well as burnout in general, was a significant predictor of psychosomatic symptoms. Furthermore, females tended to report a higher frequency of psychosomatic symptoms than males, and role conflict as well as number of years employed in healthcare were also significant contributors (Piko, 2006).

# CHAPTER 3: METHODOLOGY

## RESEARCH CONCEPTS

This project aimed to give insight into factors which exert the greatest influence on the health, satisfaction, and work ability of nursing staff in Grahamstown and, by extension, in South Africa as a whole. It focuses on the interactions between the demographic factors of nurses, their living conditions, as well as workplace factors, and how they cumulatively affect the health-related aspects. Questions posed to the nurses represent different aspects of their demographics, lifestyle, living conditions, working conditions, levels of subjective satisfaction, musculoskeletal strain, anthropometry, and work ability.

It was decided that self-report questionnaires would be the most appropriate means of information gathering for this project. Questions were put forward to nurse management at Settlers Hospital and seven municipal clinics in Grahamstown, in the form of semi-structured interviews. Questionnaires were then given to as many individual nurses as possible at each of these locations to be filled in. These questionnaires considered various aspects, including basic demographics, living conditions, work considerations, satisfaction ratings, musculoskeletal strain, and work ability. Each of these nurses was then interviewed to gain dietary recall information, as well as a general indication of physical activity levels. Some anthropometric measures were also obtained at the level of the individual nurses, namely: stature, mass, waist girth, and hip girth, from which Body Mass Indices (BMIs) and Waist to Hip Ratios (WHRs) could be calculated. Statistics were then performed on this data in order to assess the relationships between lifestyle and living condition data, workplace-related variables, and health, well-being, or work ability attributes.

## RESEARCH PROCESS

After the compilation of the questionnaires and interviews to be used for data collection in this project, ethical permission was received from the relevant parties of Rhodes University as well as of the Department of Health (see “Ethical Approval” section on page 75). Following this, it was necessary to gain permission from management of each

of the various hospitals and clinics, in order to ask questions about their workplace and to their staff. In so doing, a letter about the project (Appendix A), as well as a copy of the relevant questionnaires and interview questions were given to management to ensure that they were fully aware of the processes involved and the questions posed to the nurses.

An interview with the sister in charge, and walk-though assessment was performed at each workplace. Thereafter, a session was planned in which to tell the nurses about the project, to gain their consent if they were willing to participate, and then to conduct the research with them. Appendices B and C contain the Letters of Information, and the Informed Consent Forms that were received and signed by the participating nurses. The researcher was present when each of the questionnaires were filled in by the nurses, and following this, a short interview was held with each participant, and physical anthropometric measurements were taken.

## HYPOTHESIS

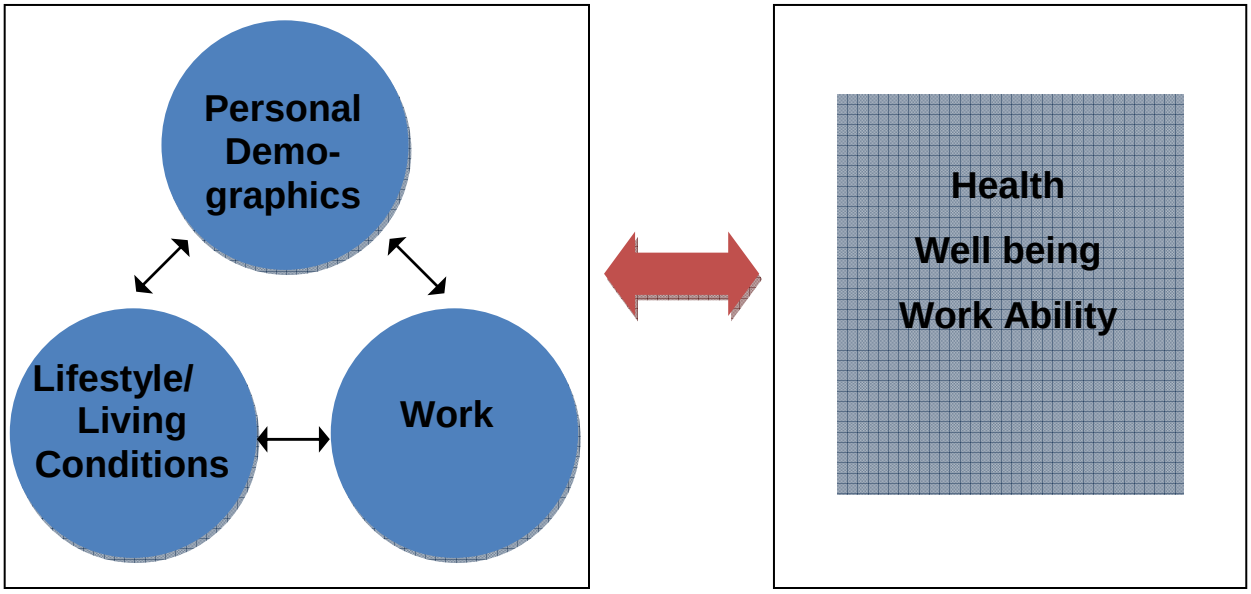
The aim of this project was to determine whether living conditions and working conditions, as well as personal characteristics, cumulatively affect the health, well-being, and productivity of nurses, as inferred from levels of musculoskeletal stress, subjective satisfaction ratings, anthropometric measures, and the Work Ability Index (WAI). The statistical hypothesis looks at whether there is in fact a correlation between the independent and the dependent variables. The dependent variables, or factors, in the study include health, well-being, and work ability, as inferred from subjective satisfaction levels, Work Ability Index scores, number of areas with musculoskeletal strain, and anthropometric measures of mass, BMI, and waist girth. The independent factors in the study are those of personal characteristics, living conditions and lifestyle, and workplace considerations.

The null hypothesis states that personal characteristics, living conditions, and working conditions do not cumulatively affect the health, well-being, and work ability of nurses in Grahamstown. In other words, it proposes that there would not be a significant

canonical correlation between the independent and dependent variables of this study. Conversely, the alternative hypothesis states that personal characteristics, living conditions, and working conditions cumulatively affect the health, well-being, and work ability of nurses in Grahamstown. It therefore would affirm that there is, in fact, a significant canonical correlation between the dependent and independent variables of this study.

The basic model of this thesis is illustrated in Figure 4. As can be seen, it refers to the relationship both amongst the various independent variables of the study ("Person", "Lifestyle/Living Conditions", "Work"), as well as between these variables and the dependent variables of the study ("Health", "Well-being", and "Work Ability"). The study aims to examine the nature of the relationship between these factors, and whether there is a statistically significant relationship between the independent and the dependent variables. The exact components of the variables of the study are discussed later in the text .

**Figure 4:** The basic model or conceptual paradigm of the project



## SUBJECT SAMPLE

This project examines the effects of living and working conditions of nurses in the Eastern Cape province of South Africa. As such, nurses working in hospital settings as well as in clinics in this area were surveyed. The city of Grahamstown, within the Makana district of the Eastern Cape was the primary focus of this research. This is primarily due to practical reasons, namely, that this is where the research department is based. There is one major medical hospital in Grahamstown, as well as one mental hospital, several municipal medical clinics, and a small number of health centres within educational settings. Subjects sampled for this project were those from the aforementioned medical hospital, as well as the seven municipal clinics. The resultant response rate and specific workplaces included in the study are indicated in the results chapter of this project.

## INFORMATION GATHERING FROM MANAGEMENT

A copy of the questions put forward to the nurse supervisors or managers, as well as the environmental assessment checklist, are included in Appendices D and E respectively. One interview was performed with the sister in charge at each clinic, and similarly one interview was conducted with the nurse supervisor at the hospitals, as well as one for each sister in charge at each of the hospital wards.

### Interview with management

The questions asked in the interviews with the nurse supervisors, or sisters in charge, included those of the work attributes, such as work organisation, work shifts and rest periods, and the daily tasks performed by nurses in that workplace. Furthermore, general questions regarding physical attributes of the work environment, including work conditions and resources, were presented. The size of the hospital/clinic was also established, as was the number of nurses and doctors working there, and the number of patients attended to per month. The nurse supervisors were also asked about the turnover and absenteeism rates of nurse employees in the workplace, and common injuries experienced by these workers. The style of this questionnaire is open-ended and hence more qualitative than the questionnaire for the individual nurses. Additional

questions were also asked during the course of the interview as the topic arose, in order to go into more depth about the working conditions, or to follow up on statements made.

**Environmental survey**

A short checklist (Appendix E) was used to assess the general work environment of the nurses in each workspace. This checklist was produced by the Department of Human Kinetics and Ergonomics at Rhodes University, and as it has not been published, no reference for it is available. One checklist was conducted at each ward or workplace, usually during the day shift, where applicable. The checklist was completed collaboratively with the researcher and the nurse supervisor or sister in charge. Factors assessed included the subjective rating of visibility, temperature, noise, and ventilation of the workplace on a scale of 1 to 5, with 1 indicating optimal conditions, while 5 indicates unsatisfactory conditions. Comments in this regard were also made. These observations also included that of workspace confinement, and the use of safety equipment, as well as rankings of absenteeism, turnover, and injury rates. Worker preparedness and organisational involvement were additional subsections of the checklist.

A singular score could also be obtained for this checklist, by adding the value of each of the responses together, with higher values indicating more hazardous work situations. The checklist recommends that if this score exceeds 80, a more comprehensive RISK assessment for the workplace is necessary.

**QUESTIONNAIRE FOR NURSING PERSONNEL**

The nurses from each workplace were each requested to fill in a questionnaire (see Appendix F) that comprised of various sections, which will be described in more detail hereafter. The first section regards basic demographic data, such as age and sex. The following section covers those work factors that cannot be generalised across all nurses in one workplace. Following this, there were questions regarding living conditions, access to basic amenities, and household income. Subjective ratings of satisfaction were subsequently included based on each of these subsections. The Work Ability

Index (Tuomi *et al.*, 2006), also included in this questionnaire, primarily revolves around subjective ratings of work ability and number of diseases experienced. A shortened version of the Nordic Musculoskeletal Questionnaire (Kuorinka *et al.*, 1987) was also added. This compiled questionnaire was also translated into Afrikaans as well as IsiXhosa. Following the completion of this questionnaire, a 24-hour dietary recall and physical activity level interview was undertaken in one-on-one sessions with the researcher. Measures of stature, mass, waist girth and hip girth were also taken. All questions asked and measurements taken were voluntary and confidential so as to protect possibly sensitive information of the participants.

**Demographics, working conditions, living conditions, and income received**

Demographic considerations included in the nurse questionnaire were age, sex, home language, race, marital status, and the highest level of education attained. Age, sex, level of education, and marital status have been seen to influence the work ability of nurses, while the inclusion of race and home language may provide better understanding of the influence of language of testing, as well as cultural factors. The nurses were also asked to provide their street and area of residence, as from this, a general indication of living conditions can be made, using data gathered from regional surveys and observations. Workplace-related questions were limited to the position that the nurse holds at work (from nursing assistant, through to nurse manager); the ward or section the nurse works in (or the healthcare service provided); length of time spent in nursing; as well as average number of hours worked per week, including overtime, and whether this is comprised of day or night shift hours. Most other general factors such as workload and work environment could be evaluated from the common attributes of the workplace, as received from the managerial questionnaire and workplace assessment.

Access to basic amenities at the living place of nurses was also considered, as these factors may vary within the same street or residential area. Factors covered include access to water, electricity, and sanitation services. Type of house and whether the house leaked when it rained, were also enquired, as was the number of residents within the household. Reported roof leakage was used as an indication of housing condition

(see Møller, 2008). Respondents were also asked how many social grants were received by their household, if any, as well as total income received per month, after tax, and the number of people who rely on this income, to gain a general picture of the socio-economic situation of the individual.

**Subjective measures and intent to leave nursing**

The nurses were asked to rate their levels of satisfaction on a 5-point Likert scale (from very dissatisfied to very satisfied), for various factors. These include: satisfaction with their lives as a whole; satisfaction with living conditions; satisfaction with their job; satisfaction with working conditions; and satisfaction with health. As a measure of intent to leave, nurses were asked how often they think about leaving nursing (on a 5-point scale from never, to a few times every day). Validation for these questions is based on studies which have indicated that as little as one question can be used to measure work satisfaction or dissatisfaction of nurses (see Nagy, 2002). This concept was expanded to cover other areas of satisfaction in the nurses' lives. Intent to leave has similarly been measured using a minimal amount of questions with reportedly satisfactory levels of reliability and validity (Tzeng, 2002; Camerino *et al.*, 2006).

Literature on this topic, includes that of Scarpello and Campbell (1983), who reckoned that the best global rating of job satisfaction is a one-item, 5-point scale that simply asks: "Overall, how satisfied are you with your job?". These authors, among others (see Nagy, 2002), believe that a single item measuring overall satisfaction is superior to summing up facet scales, as multiple-item facet scales may neglect some components of a job that are important to an employee. Likewise, it is also possible that facets which are not important to an employee's overall satisfaction may also be included, leading to erroneous results. Additionally, Wanous *et al.* (1997) demonstrated that single-item measures of overall job satisfaction correlated quite highly with multiple-item (or scale) measures of overall job satisfaction. Several other reasons for which a single-item measure of overall job satisfaction may be preferable to scale measures of overall job satisfaction, include that: single item measures usually take less space; they are much shorter and hence more likely to be completed by an employee; they may be more cost-

effective; they may contain more face validity; and furthermore may be better to measure changes in job satisfaction (Wanous *et al.*, 1997; Nagy, 2002). Criticisms of single-item measures include that they cannot yield estimates of internal consistency reliability, nor can they be used in structural equation models (Wanous *et al.*, 1997). Nagy (2002), however, notes that it is far more important to ensure that the instrument represents and measures the construct it sets out to measure.

The nurses were also asked to indicate 3 of the most stressful or dissatisfying aspects of their job, out of a list of 14 factors. These aspects were: 1) Workload and time pressure; 2) Physical strain; 3) Mental or emotional strain; 4) Demands from patients; 5) Relationships with staff members; 6) Relationships with superiors; 7) Work organisation or management; 8) The work environment (e.g. the building, cleanliness, lighting, noise levels); 9) Lack of equipment or supplies; 10) Risk of contracting or living with HIV/AIDS; 11) Salary or pay; 12) Opportunities for promotion or personal growth; 13) Professional recognition; and 14) Balancing household and work demands. These 14 factors appeared to be commonly cited themes in literature as reasons for dissatisfaction and stress within nursing. Space was also left for additional comments in this regard. A further question asked the nurses what they consider the best aspect, or aspects, of their job to be, and this took the form of an open-ended question.

**The Simplified Nordic Musculoskeletal Questionnaire**

The Nordic Musculoskeletal Questionnaire (NMQ) (Kuorinka *et al.*, 1987), requires respondents to give an indication of whether or not they experienced aches, pain, discomfort, or numbness in their bodies during the past week, in the past year, as well as whether this trouble prevented the individual from carrying out normal activities in the past year. The questionnaire divides the body up into 9 regions: namely the neck; shoulders; elbows; wrist/hand; upper back; lower back; hips/thighs; and ankles/feet. For the body parts of the elbows and the shoulders, it was also asked whether the pain was in the right or the left, or both sides of the body. Kuorinka *et al.* (1987) note that the questionnaires consist of structured, forced-choice, binary or multiple choice variants, and may either be self-administered or used in structured interviews. The questions,

furthermore concentrate on the symptoms most commonly encountered in an occupational setting (Kuorinka *et al.*, 1987).

The NMQ is recognised to be suitable for application in a wide diversity of workplaces, and can accommodate large numbers of workers in a study very quickly, cheaply, and validly (Dickinson *et al.*, 1992). Dickinson *et al.* (1992) add that further benefits arise from the increasing databank of occupational populations, with which to make comparisons. Dickenson *et al.* also note that the simplicity of the questionnaire permits a large number of specialists to use the questionnaire as a means of indentifying the workplaces and subjects that require more in-depth examination or for intervention. Kuorinka *et al.* (1987) note that the reliability and validity of the questionnaires has been shown to be acceptable. Additionally, it has been shown that response distributions are different for different occupational groups, and these differences are related to the estimated workload or local physical demands (Kuorinka *et al.*, 1987).

For this research, the Nordic Musculoskeletal Questionnaire was modified slightly, due to space constraints, and to ensure the questionnaire did not get too tedious for the nurses to complete. As such, the questions, “Have you are any time during the last 12 months been prevented from doing normal work because of the trouble?” and “Have you had any trouble during the last 7 days?” were asked generally instead of for each body region separately. The question regarding musculoskeletal ache, pain, or discomfort experienced in the past 12 months remained unchanged.

**The Work Ability Index**

Work ability may be defined as the ability of a worker to perform his/her job, while taking into account the specific work demands, individual health condition, mental resources, and work life (Chiu *et al.*, 2007). The Work Ability Index (WAI) is noted by Ilmarinen (2007) to be an instrument used in clinical occupational health and research, in order to assess work ability during health examinations and workplace surveys. The index considers the demands of work, as well as the workers’ health status and resources (Ilmarinen, 2007).

The Work Ability Index (WAI) (Tuomi *et al.*, 2006) contains seven items, namely: 1) subjective feelings regarding current work ability and how it compares with lifetime best (0-10 points); 2) work ability and how it compares with work demands (2-10 points); 3) number of diseases diagnosed by a physician (1-7 points); 4) estimated work impairment because of sickness (1-6 points); 5) sick leave during the past year (1-5 points); 6) own assessment of work ability two years from now (1, 4 and 7 points); and 7) mental resources (1-4 points). A WAI score between 7 and 27 is considered to indicate "poor" work ability, between 28 and 36 "moderate" work ability, 37-43 "good" work ability, and a score 44-49 refers to "excellent" work ability (Tuomi *et al.*, 2006). WAI scores have been seen to decrease significantly with age, and to be closely related with intent to leave the nursing profession (Chiu *et al.*, 2007). Chiu *et al.* (2007) attribute different WAI scores for different countries to differences including demographic structure, the education or training system, lifestyle, and working hours. Ilmarinen (2007) notes that the WAI has been used both in research and practice, and has been broadened to various countries, as well as being translated into 24 languages. The WAI and all its items are further seen to reliably predict work disability, retirement, and mortality (Ilmarinen and Tuomi, 2004).

## INTERVIEW WITH NURSING PERSONNEL

Following the completion of the questionnaires, an interview was held with each of the nurses in order to obtain information about their diet and physical activity levels, as well as to take some basic anthropometric measures (see Appendix G). The NIH (2002) note that diet and physical activity are lifestyle and behavioural factors that influence the aetiology and prevention of various chronic diseases such as cancer and chronic heart disease, as well as playing a role in weight gain, loss, or maintenance.

### Dietary Recall

A dietary recall sheet was included in order to grant insight into the average daily consumption of food and drink by the individual. The nurses were requested to state everything that had eaten the previous day, as well as the quantities thereof, and how the food was prepared. Pictures of typical serving sizes (see Appendix H) were shown

to the subjects in order to facilitate the estimation of how much of a foodstuff they ate. Subjects were also asked to indicate whether this was a normal diet for them, whether they were at work that day, and whether they were pregnant or breastfeeding, as these factors may influence the diet or dietary needs of individuals. The 24-hour dietary recall was presented interview-style by the researcher, in a language familiar to the subject.

It was decided that a 24 hour dietary recall would be the most appropriate method of gathering dietary information. Food frequency questionnaires may also be used similarly for this purpose; however, these checklists could potentially leave out foodstuffs eaten by certain population groups in the study. Food records and short screeners are alternative measures of gathering self-reported dietary information (NIH, 2002). NIH (2002) adds that each of these methods is used successfully in various settings, yet each method has flaws and limitations. A benefits of the 24-hour recall in comparison to other methods is its logistical simplicity (Beaton *et al.*, 1979). Beaton *et al.* further add that it is generally agreed that for large groups of subjects, well-conducted 24-hour recalls yield estimates of group average intakes which are similar to those obtained using more cumbersome techniques.

In the case of this research, having the dietary recall presented as an interview, also reduced the tedium of completing a questionnaire that is too lengthy, had it been included in written form, and hence aimed to increase the chances of the subjects responding accurately. Limitations include that these recalls are prone to underreporting, as well as that a single 24-hour recall does not accurately represent usual individual intake, or provide a reliable description of the distribution of usual intakes of a population (NIH, 2002; Beaton *et al.*, 1979). General disadvantages of self-reports of physical activity and dietary recall as a whole, include challenges of memory, estimation, and bias, and their being prone to varying degrees of measurement error (NIH, 2002).

Following the dietary recall, food data could be analysed to give an indication of the total daily energy and nutrient intake. The FoodFinder dietary analysis program was used to

analyse this information once it was recorded onto the system. All the foodstuffs consumed, and the quantities thereof were recorded in the system per participant. The analysis provided information regarding the energy, protein, fat, carbohydrate, sugar, fibre, minerals (such as calcium and iron) and vitamins present in the daily diet, as well as various other dietary information. This information could further be compared with Recommended Daily Allowance (RDA) reference values. Absolute energy intake could also be compared with approximate energy expenditure values.

Following the dietary recall, singular questions were asked regarding how many cigarettes the individual usually smoked per day, if any, and how many alcoholic drinks the individual usually drinks per week.

**Physical activity levels**

Many routine daily activities can involve moderate intensity physical activity (NIH, 2002). Mode of transport to work, for example, may be a source of physical activity of the nurses, as some may be required to walk long distances before getting to work and/or home from work, or before getting on alternate transport to and from the workplace. This factor is also seen to vary with location of residence and socio-economic grouping. Nurses were therefore asked how they usually get to work each day, and how long this generally takes. They were also asked if they ever took another means of getting to work, and if so, what, and how often or under which circumstances.

Household chores and recreational activities also contribute to energy expenditure and physical activity or stress of nurses. Factors such as cooking food, cleaning the house, washing clothes and ironing, gardening, shopping, and looking after children were considered in addition to participation in sport or other extramural activities. Nurses were asked how many hours per day, or per week, they spent performing a variety of these household as well as recreational activities. Recreational activities enquired about included whether the nurses participated in any additional form of exercise or sport, such as walking, jogging, going to the gym, or playing soccer. Number of hours spent reading, and watching television per week was also included. Additional questions

asked if nursing was the only job held, as well as how many hours of sleep they usually get each night (or day, in the case of shift workers). The physical activity the nurses perform at work was judged by the workload and tasks reported by the nurse management.

## ANTHROPOMETRIC MEASURES

The physical measures taken on individual nurses include the anthropometric measures of stature, mass, waist girth and hip girth. Stature and mass were used to calculate the Body Mass Index (BMI) of participants, while waist and hip girth were further used to calculate their waist to hip ratio (WHR). Feedback was given to the nurses after these measures were taken regarding how their BMI and WHR compared to ideal values, and the health risks associated with these factors.

### Body Mass Index (BMI)

Body mass was measured using the scales that were present in each of the workplaces. Although the use of different scales could jeopardise the reliability of the results, the scales were considered to be accurate, and are used for medical purposes. Stature was measured using a tape measure that was fastened to the wall at each of the workplaces. Subjects were asked to place their ankles against the wall and stand as upright as possible for stature to be measured. Participants were asked to remove their shoes while these measurements were taken. Participants were additionally asked to remove heavy jackets, or contents in pockets, before their masses were taken.

The Body Mass Index (BMI), is the ratio of the mass of subjects to their stature, and was calculated using the following formula:

$$\mathrm{BMI} = \frac{\mathrm{Mass\,(kg)}}{\mathrm{Stature2(m2)}}$$

Hence, the mass of subjects, in kilograms, is to be divided by the square of stature, in metres. From these BMI values, individuals may be superficially classified as

“underweight” (a BMI of less than 18.5), “normal” (BMI between 18.5 and 24.9), “overweight” (BMI between 25 and 29.9), or “obese” (BMI greater than 30). Classifications of obesity further comprise of “class 1 obesity” (30-34.9), “class 2 obesity” (35-39.9), and “class 3 obesity” (BMI greater than 40) (James, 2004).

Individuals with BMI values of below 18.5 or above 24.9 are seen to be placed at a higher risk of health problems and mortality. McArdle *et al.* (2001) states that as BMI increases throughout the range of moderate and severe overweight, so does the risk of cardiovascular complications (such as hypertension and stroke), certain cancers, diabetes, gallstones, osteoarthritis, and renal disease. It should be noted, however, that there are limitations with the use of BMI for body composition analysis, as BMI does not account for whether the one’s mass is high due to fat mass or due to muscle or lean body mass. Other, less practical, methods of body composition analysis include hydrostatic weighing, bioelectrical impedance analysis, as well as skin-fold measures.

**Waist girths, and the Waist to Hip Ratio (WHR)**

Waist girths and hip girths were measured using a tape measure, and although subjects were requested to remove bulky jackets or clothing, it was measured over a layer of clothing to avoid unease or embarrassment. Waist girth is measured at the narrowest circumference of the participant’s waist, while hip girth is measured at the widest point of the participant’s hip or thigh region.

Waist and hip girth measurements can be used to calculate Waist to Hip Ratios (WHRs). This is calculated by dividing the waist girth value by the hip girth (keeping the units of measurement constant). The waist to hip ratio grants an indication of the main sites of fat deposition of subjects. When fat is predominantly accumulated around the waist, one may be termed as having an “apple-shaped” body, while when fat is predominantly found in the hip region, one is termed as being “pear-shaped” (Goldman, 2008). In obese individuals, apple-shape bodies are associated with central obesity, while pear-shaped bodies are seen to have peripheral obesity. A WHR of over 0.8 in women, and 0.95 in men, generally grants an indication of central or android-type

obesity, in which most of the fat of subjects is deposited around the waistline. This is seen to place individuals at a higher risk of gaining health-related problems as compared to “pear-shaped” individuals, as well as being associated with increased risk of death, even after adjusting for BMI (McArdle *et al.*, 2001).

McArdle *et al.* (2001, p833-834) go on to state, “Central fat deposition, independent of fat storage in other anatomic areas, reflects an altered metabolic profile. It increases the risk for hyperinsulinemia (insulin resistance) and glucose intolerance, type II diabetes, endometrial cancer, hypertriglyceridemia, hypercholesterolemia and a negatively altered lipoprotein profile, hypertension, and artherosclerosis.” Waist girth alone can, additionally, be used to estimate health risks. McArdle *et al.* (2001) report that women whose waist measurements are above 76.2cm have twice the risk of for coronary heart disease than those with smaller waists. Men with a waist girth of 102cm and above, and women with waist girths of 86cm (or 88cm) and above, are at a high risk for various diseases, and these values may further be used as cut-off points for central type obesity (McArdle *et al.*, 2001; Puoane *et al.*, 2002).

## PILOT STUDIES

The provisional questionnaire was discussed with a few nurses within Grahamstown, namely: one retired nursing professional from Settlers Hospital, and four nursing sisters from the Rhodes Health Centre. In these discussions, various comments and advice was given by the nurses about the questions in the questionnaire, which were taken into consideration. According adjustments were made to the questionnaire, so as to make it more applicable to the nursing population. The nurse questionnaire was also revised after having it completed by the first five nurses in the sample, after observing which questions could have been sources of misunderstanding. As only minor corrections were made, the results for these questionnaires were still included in the results.

## TRANSLATIONS

The nurse questionnaire (as well as the nurse interview sheet) was translated into both Afrikaans and IsiXhosa, as these, along with English, are the most commonly spoken

languages in the Eastern Cape, and by nurses in this region in particular. Following the initial translation, it was necessary to retranslate these questionnaires back into English, in order to check that no misunderstandings or ambiguities were present. It was also necessary to check the translations with various people who were fluent in the particular languages, to ensure that the meaning of questions was not lost in translation, that the grammar and spelling was correct, and to ensure that the language was not too formal for common understanding. It was also necessary in the case of the Xhosa questionnaire, to speak to a nursing professional whose native tongue was isiXhosa, in order to assist and check the translations of the various diseases in the questionnaire, as the translations of many of the diseases are not used in everyday speech in Xhosa, or do not have Xhosa equivalents.

## FEEDBACK

Feedback was given to the nurses immediately after participation regarding their BMI and WHR. This was accompanied by a pamphlet containing information about these variables, and basic health-related information about diet, physical activity, work ability, and musculoskeletal pain (see Appendix I). Additionally, once the findings of the study as a whole were available, feedback regarding these results was given to the participating clinics and hospitals, as well as to the Department of Health. This feedback included a basic explanation of the findings of the study, as well as recommendations made based on the results.

## ETHICAL APPROVAL

Ethical approval for this project was granted by the Human Kinetics and Ergonomics' Ethics Committee of Rhodes University as of the 4$^{th}$ of March 2009 (see Appendix J). This entailed ensuring that the project would pose minimal risk of harm to the subjects, and that no processes of lower risk were available in order to gain the same information. The necessary permission to perform research in the clinics was granted by the Primary Health Care department of Makana in Grahamstown (20 March 2009); while permission to perform research in the Hospitals was granted by the Eastern Cape Department of Health located in Bisho (7 April 2009) (Appendices K and L).

## STATISTICAL ANALYSES

The data from each of the participants' questionnaires and interviews were compiled into a single Excel document. The answers for each question were coded into numbers to enable statistical analyses to be performed on the data. Initial descriptive statistics performed, where relevant, were the mean, mode, standard deviation, and the minimum and maximum values. The mean scores obtained for each variable were compared with norm values of these factors, where available. These norm values were obtained from various sources, including the South African Census (Statistics South Africa, 2004), a survey of social indicators of neighbourhoods in Grahamstown East (Møller, 2008), the South African Demographic and Health Survey (Department of Health, 2004), and various other journals and articles that include relevant variables. Simple statistical correlations (Pearson moment and partial correlations) were also determined, in order to observe basic relationships between the data. It is noted that these correlations are not ideal for the purposes of this research. However, these correlations may be used in order to gain a better understanding of the data, and to better explain findings of the more complex statistical procedures.

The data was transferred into the STATISTICA (Version 8.0) software package in order for statistical relations to be assessed. Statistical analyses were performed in order to calculate whether significant correlations occurred between the stress and strain variables, namely: demographic, living, or working variables; and health, work ability, or well-being. As such, it could be noted whether the factors regarding quality of the residence as well as the workplace, do have a role to play in the nurses health, quality of life, and ability to work effectively. Factor analysis was performed to determine whether there were similar trends occurring between different variables, and in the process reduced the number of variables in the data set into representative factors. Canonical correlations were then used to determine the nature and extent of the relationship between the set of dependent variables, and the set of independent variables.

## Factor Analysis

Ferguson and Takane (1976) explain that factor analysis is a multivariate statistical method which is used in the analysis of tables, or matrices, of correlation coefficients. It is a technique to summarise large correlational matrices (Craft, 1990). Factor analysis is a method that aids in reaching a meaningful interpretation of the ways in which variables are related. It reduces the original set of variables to a smaller number of variables, termed factors, and acquires meaning because of structural properties that may exist within the set of relationships (Ferguson and Takane, 1976). Craft (1990) further explains that it systematically removes the redundancy from a set of correlated variables and represents the variables with a smaller set of derived variables.

Factor analysis therefore summarises the variables for analysis. The representative factors could then be used for the canonical correlation procedure. Factors were determined independently for demographic or personal variables, living condition variables, working condition variables, as well as for the dependant - or health related and well-being related - variables. Potential variables are listed in Tables XIII and XIV. Categories of the variables in the tables illustrate the number of possible responses to the question, or measure taken. Most of the variables were obtained by close-ended questions in the questionnaire, but open-ended questions were also included in the questionnaire and in the interview, as well as physical anthropometric measures. Factor analysis was performed on selected variables from each category.

Some of the variables were easy to categorise into groups of independent versus independent variables, or into categories within those, whilst others required some deliberation and explanation. For example, stature was included as an independent variable, as it is generally inherent, and unaltered by lifestyle or work. Meanwhile, other anthropometric measures of mass, waist girth, and BMI were used as health indicators. Subjective ratings of satisfaction for living conditions and for working conditions were also used as independent variables, as a subjective rating for the associated categories. It would then be possible to see whether the dependent variables of the study were altered by these variables.

**Table XIII:** The independent variables of the study

| Group | Variable | Categories |
|---|---|---|
| **Demographic or Personal Variables** | Age | 6 ordinal categories |
| | Sex | 2 nominal categories |
| | Home language | 4 nominal categories |
| | Race | 6 nominal categories |
| | Marital status | 6 nominal categories |
| | Highest level of education | 9 ordinal categories |
| | Stature | Continuous measure (cm) |
| **Work Considerations** | Position at work | 5 ordinal categories |
| | Clinic or hospital | 2 nominal categories |
| | Specific ward or clinic | 18 nominal categories |
| | Number of hours worked per week | Open response – continuous |
| | Day or night shift | 2 nominal categories |
| | Tenure | 8 ordinal categories |
| | Satisfaction with working conditions | 5 ordinal categories |
| | Stressors or dissatisfiers | Three of a list of 15 aspects |
| | Best aspect of job | Open-ended response |
| **Living Conditions** | Area of residence | Open question – Street, Suburb |
| | Type of house | 5 nominal categories |
| | Roof condition | 4 ordinal categories |
| | Number of residents in house | 10 ordinal categories |
| | Main source of water | 6 nominal categories |
| | Type of toilet | 6 nominal categories |
| | Fuel for lighting | 4 nominal categories |
| | Fuel for cooking | 4 nominal categories |
| | Income received | 7 ordinal categories |
| | Number of people reliant on this income | 10 ordinal categories |
| | Number of grants received | 5 ordinal categories |
| | Satisfaction with living conditions | 5 ordinal categories |
| **Physical Activity and Dietary Intake (Lifestyle)** | Dietary recall | 145 potential continuous scores |
| | Smoking habits | 3 ordinal categories |
| | Drinking habits | 4 ordinal categories |
| | Mode of transport to/from work | 4 nominal categories |
| | Time taken to get to/from work | Continuous |
| | Time spent walking to/from work | Continuous |
| | Time spent doing housework (x6 aspects) | Continuous |
| | Time spent looking after children | Continuous |
| | Time spent watching TV or reading | Continuous |
| | Recreational sport or exercise – type | 4 nominal categories |
| | Recreational sport or exercise – duration | Continuous |
| | Time spent sleeping | Continuous |

**Table XIV:** The dependent variables of the study

| Group | Variable | Categories |
|---|---|---|
| **Anthropometric measures** | Mass<br>Body mass index (BMI)<br>Waist girth; Hip girth<br>Waist-to-hip ratio (WHR) | Continuous<br>Continuous<br>Continuous<br>Continuous |
| **Subjective ratings** | Life satisfaction<br>Satisfaction with health<br>Job satisfaction<br>Intent to leave nursing | 5 ordinal categories<br>5 ordinal categories<br>5 ordinal categories<br>5 ordinal categories |
| **Musculoskeletal trouble** | Musculoskeletal stress (x15 body regions)<br>Musculoskeletal trouble in past year<br>Musculoskeletal trouble in the past week | Indicate affected regions<br>Dichotomous (yes/no)<br>Dichotomous (yes/no) |
| **Work Ability Index** | Work ability index (x10 questions + 51 possible diseases) | WAI score - continuous |

## Canonical Correlation

A canonical correlation, according to Ferguson and Takane (1976), is an ordinary product-moment correlation between two sums of weighted scores. It calculates the degree of correlation between two derived variables, or, in other words, the relationship between several predictor variables and several criterion variables, as sets (Craft, 1990). Derived variables are obtained from a set of criterion variables, as well as a set of predictor variables, which are weighted and then added together to obtain a composite score for each subject or case. These two sets of composite scores (criterion and predictor) are then correlated with each other (Craft, 1990). Canonical correlation thus differs from multiple regression and correlational analyses, as in the latter there are only single dependent (Y) variables, along with linear combinations of sets of two or more independent variables (X).

In this study, canonical correlations were performed to determine the extent of the relationship between the sets of personal or demographic factors, lifestyle or living condition factors, workplace related factors, and health or well-being factors.

# CHAPTER 4: RESULTS

## SUBJECT SAMPLE

Questionnaires and interviews were completed by 146 nurses and 6 care-givers in Grahamstown. Of these, 32 nurses were from the seven municipal clinics in the city. The remaining 120 participants worked at Settlers Hospital in Grahamstown, of which 114 were nurses, and 6 were care-givers. The included care-givers were grouped as nursing staff for the purposes of analyses, due to similarities in task requirements. One of nurses from the hospital only completed the interview and not the questionnaire, and for one of the clinic nurses the interview was not performed. Of the participants, 33 nurses were night staff at the hospital, while the rest worked during the day. Nursing personnel in Settlers Hospital care for patients that require 24 hour care, while in the clinic, patients visit during the day and do not stay overnight. Data collection was primarily performed in the time period from the 8th May 2009 until the 30th June 2009, although interviews with the nurses in charge at each workplace (clinics and wards) also occurred before this time. The interviews with the nurses in charge regarded workplace factors, and although not included in statistical analyses, are used for the purpose of understanding and discussing the findings.

**Table XV:** Total number of nurses involved in the study per workplace. Total numbers are given for each participating clinic, as well as for Settlers Hospital as a whole.

| Workplace | Number of participating nurses | Total number of nurses | Percentage response |
|---|---|---|---|
| **7 municipal clinics:** | | | |
| Day Hospital | 9 | 17 | 53% |
| Anglo-African Street Clinic | 2 | 3 | 67% |
| Joza Clinic | 5 | 6 | 83% |
| Middle Terrace | 4 | 5 | 80% |
| NG Dlukulu | 4 | 5 | 80% |
| Raglan Road | 5 | 5 | 100% |
| V Shumane | 3 | 4 | 75% |
| **Total** | **32** | **45** | **71%** |
| | | | |
| **Settlers hospital:** | | | |
| Day staff (all wards) | 87 | 122 | 71% |
| Night staff (all wards) | 33 | 46 | 72% |
| Total (including those on leave) | 120 | 168 | 71% |
| **Total** | **120** | **168** | **71%** |

**Table XVI:** Total number and percentage of nursing personnel involved in the study per hospital ward at Settlers Hospital. The "total number" refers to the number of nurses present during the week when data was captured. Brackets () indicate the inclusion of care-givers in the number.

| **Ward at Settlers Hospital** | **Day staff** | | | **Night staff** | | |
|---|---|---|---|---|---|---|
| | **Participants** | **Total number** | **Percentage** | **Participants** | **Total number** | **Percentage** |
| Surgical Ward | 15 | 15 | 100% | 5 | 6 | 83% |
| Medical Ward | 10 | 13 | 77% | 5 | 8 | 63% |
| Maternity | 11 | 14 | 79% | 7 | 8 | 88% |
| Paediatrics | 7 | 10 | 70% | 5 | 6 | 83% |
| Palliative Care | 5 (+6 care-givers) | 8 (+6 care-givers) | 63% (79%) | 4 | 6 | 67% |
| Barratt | 8 | 10 | 80% | 5 | 6 | 63% |
| Casualty | 6 | 9 | 67% | 2 | 6 | 33% |
| Theatre | 6 | 7 | 85% | N/A | | |
| Central Sterilizing Unit | 2 | 2 | 100% | N/A | | |
| Out Patient Department | 8 | 8 | 100% | N/A | | |
| Masonwabe | 3 | 4 | 75% | N/A | | |
| **Total** | **81 (+6)** | **100 (+6)** | **81% (82%)** | **33** | **46** | **71%** |

Table XV and XVI illustrate the total number of participants compared to the total number of possible participants from each workplace. There were 168 nurses employed by the hospital in total at the time of data collection, although the rates in Table XVI vary from this total as it includes only the amount of nurses working in each division on the appropriate week. Rates of absenteeism, sick leave, and leave for reasons such as family bereavements is seen to be 11-12% on average per month, but may reach up to 19%.

The participating nurses were taken from each of the wards in the hospital, and this response rate varied from 53% to 100% per ward, when looking at day and night staff collectively. The six care-givers in the sample worked in the Palliative Care Unit of the hospital. This ward relies heavily on care-givers for the provision of care, and as such, care-givers were included in this sample. At the time of data collection, a few of the night staff in the Casualty Ward were on leave; and as a result of the high workload and time constraints of the remaining staff, there was a low response rate. Participation rates of nurses in each of the Grahamstown clinics also ranged from 53% in one clinic

to 100% in others. The low percentage response rate for the one clinic (Day Hospital), was due to the number of nursing staff who work outside of the clinic much of the time, and as such were not available to participate in the study.

While all of the municipal clinics in Grahamstown participated in the study, there were two more hospitals in the city, namely Themba Hospital, and Fort England Hospital. Themba Hospital is a hospital located in the township area of Grahamstown, and it provides care for tuberculosis sufferers. Although an initial interview was conducted with the Nurse Supervisor and Sister in Charge at the hospital, it was evident that due to time constraints and levels of understaffing, it would not be possible for the nursing personnel to participate in the study. Fort England Hospital is a psychiatric hospital in the city. Due to probable differences in task demands in comparison to those working in municipal clinics or Settlers Hospital, nursing staff from this hospital were not incorporated into the study.

## INTERVIEW WITH NURSE SUPERVISORS

This section contains a brief overview of the results obtained during the interview with the nurse supervisors or sisters in charge, at each of the workplaces, as well as the environmental assessments of the workplaces. Names of the sisters in charge or supervisors are not included, and as such statements are not referenced, for the sake of confidentiality and anonymity of the participants' responses. These interviews were conducted from the dates of 17th April until the 18th of June 2009. Results obtained help to grant a greater general understanding of the different workplaces and working conditions of the participants in the study, and may help to explain the results obtained from the nurse questionnaires and interviews.

### Overview of workplaces

At the time of the study, Settlers Hospital was undergoing renovations, as part of a Private Public Partnership, in order for it to become more privatised. Although largely seen to be beneficial, these renovations could be a cause of stress due to noise and disruptions in the short-term. On average, just fewer than 3000 patients were cared for

by the hospital in total per month. There were 220 posts for nursing personnel at the time of the interview, and 168 (76%) of these posts were filled. Of the 13 doctors' posts, 3 were vacant at the time. Interviews were conducted with the sisters in charge in eight of the nine wards at Settlers Hospital.

In the Surgical Ward, wounds were reportedly the most common problem presented by patients, and noise was the highest ranking factor in the walk-through checklist. The Medical Ward was a busy and stressful ward to work in, and patients commonly had diseases such as hypertension, diabetes, asthma, heart problems, tuberculosis (TB), or HIV/AIDS. Psychotic patients were also admitted into the medical ward for observations. The Paediatric Ward attended to babies, as well as older children. The Maternity Ward was divided into sections for labour, post-natal, post-Caesarean sections, nurseries, and private rooms. Barratt 2 was the Long Term Care Ward, caring for those with strokes, for example, although it also acted as an overflow ward for medical patients. In the Palliative Care Unit (PCU), most of the patients presented with HIV/AIDS or cancer. There were 8 nursing staff and 6 care-givers in the PCU, and the care-givers were relied on to assist with many of the tasks. Stressful aspects of working the PCU included dealing with the high death rate of patients. The Out Patient Department (OPD) functions in a similar manner to the clinics, with approximately 70 patients visiting each day (1727 patients came in the month of March, as an example). The Casualty Ward commonly deals with those with epilepsy, diabetes, asthma, diarrhoea, and vomiting; as well as victims of car accidents, and sports injuries. The Operating Theatre functions from 07h00 to 19h00 during the week, with nurses on call in the evening and over weekends. Linked to the Operating Theatre, is the Central Sterilising Unit .

The Day Hospital was originally intended to be a 24-hour hospital. However, due to a lack of resources, as well as the structure of the building, it now operates as a community healthcare centre. It is grouped as a clinic in this study. Approximately 4000 to 5000 patients visit the Day Hospital per month. Anglo-African Street Clinic is located within Western Grahamstown (town). Approximately 2000 patients visit here per month. Three nurses were working here at the time of the interview, and time pressure was

seen to be a large cause of stress. Middle Terrace Clinic is located within the Coloured Area of Grahamstown, and appears to have a high number of facilities, and good infrastructure for the needs of the clinic. Approximately 800 or more patients visit the clinic every month. Joza Clinic is located within the Grahamstown location (Grahamstown East), as are the rest of the clinics. It is a busy clinic, and had 3613 patients visiting it in the previous month. At NG Dlukulu, statistics recorded that 1804 patients visited in the previous month. Around 2600 clients visited the V. Shumane Clinic in Tantyi in the previous month. More than 2000 patients are seen at Raglan Road Clinic per month.

**Tasks performed**

In the hospital, Professional Nurses ("sisters") perform procedures such as inserting intravenous (IV) lines, doing sutures, administering high level drugs, as well as doing administrative work, educating and training other nurses, as well as assisting the other nursing personnel with their tasks. Enrolled nurses (or "staff nurses"), perform some advanced procedures such as dressing wounds and removing sutures, and can administer medium level medication without supervision. Nursing assistants perform the more elementary procedures such as monitoring patients' vital signs, as well as washing, changing, and moving patients. Nurses in the hospital are seen to spend a lot of time on their feet. The most common conditions reported in hospital patients are those of chronic diseases such as hypertension, diabetes, asthma, strokes, tuberculosis (TB), HIV or retroviral diseases, epilepsy, and cancers, in addition to problems such as diarrhoea and pneumonia. There are also injuries, such as those due to motor vehicle accidents, and due to violent crimes, including stabbings, rape, as well as drug overdose.

In the clinics, the most common tasks performed by nursing personnel are those of primary healthcare procedures. It is necessary to assess the patient and then treat and monitor them, which incorporates immunisation procedures, the testing of blood pressure, dispensing medication, and the dressing of wounds. Common disorders presented by patients include chronic conditions of hypertension, diabetes, epilepsy,

and asthma, as well as acute cases or emergencies. HIV and TB are also commonly presented by patients. Programmes provided by the clinics include those of immunisation, antenatal care, TB, nutrition, as well as HIV/AIDS, in addition to chronic care, curative care for minor ailments, and also mental health problems in some cases. HIV/AIDS care also incorporates programmes of prevention of mother to child transmission, anti-retrovirals, and voluntary counselling and testing. High levels of physical exertion by the clinic nurses are uncommon, Much of the work is performed while sitting down, but some procedures require nurses to stand.

The most significant injury or sickness reported by nurses in the hospital was back pain. Needle-prick injuries, and the hazard of airborne TB were also reported problems in the hospital; as well as incidents such as getting fingers pinched in cot-sides of beds, slipping on staircases, and assault from patients. Meanwhile, back pain was seen to be a problem in a few of the clinics. Needle-prick injuries, as well as infection with TB were generally greater concerns. Physical injuries or sicknesses were reportedly low in nursing staff at the clinic, but there were high levels of stress, and that the staff felt overworked, and that there are many demands from the community. Tiredness and stress may be among the most common complaints of the clinic nurses. Also, while reports of injuries or sicknesses in the nurses were rare, assault from patients could occur.

**Work conditions**

The buildings, or infrastructure, were seen to be a problem in many of the municipal clinics. These problems include those of being too small, without the possibility of extension. There were not always enough consulting rooms for the nurses, or sufficient space in treatment rooms, and there is an increased risk of contracting TB due to the close confinement. Most of the clinics reported that there were not often problems with the supply of medication. Access to basic supplies, such as gloves, was also seen to be sufficient. It was reported, however, that although access to equipment was acceptable, more equipment would be beneficial. The hospital generally was considered to have sufficient amounts of equipment, supplies, and medication.

Pay was reported to be a cause of stress or difficulty at work, especially in comparison to workload, as well as a limited budget for healthcare in general. Stress at work was also seen to come from pressure or demands from patients, and a lack of time at work to fulfil requirements of the job such as administrative duties. Staff relationships could also exacerbate this stress, and more staff would relieve the high workload. Staff shortages were seen to limit optimal healthcare. Another reported problem was the length of time that patients have to wait before being attended to, as they may wait for over 3 hours.

A major factor hindering optimal healthcare was also seen to be poverty, especially in relation to people getting infected with HIV, or defaulting on treatment, in order to obtain or retain governmental grants. Unemployment was also a reported problem, in addition to poverty, which is linked to an increase in disease such as TB, due to lack of food, poor housing, and overcrowding. Additionally, some patients need to be re-treated for the same conditions, as after treatment they are placed back in the same living conditions that caused the problem in the first place. Budgetary constraints, lack of skilled professionals, lack of community responsibility for their own health, was well as poverty, were also reported to be major limiting factors to healthcare in the hospital.

**Risk assessments**

Environmental assessments were obtained from each of the participating clinics, Themba Hospital, Settlers as a whole, and for eight of the nine wards at Settlers Hospital. In this assessment, the sisters in charge were asked to rank 26 variables regarding site conditions, worker preparedness, organisational involvement, and incidence rate, on a scale from 1 to 5 (with 1 indicating low risk, and 5 indicating the highest level of risk). When the ratings obtained for each of the questions were summed together, the scores obtained for each of the workplaces ranged from 33 to 63. These scores are all below the checklist's guideline that scores of 80 require a more thorough risk assessment to be undertaken. However, the checklist still reveals areas of concern within the different workplaces.

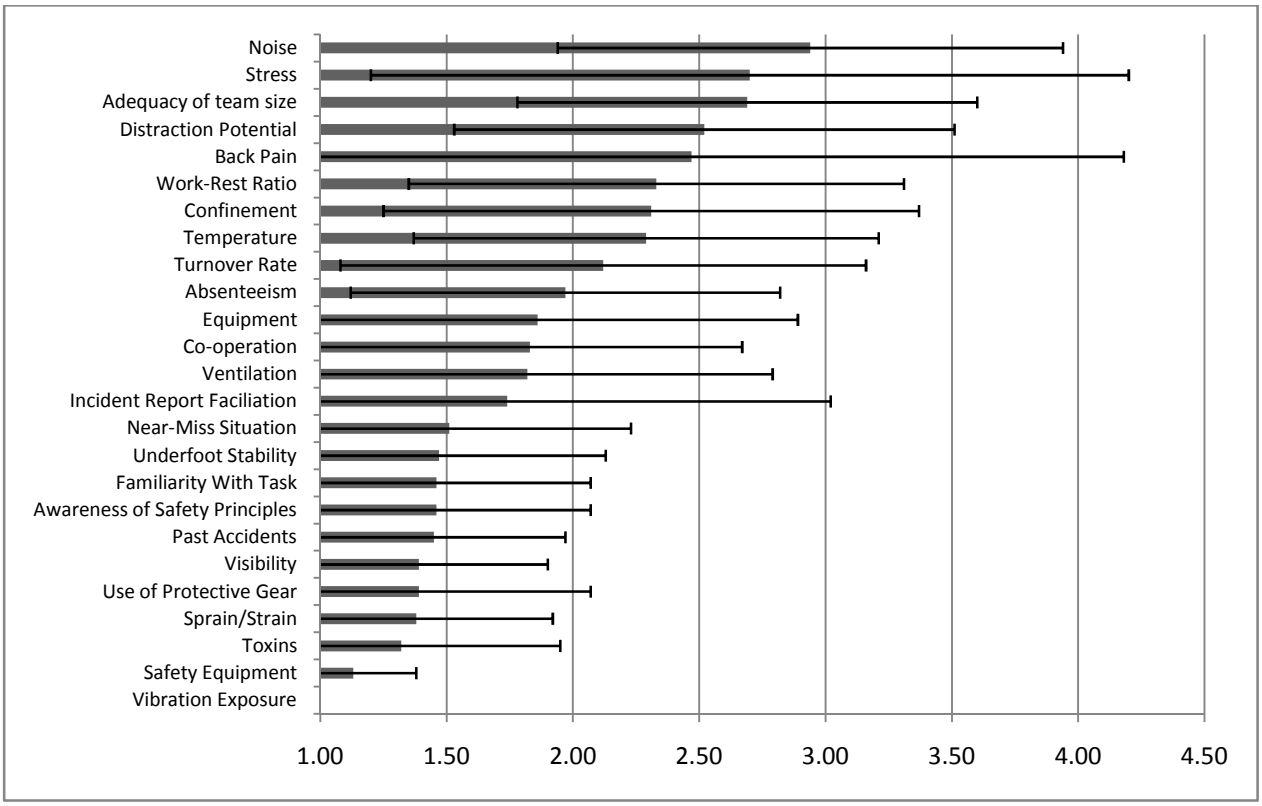



**Figure 5:** Mean ratings of environmental risk for eight wards at Settlers Hospital and seven municipal clinics, as per walk-through assessment

The mean obtained for the total amount of risk in the wards at Settlers Hospital was similar to the mean amount in the clinics (48 and 46 respectively). These results ranged from 35 to 61 in the clinics, and 33 to 63 in Settlers Hospital. The total standard deviation was 8.58, and was 8.26 and 9.75 for the clinics and the hospital respectively. The greater variability amongst hospital wards compared to among the different clinics is likely to be, at least partially, attributable to the greater number of wards than clinics. When results for the clinics and Settlers Hospital were averaged, noise, stress, adequacy of team size, distraction potential, and back pain received the highest ratings of risk (see Figure 5). Risk due exposure to vibration as well as toxins were minimal, and the availability of safety equipment was also not rated highly as a risk factor when looking at the hospital and clinics in general. Various other factors including previous occurrences of strain or sprain or accidents, use of protective gear and awareness of safety principles, familiarity with task, visibility and underfoot stability, were also minimally rated, receiving means of under 1.5.

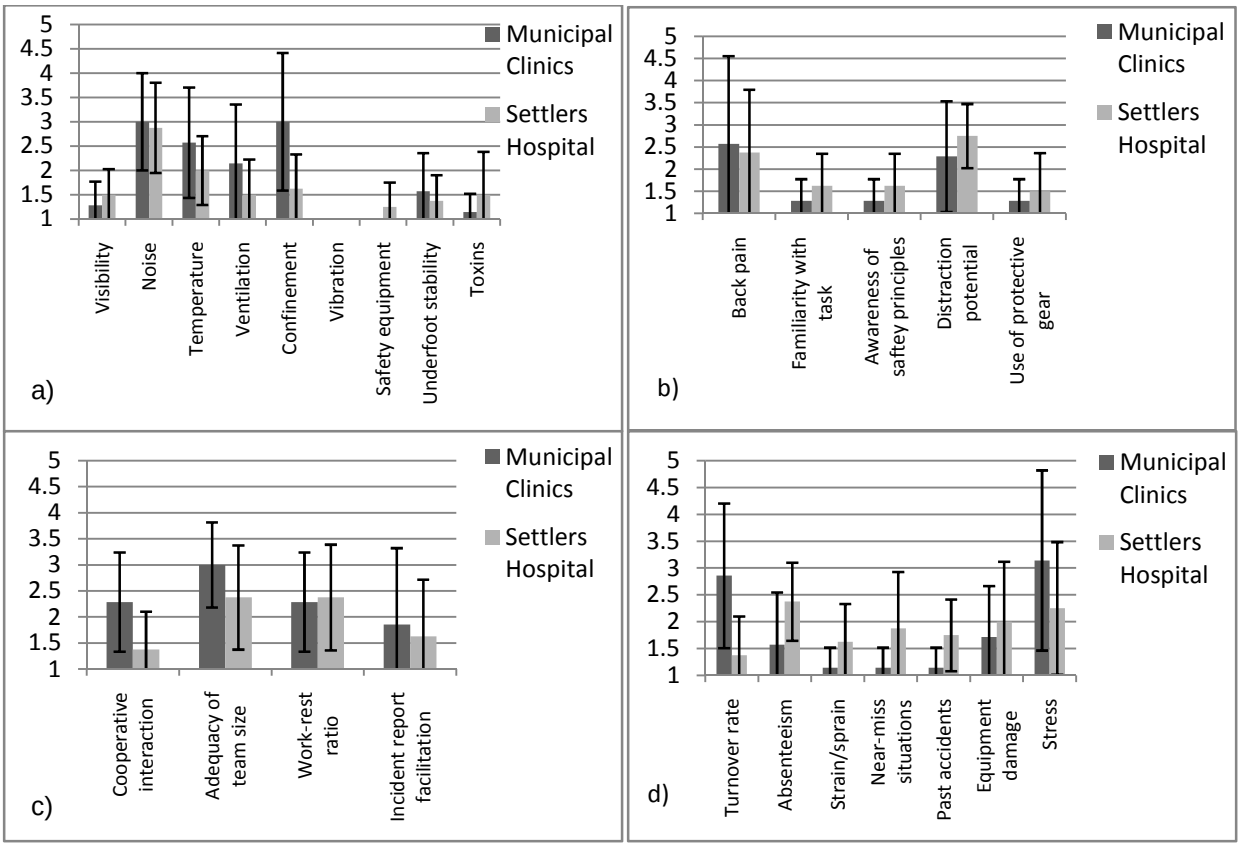



**Figure 6a-d:** Environmental risk factors reported on a scale from 1 (low risk) to 5 (high risk) by sisters in charge at seven municipal clinics, and eight wards at Settlers Hospital. a) Site Conditions (top left), b) Worker Preparedness (top right), c) Organisational Involvement (bottom left), and d) Incidence Rate (bottom right).

As can be seen in Figures 6a-d, which illustrate the reported levels of risk in Settlers Hospital wards versus the various clinics, highest mean levels of reported risks in the clinics were for that of stress, followed by that of adequacy of team size, workspace confinement, and noise; as well as turnover rate; temperature; and back pain. Meanwhile, the highest risk ratings reported at Settlers Hospital were seen to be that of noise and distraction potential. Other risk areas in the hospital could include back pain, adequacy of team size, work-rest ratios, absenteeism, and stress. It was evident that the problems of workspace confinement, turnover rate, worker co-operative interactions, and stress were much higher in the clinics than in Settlers Hospital. Meanwhile, reports of absenteeism, occurrences of strain or sprain, and past accidents appeared to be higher among the wards in Settlers Hospital than in the municipal clinics.

## RESULTS OF QUESTIONNAIRES AND INTERVIEWS WITH NURSES

### Demographics of nursing personnel

The mean age category for the sample was 41-50 years. None of the nurses were less than 20 years of age. 14% of the participants were in the 21-30 year age category, 21% were between 31 and 40 years, 40% were between 41 and 50 years, while 20% were between 51 and 60, and the remaining 5% were over 60 years of age. Figure 7 depicts the distribution curve of age for the nurses in the study. There tended to be fewer night staff in the younger age category (21-30 years), as well as in the highest age category (>60 years) in this sample, compared with nurses working in the day. Additionally, the number of nurses in each age category tended to be more evenly distributed for clinic nurses than in the hospital. Especially noteworthy is that there are a higher percentage of nurses over 60 years working in the clinics than in the hospital.

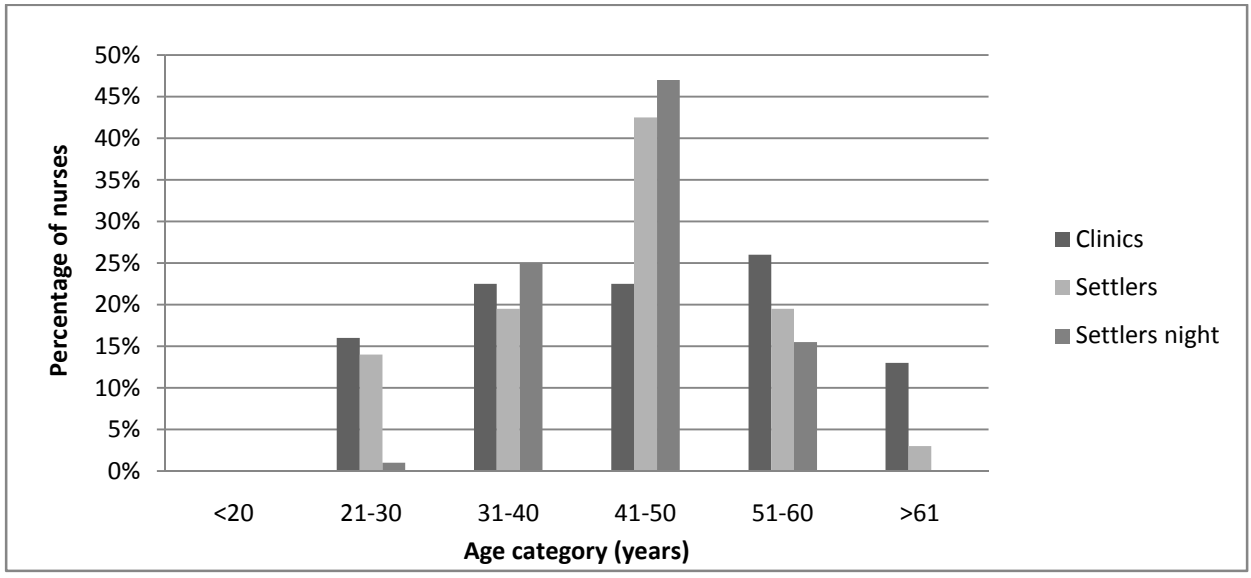



**Figure 7:** Age distribution of participating nurses according to workplace and shift worked (N=150)

The majority (91.5%) of the nurses were female, while only 8.5% of the nurses were male. There was a slightly higher percentage of female nurses within the clinics than in the hospital, as there were only 2 male participants (6%) within the clinic population, while around 9% of the hospital's sample was male.

The majority of the nurses (64.5%) were first (home) language Xhosa speakers. 24.5% reported to have Afrikaans as their home language, while only 5% were English speaking. Some (3.33%) of the nurses reported to have two home languages, namely English and isiXhosa (1.33%), and English and Afrikaans (2%) respectively. Four (2.67%) of the nurses speak languages other than the three previously identified, with two of these speaking Venda, and two having Zulu as a first home language. Associated with language is the race of participants. 70% of the participants were Black Africans, 22% Coloured, 7% White, and 1% were unspecified. These demographics were not uniform across the clinics and the hospital, as the clinics tended to have higher percentages of Black Africans (87%) and fewer coloureds (13%) than the hospital (66% and 29% respectively). There were no white respondents working in the clinics, while 9% of the hospital respondents were white.

On a related note, when the participants were given the opportunity to chose whether to fill out the questionnaire in Afrikaans, Xhosa, or English, all of the nurses chose to fill the questionnaire out in English. This was not anticipated, as the majority of the nurses are not first language English speakers. However, English appeared to be the dominant language in the healthcare industry, and as most of the nurses were schooled in English, they were probably more confident in using this language when reading and writing. A couple of the participants used the documents in the alternate translations to look at if they were uncertain what a question meant in the English questionnaire. Additionally, all the nurse interviews were conducted in English, and as such, no translator was required.

Regarding marital status, 49% of the nurses were married, and 41% were unmarried. Of the remaining 10%, 6% reported themselves to be divorced, 2.6% widowed, 0.67% separated, and 0.67% as unmarried but living with a partner. It appears that clinics have the highest percentage (55%) of married nurses, compared to the day and night staff at the hospital (49% and 39% respectively), while the night staff have the highest percentage of single nurses (50%).

The highest level of education for the caregivers (4% of the sample) was a Grade 12. 1% of the rest of the sample also had a Grade 12 as their highest level of education. 23% of the sample had completed a 1 year nursing certificate, the qualification needed to become a nursing assistant. 17% had completed a 2 year nursing certificate, necessary to being a staff nurse. Another 23% completed a 3 year nursing diploma, with or without an additional 2 year bridging course. 29% had a Bachelor of Nursing Science degree (BCur), a 4 year nursing diploma, or its equivalent. Thus, up to 52% of the sample had the prerequisite training for being professional nurses. Results were not obtained for 3% of the sample.

**Workplace factors**

Educational level is closely linked with professional position. As was previously mentioned, 4% of the respondents were care-givers. Following this, 33% of the sample were nursing assistants, 13% were staff nurses, 46% were professional nurses, and 4% were listed as nurse managers. These values vary substantially between the hospital and the clinics, as the clinics have a higher ratio of professional nurses to nursing assistants and staff nurses.

Official hours of work are 40 hours per week for both nurses in both the hospital as well as in the clinics. Clinic hours are from 07h30 to 16h30 from Monday to Thursday, and 07h30 to 15h30 on Fridays, with a 15min-30min tea break provided, and a 1 hour lunch break per day. Some of the clinic nurses are required to work overtime for 1 hour on Saturdays and Sundays in order for daily TB injections to be given. Hospital shifts vary. Most of the nurses work three 12 hour shifts (07h00-19h00) per week, and one 6 hour shift (07h00-13h00), while others work two 12 hour shifts and three half shifts. Meanwhile the nightshift workers work from 19h00 to 07h00 for 7 nights in a row from Wednesday to the following Tuesday, and then have a full week off. Only one of the participants reported working part-time, which was for 25 hours per week. Additionally, overtime was reported to be more common amongst the night staff. In the study sample, 74% of the participants (including all the clinic staff) work during the day, 23% worked night shifts, and the remaining 3% reported to work both day as well as night shifts.

More than a quarter (28%) of the nurses had been in nursing for less than 5 years. This category is largest for both clinic and hospital nurses. There is a sharp decline following this category, in the number of nurses that have been working for 5 to 14 years (7% from 5-9 years, and 7% from 10-14 years). There is an increase in nurses have been working for between 15 to 29 years, after which the graph shows a decline in numbers as the years progress (13% from 15-19 years, 20% from 20-24 years, 13% from 25-29 years, 7% from 30-34, and 4% for 35 years or more). However, in the clinic population there is a higher percentage of nurses that have been working for over 35 years than in the hospital (13% versus 1% respectively). Figure 8 displays the distribution of length of time in nursing by 5 year categories for clinic, hospital day staff, and hospital night staff.

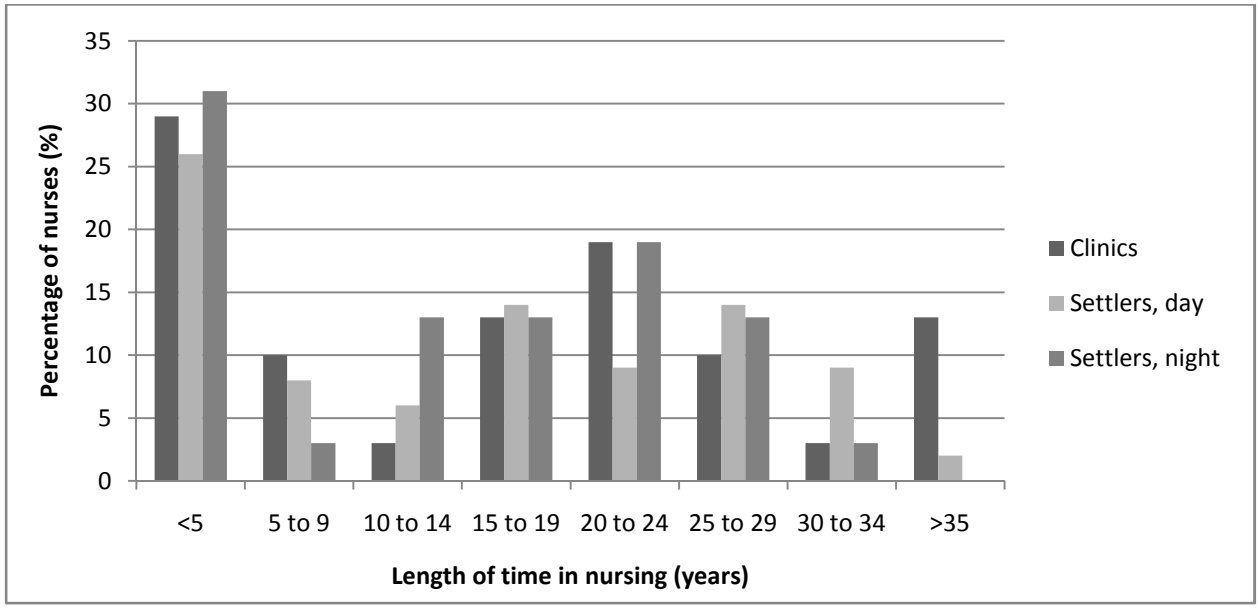



**Figure 8:** Length of time spent in nursing according to workplace (N=149)

## Living Conditions

The majority of the nurses (65%) lived in formal brick houses, while 25% reported to live in flats, townhouses, or cottages. Only 6% reported living in RDP housing (housing provided for or subsidised by the government), 2% in traditional housing, 1% in informal housing or shacks, and for 1% of the respondents no response was given (see Figure 9). It is necessary to note that many nurses live in Grahamstown, such as in a nurses'

residence for hospital staff, during the week for work, and then go home to more rural villages during the weekend (or on off days). As such it is difficult to determine which houses were referred to in their responses. The question of whether their roof leaked when it rained was asked in order to grant an indication of housing quality. The majority (71%) of the respondents noted that their house never leaks when it rains. 13% said that their roof seldom leaks, 5% indicated that it often leaks, 9% said it always leaks when it rains, and 2% of the sample omitted this question.

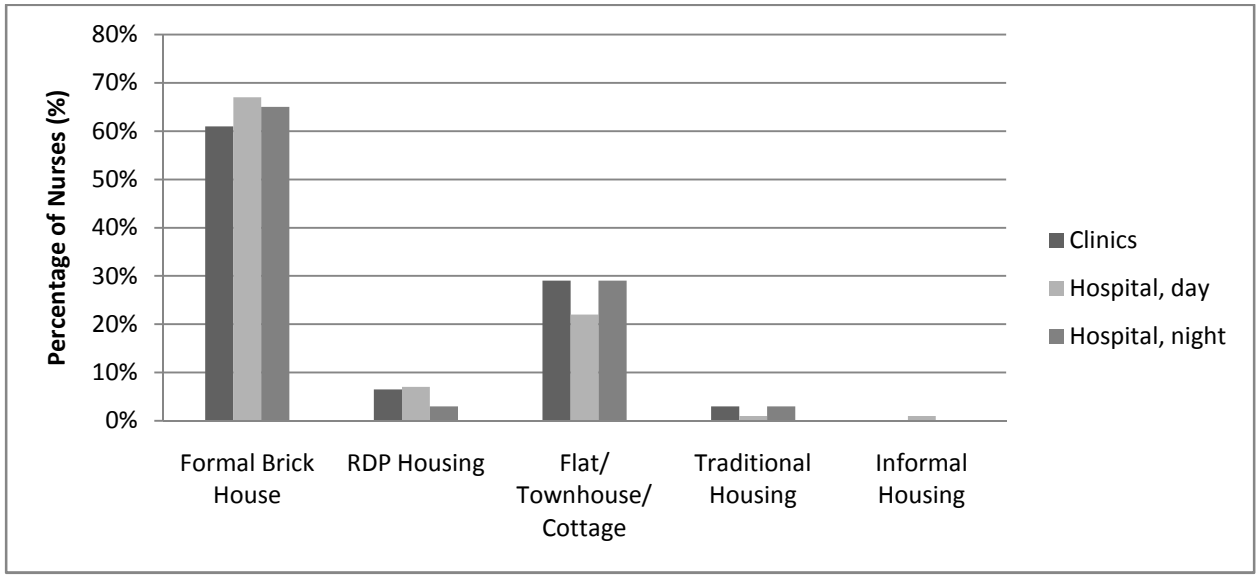



**Figure 9:** Type of house or residence of nurses in the sample (N=149)

Addresses were not given by around 13% of the sample. This seemed to be primarily due to misunderstanding, as many did not realise they were supposed to write down their response, instead of ticking the appropriate block as with the other questions. The addresses obtained were crudely coded by street and area into four main groupings. These included 1) Middle-upper class Grahamstown, 2) Middle-lower class Grahamstown, 3) Township (Grahamstown East), and 4) Outside of Grahamstown, of which 11%, 27%, 40%, and 9% of the sample were grouped, respectively. Places outside of Grahamstown were recorded to include Port Alfred, Port Elizabeth, Fort Beaufort, Alicedale, Cradock, King William's Town (which are all in the Eastern Cape), and as far away as Durban (which is in KwaZulu Natal), in one case.

When it comes to the level of crowding in the house, the average number of people living in each residence was 4. More specifically, 7% of the participants reported living alone; 12% lived with one other person; 15% lived in a household of 3 people; and 26% lived in a household of 4 members. 20% lived in a household of 5; 11% in a house of 6; 3% in a house of 7; and 4% in a household with 8 or more residents. Interestingly, nurses from the clinic tended to live with fewer people than nurses from the hospital.

Most (74%) of the participants had access to piped water (taps) in their houses. However, many (21%) relied on piped water that they fetch from a tap in their gardens. Only a few had to obtain water from a communal tap located either less than 200m away (3%), or further than 200m away (1%) from their houses. 95% of the nurses had working flush toilets within their property. About 1.33% used chemical toilets, 0.67% used a pit latrine, 0.67% had no toilet or the toilet was broken, and 2% of respondents did not answer this question.

Most of the nurses (95%) relied on electricity as the primary source of fuel for lighting their houses. In fact, none of the respondents noted anything else as their primary source of lighting, although some mentioned they additionally use paraffin along with electricity (3.33%), and 1.33% of the respondents did not answer this question. Many (around 11%) of the respondents did not answer the second part of this question, regarding the primary source of fuel used for cooking. This was probably due to how the question was structured in the questionnaire. Although most of the respondents (88%) said that electricity was their main fuel source for cooking, a number also used gas as a primary fuel source for cooking (4%). 8% reported using both gas as well as electricity for cooking.

Half (50%) of the participants recorded their households' total monthly income, after tax, to be between R5001 and R10 000. 23% reported an income of below R5000, while 14% reported a household income of between R10001 and R15000. Only a few represented households (12%) had income of above R15000 per month. On average, 4

people were reliant on this income, and this is the case in 24% of the households. Only 5% of the participants are the only ones reliant on their income, 13% have two people reliant on this income, and 16% use this income for three people. 19% have 5 people that are reliant on this income, 9% have 6 people, and 12% have 7 or more people that rely on this income. There was no evident correlation between total monthly income and the number of people reliant on the income (at $p<0.05$).

Most of the nurses did not receive any form of social grant (65%), although 20% received 1 grant, 6% received 2 grants, and 2% received 3 or more grants. 7% did not answer this question. Social grants are received by certain members of the community for reasons such as disability, pension, and child support. The number of social grants received was positively correlated with the number of residents per household ($r=0.27$, $p<0.05$), as well as negatively associated with position at work ($r=-0.21$, $p<0.05$) and level of household income ($r=-0.18$, $p<0.05$). As such, those with more dependents, lower positions and lower income had a greater reliance on grants than others.

**Satisfaction Ratings**

The modal value of subjective satisfaction for all 5 considered aspects (Life as a whole; Living conditions; Personal health; Job; and Working conditions) on a 5-point scale from very dissatisfied to very satisfied, was that of satisfaction with the associated aspect. However, some aspects were rated highly more often than others. For example, nurses were more commonly satisfied (and less dissatisfied) with their health than any of the other variables. The lowest satisfaction (and highest dissatisfaction) ratings were obtained for working conditions. This trend of highest levels of satisfaction with health, and lowest levels of satisfaction with working conditions held both amongst the hospital and the clinic samples. Figure 10 displays the distributions of each of these variables on a scale from very dissatisfied to very satisfied. Each of the five satisfaction ratings were seen to be correlated with each other ($p<0.05$). The association between life satisfaction and satisfaction with living conditions was particularly strong ($r=0.77$, $p<0.05$), followed by the association of life and job satisfaction ($r=0.51$, $p<0.05$) as well as job satisfaction and satisfaction with working conditions ($r=0.58$, $p<0.05$).

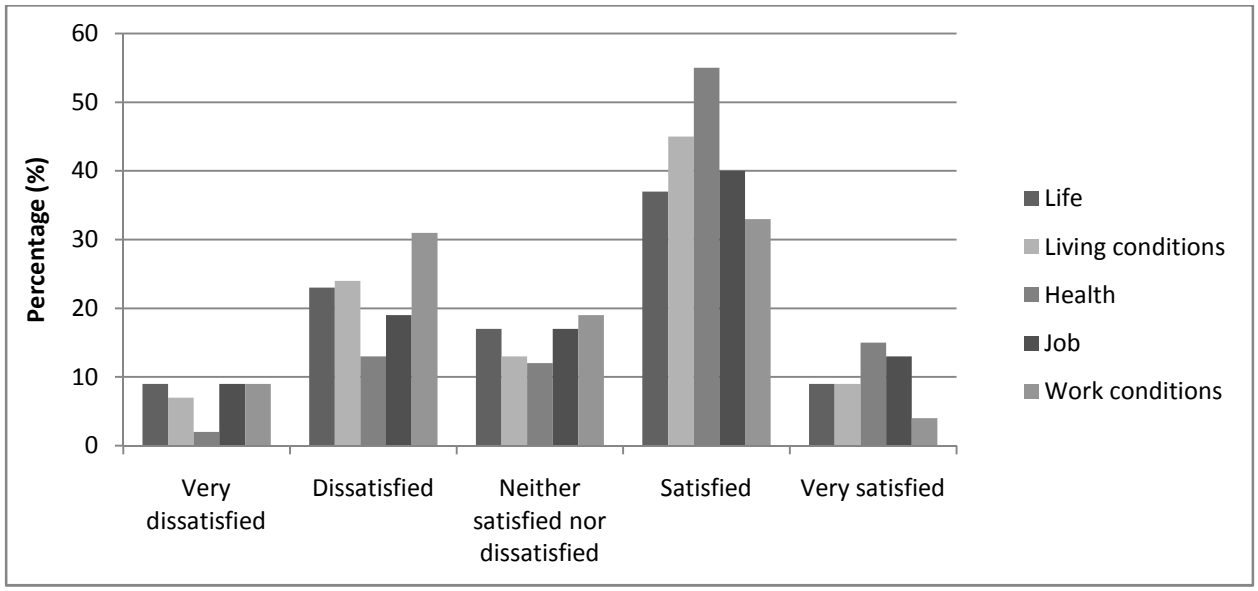



**Figure 10:** Percentage of ratings of subjective satisfaction with life, living conditions, health, job, and working conditions for nurses in Grahamstown (N=144-148)

Most of the nurses (58%) never thought about leaving nursing. Meanwhile, 23% of the nurses thought about leaving nursing sometimes per year, 10% sometimes per month, only 1% sometimes per week, and 4% thought about it sometimes per day. The frequency at which the participants think about leaving their job is used in this case to provide an indication of intention to quit their jobs. Intent to leave was negatively correlated with job satisfaction ($r=-0.23$, $p<0.05$) and satisfaction with working conditions ($r=-0.21$, $p<0.05$), while it was not correlated with life satisfaction nor satisfaction with living conditions and health ($p<0.05$).

As can be seen in Figure 11, high workload as well as salary or pay far outweighed the other factors as being the main causes of stress or dissatisfaction among the sample. 56% and 60% of the nurses respectively listed workload and salary or pay amongst the three most stressful or dissatisfying aspects of their jobs from a predefined list of 14 aspects. These sources of stress or dissatisfaction were followed by the demands from the patients (29%) and the risk of living with or contracting HIV/AIDS (23%). The lowest rated causes for stress and dissatisfaction from the list of 13 factors were relationships with staff members (6%), followed by the physical demands of the job (9%). The

remaining eight factors (mental or emotional strain; relationships with superiors; work organisation or management; the work environment; lack of equipment or supplies; opportunities for promotion or personal growth; professional recognition; and balancing household and work demands) were listed as factors of job stress or dissatisfaction by between 11% and 19% of the participants. While relationships with supervisors and with staff members were not commonly reported as top stressors, workload, time pressure, and demands from patients were. Despite the demands of the job, it appeared that the supervisors and staff all worked together and supported each other in order to try complete the many tasks. Three of the nurses (2%) wrote down other factors that caused them stress or dissatisfaction at work, and these included 1) that the workplace is far from their home; 2) not getting off-duties of their choice (ward choice); and 3) not qualifying for a salary despite working very hard (care-giver response).

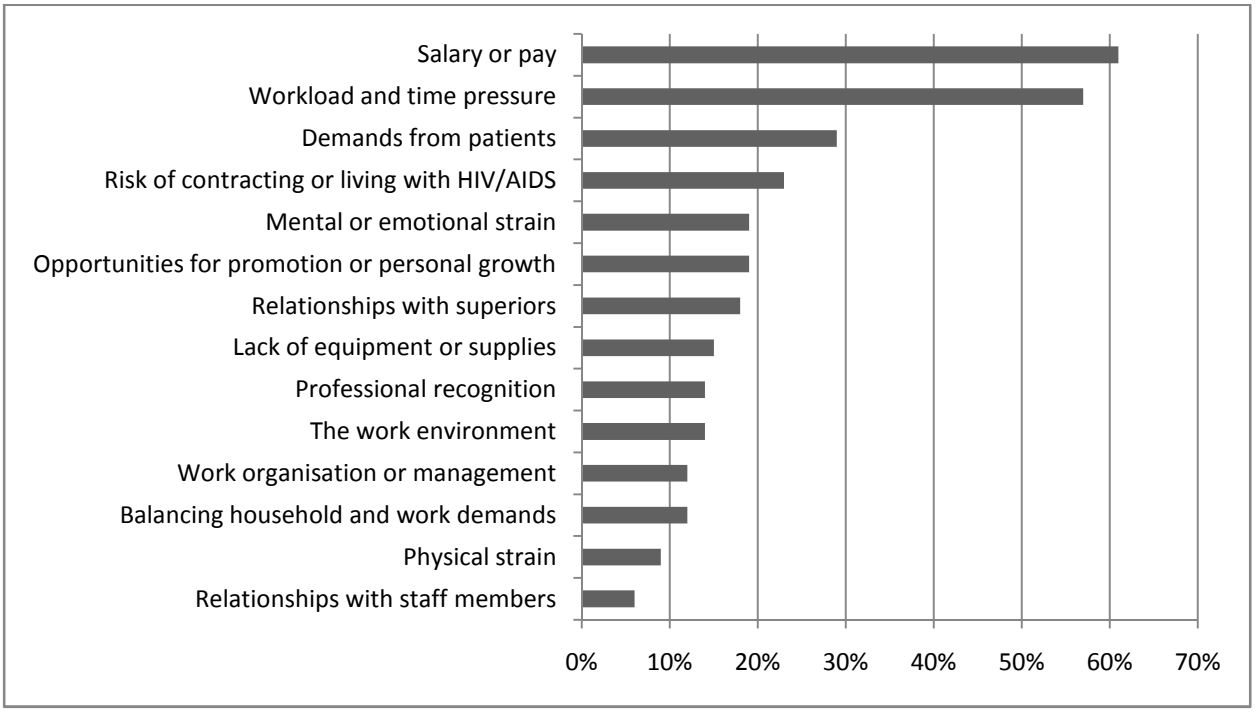



**Figure 11:** Ratings of perceived sources of stress and dissatisfaction at work, when participants were asked to indicate the three top sources of stress and dissatisfaction at work (N=147)

The reports of perceived sources of stress and dissatisfaction differed between the hospital and clinic nurses. The clinic nurses were more likely than the hospital nurses to

report stress due to workload (75% in clinics, and 53% in hospitals), demands from patients (59% and 22%), mental strain (31% and 16%) as well as from the work environment (31% and 10% for the clinic and hospital sample respectively). Meanwhile, the hospital nurses had more reports of stress due to HIV/AIDS (27% in hospital, 13% in clinics), for physical strain (11% in hospital, 3% in clinics), stress due to relationships with staff and superiors (7% and 20%, versus 3% and 13%), and personal growth opportunities (22% and 13% respectively), than the clinic nurses. Stress or dissatisfaction due to the remaining options of salary or pay, equipment, management, and the work-home interface were similar in the hospital and clinic sample.

An open-ended question was included in the questionnaire to ask participants what the best aspect of their job was. About 70% of the participants noted a response to this question. Most of the responses given to the question regarding what the nurses liked most about their jobs were related to patient care (about 60% of the responses). They enjoyed, for example, talking to their patients, or seeing a sick patient get well again. A number of responses were further related to specific aspects of care provision, such as post-natal care, or counselling (around 8%). A number also noted they liked to provide a service to the community (around 5%). Other responses related to the good working relationships with colleagues, communication with staff, and working as a team (about 20%). General work organisation and management, was also noted, as was the provision of equipment. Further responses related to salary, skills development, and personal empowerment (around 8%).

**Musculoskeletal Strain**

A simplified version of the Nordic Musculoskeletal Questionnaire (Kuorinka *et al.*, 1987) was used to grant an indication of the musculoskeletal stress experienced by the nurses. In the responses to this, 10% of the nurses reported no ache, pain, or discomfort in any of the 9 listed body areas in the last 12 months. 28% had trouble in one area, 25% had trouble in 2 areas, 15% had trouble in 3 areas, and 21% had trouble (ache, pain, or discomfort) in 4 to 9 of the body regions. Results were not obtained from 1% of the nurses. Regarding this above-mentioned trouble, 19% reported that it

prevented them from doing normal work (at work or at home) during the last 12 months. Furthermore, 23% had experienced associated musculoskeletal trouble in the previous 7 days.

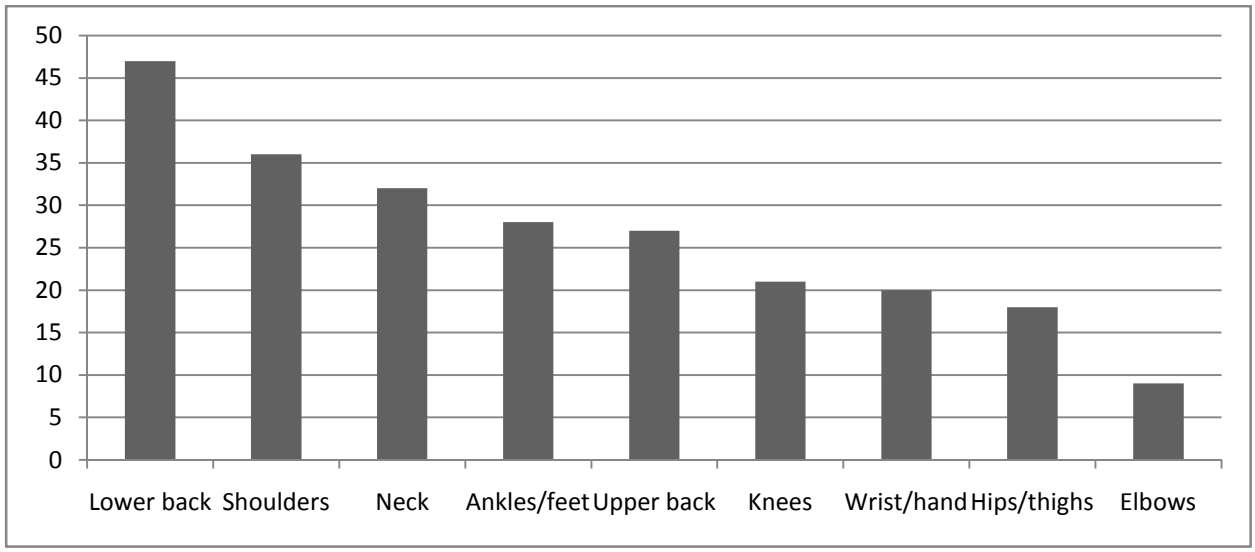



**Figure 12:** Percentage of nurses reporting of musculoskeletal aches, pain, or discomfort in nine body areas during the last twelve months (N=149)

Figure 12 depicts the body regions most commonly affected with ache, pain, or discomfort in the study sample. As is evident, the lower back is the region that is most commonly affect by ache, pain, or discomfort, with approximately 47% of the participants reporting lower back pain. Aches, pain and discomfort were secondly most prevalent in the shoulder region, and then in the neck; with 36% and 32% of nurses respectively reporting associated pain or discomfort. More than a quarter of the nurses therefore reported pain in these areas in the past 12 months, as well as in the additional areas of the ankles/feet (28%), and in the upper back (28%). 20% reported trouble in the wrists/hands, and 18% in the hips, or thighs, while the elbows were the areas with the least frequent reports (9%) of ache, pain, or discomfort in the past year.

Of those reporting musculoskeletal trouble that had interfered with their work in the previous 12 months, one-third (33%) of the trouble was in the back. 19% was in the ankles or feet; 14% was in the elbows; 10% in the shoulders; 10% in the knees; and low

amounts (5%) were in the arms; legs; and wrists or hands. Then of those who reported trouble in the last 7 days, 31% was in the back; 13% was in the feet or ankles; 10% was in the shoulders; 10% in the legs; 10% in the knees. 3% reported trouble in the elbows, and 3% in the clavicle; while 6% reported trouble in both the neck and shoulders simultaneously; and 3% in the neck and back simultaneously.

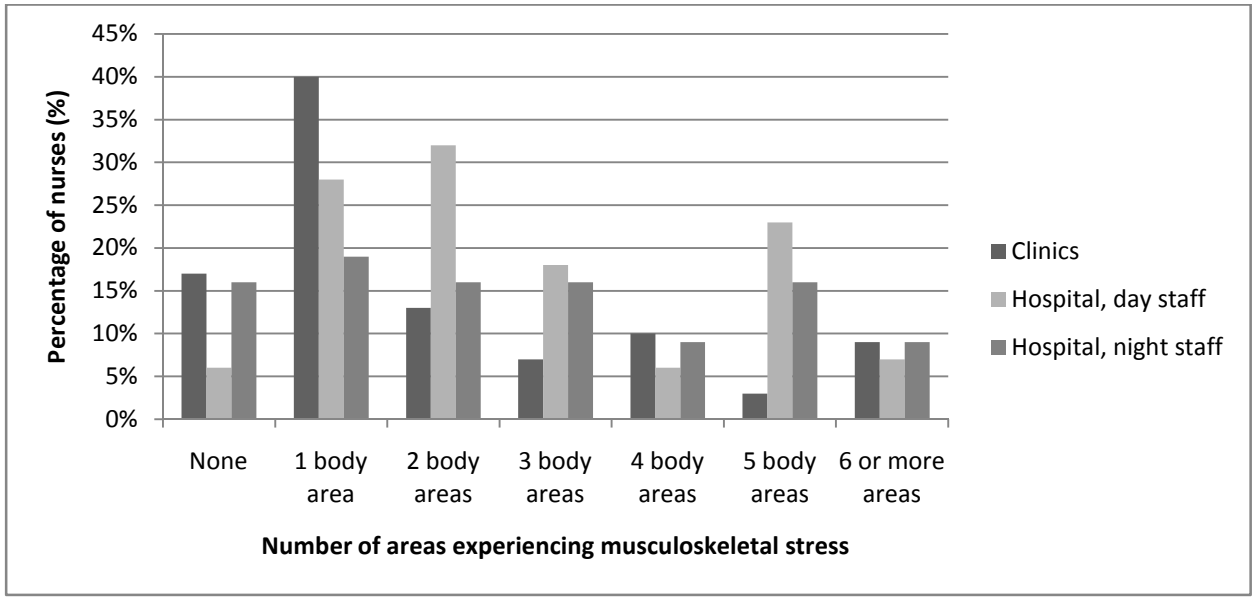



**Figure 13:** Reports of musculoskeletal ache, pain, or discomfort in the previous twelve months, in day and night staff at Settlers Hospital versus clinic workers (N=149)

There were fewer reports of musculoskeletal aches, pain, and discomfort amongst the clinic nurses as compared to the hospital participants. While only 3% of the clinic nurses reported trouble interfering with their work in the last 12 months, 24% of the hospital nurses reported having trouble. However, similar amounts of clinic and hospital nurses (23% and 26% respectively) reported musculoskeletal trouble in the previous 7 days. Then, as can be seen in Figure 13, although the clinic nurses tend to have more reports of a single area with ache, pain, or discomfort, they made fewer reports of pain in many body areas than the hospital participants did. Hospital nurses tended to have more reports of trouble in the lower back, shoulders, ankles/feet, and elbows, compared to the clinic nurses, who had a higher percentage of reports of neck, and hip/thigh trouble than the hospital nurses.

**The Work Ability Index**

The Work Ability Index (WAI) (Tuomi *et al.*, 2006) was incorporated into the questionnaire completed by the nurses, and in itself comprises of 7 items. The responses for each of the questions are then used to calculate a WAI score for each nurse. If any of the questions in the WAI are incomplete it is not possible to calculate the total WAI score for that respondent. As the questionnaire was quite long and relatively time consuming, it also added to the likelihood that respondents would not complete all of the questions. The cumulative WAI score was calculated for approximately 85% of the sample. Each of the respective components of the WAI index shall also be discussed.

The first question of the Work Ability Index (WAI) asked the participants to rate their current work ability compared to lifetime best on a scale from 0 to 10 (0 meaning they are completely unable to work, and 10 representing work ability at its best). None of the respondents rated their current work ability as anything less than 4. Two (1.33%) of the respondents rated their work ability as 4 and the same number for 5. 4% of the respondents rated their work ability as 6; 10% at 7; 22% at 8; 19% at 9, and the majority (37%) regarded their work ability to be optimal at 10. This first question of the WAI section was left out by a number (5%) of the participants, which was likely to be due to the formatting of the question, causing it to be unclear to the respondents as to what it meant or how to complete it.

Similarly for physical and mental work ability, which make up the second item of the WAI, most of the nurses ranked themselves optimally (50% and 45% respectively with a rating of “very good”). 32% and 29% were rated at “rather good”, 16% and 21% at “moderate”, 0.67% and 1.33% at “rather poor”, and 0% and 0.67% at “very poor”, for physical and mental work ability respectively. As such ratings for physical work ability were slightly higher than those for mental work ability. More of those in the hospital were found to rank their physical and mental work ability as “very good” than those in the clinics.

Thirdly, was the item of number of diseases diagnosed by a physician. This question was misunderstood in some cases, and as such, scores for some participants (approximately 5%) were not included in these results. It was found, however, that 41% of the participants did not report having any of the listed conditions, as per doctor's diagnosis. 23% reported having 1 of the conditions, 9% having 2, and 9% were diagnosed with 3 of the conditions. The rest of the participants (around 13%) reported having 4 or more of the listed conditions. A list of a total number of 51 diseases is included in the WAI, which are grouped under subheadings. Figure 14 displays the total number of reported diseases diagnosed by a physician according to these subheadings.

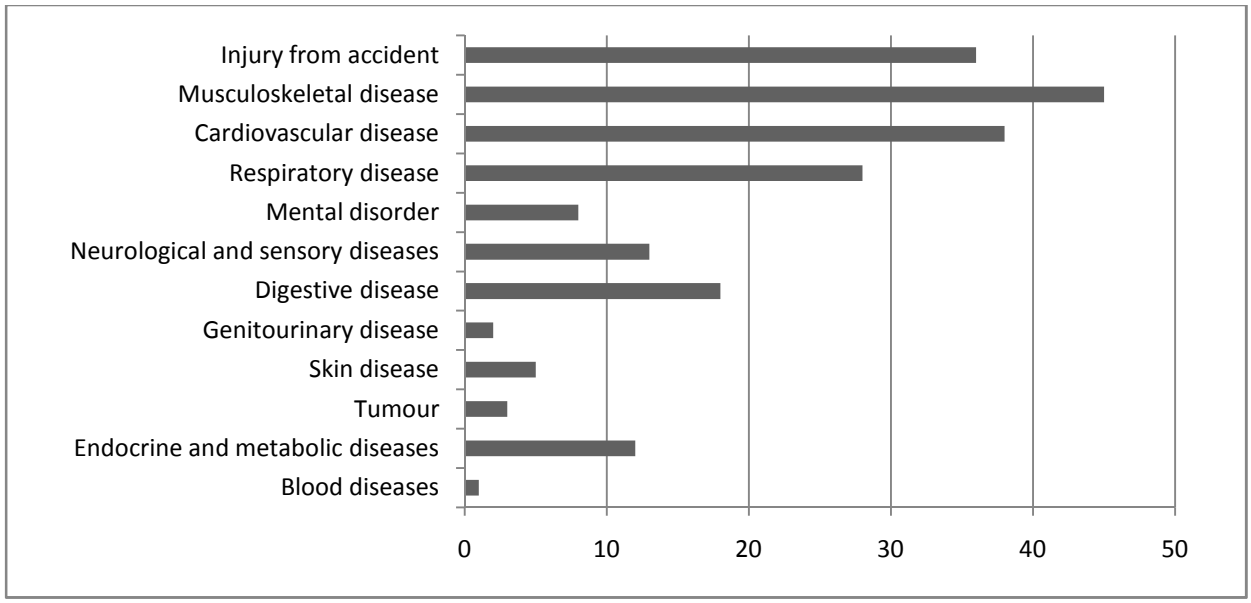



**Figure 14:** Number of reported diseases, according to subheadings included in the Work Ability Index (N=144)

Injuries from accidents and musculoskeletal disease were not infrequent. 6% of the sample reported having back injuries; 8% reported injury to the arm or hand; 9% had an injury of the knee, leg, or foot; and another 1% other forms of injury. Regarding musculoskeletal disease, 3% reported disorders of the upper back; 5% disorders of the lower back; and 9% had sciatica. Additionally 5% had a musculoskeletal disorder affecting the limbs, and 6% were diagnosed with arthritis. 2% had other forms of musculoskeletal disease.

Of all the diseases listed in the questionnaire, hypertension was most commonly reported, with 20% of the sample having this disease. 6% of the participants reported having diabetes. Coronary heart disease is also associated with these two diseases, and was reported by 2% of the sample. 2% of the sample additionally noted that they had been diagnosed with high cholesterol, and 1% reports other forms of cardiovascular disease. None of the participants reported having coronary thrombosis, myocardial infarction, or cardiac insufficiency. 1% of the sample was diagnosed as being obese. Regarding other endocrine and metabolic diseases, 2% of the sample had goitre or another thyroid disease. Digestive diseases were also present, with 2% of the sample having gall stones or disease; 2% having a gastric or duodenal ulcer; 2% with gastritis or duodenal irritation; and 1% with colonic irritation. 4% noted having another form of digestive disease, of which 3% were irritable bowel syndrome.

Regarding respiratory diseases, 10% reported having repeated infections of the respiratory tract, including tonsillitis, acute sinusitis, and acute bronchitis. 1% reported having chronic bronchitis, and 3% chronic sinusitis. Another 3% reported bronchial asthma. 1% reported being diagnosed with pulmonary tuberculosis, while 1% reported other forms of respiratory disease.

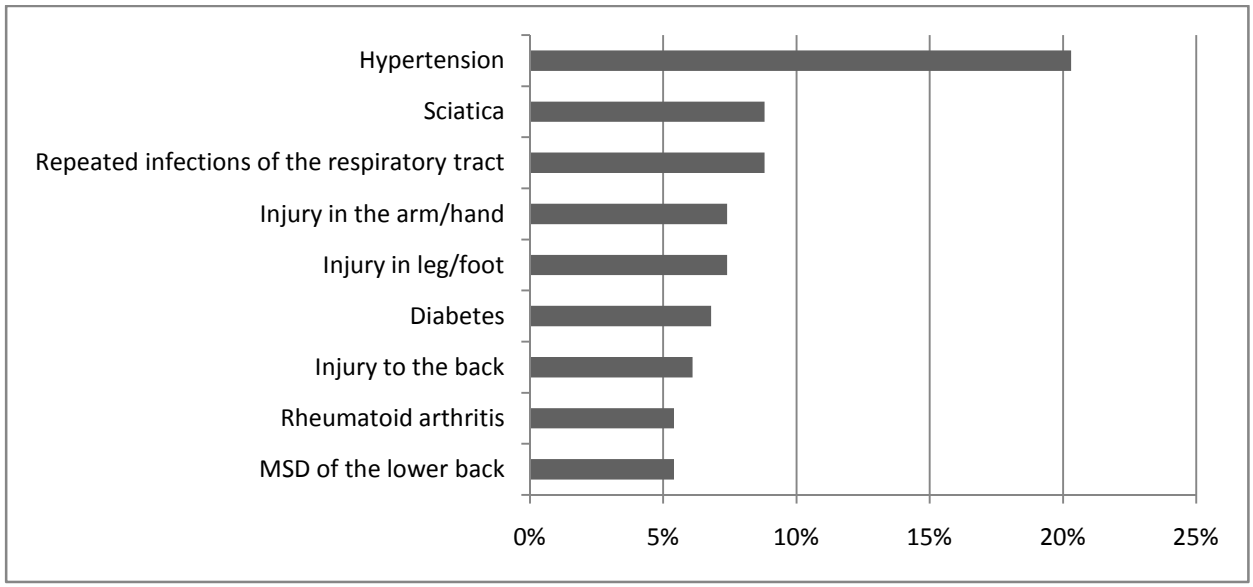



**Figure 15:** Leading diseases diagnosed by a physician, as reported by over 5% of the participating nurses (percentage of the sample) (N=144)

1% of the subjects were diagnosed with a mental disorder or severe mental health problem (such as severe depression), while 4% reported slight mental disorders, such as slight depression, anxiety, or insomnia. Regarding neurological and sensory diseases, 4% reported problems or injury to hearing; 1% had visual disease or injury; and 3% suffered from a neurological disease (such as migraine, stroke, neuralgia, or epilepsy). There were other remaining diseases, reported by some of the participants. These include allergic rash or eczema in 3% of the sample; and other forms of skin disease in another 1%. There were 3 cases (2%) of genitourinary disease, namely urinary tract infection, kidney disease, and abnormal bleeding, respectively. 1% of the sample had benign tumours, while 1% had a malignant tumour or cancer. 1% of the sample reported being anaemic. No participants reported having birth defects. The most commonly reported diseases by this sample are listed in Figure 15.

Around 12% of the participants omitted the following question of estimated work impairment due to diseases (probably due to the formatting of the question), making it the least answered question in the questionnaire. This was the forth item in the WAI. Of the responses, approximately 56% indicated that no disease was present, or that the disease did not cause any hindrances. 22% indicated that they are able to do their job, but it causes some symptoms. 16% responded that they must sometimes slow down their work or change their work methods. 5% and 1% respectively noted that because of their disease they consider themselves able to do only part-time work, or that they are in their opinion entirely unable to work. In cases where this question was the only question from the WAI omitted by a participant, this number was substituted, based on norm responses for this question, as well as on the participant's responses to other questions of the WAI. In this manner, the WAI score could be calculated for more of the respondents, hence increasing statistical power.

The fifth item of the WAI regards sick leave. Many (37%) of the participants reported having not taken any sick leave during the past 12 months. On the other hand, 45% took from 1 to 9 days of sick leave. 10% took from 10-24 days of sick leave, while

3.33% took 25-99 days of sick leave. This question was not answered by 5% of the nurses.

Own prognosis of work ability two years from now was the sixth item of the WAI. This question could have been cause for confusion amongst some of the nurses, as the researcher was asked what it meant on a few occasions. However, the responses indicated, as would be expected, that most of the nurses (71%) were relatively certain that they would be able to continue working in two years from now. 17% responded that they were not certain; and 6% indicated that they thought it unlikely that they would be able to work in two years time. 6% did not complete this question.

There were three questions posed under the title of “Mental Resources”, the final item in the WAI. Less than 5% of the sample failed to answer each of these questions. The first question asked whether the respondent had recently been able to enjoy their regular daily activities. 37% responded that they often are able to; 9% that they are able to rather often; 37% sometimes; and 1% and 3% are rather seldom and never able to respectively. The second question asks whether the respondent has recently been active and alert. Most of the nurses (55%) stated that they always are; 13% that they are rather often; 18% that they sometimes are; 1% that they are rather seldom; and 2% that they never are active and alert recently. Finally, the last question in the WAI asks the respondents whether they have recently felt themselves to be full of hope for the future. Most of the nurses (54%) answered that they have continuously; while 10% have rather often; 23% sometimes; and 1% and 2% respectively have rather seldom or never found themselves to be full of hope for the future recently. In general, for these three questions, the clinic sample tended to have more positive scores than the hospital samples. Those who ranked themselves optimally for these three questions respectively, were 45%, 56%, 73% in the clinic, 43%, 59%, 54% in the day staff at Settlers Hospital, and 30%, 50%, 63% for the night staff.

From the responses to each of the items, the cumulative WAI score was calculated for the participants. The mean WAI score for the sample of nurses was 41, which falls into

the category of good work ability. This value was similar for hospital day staff, hospital night staff, and clinic staff (with mean values of 42, 41, and 40 respectively). The minimum WAI score calculated was 30 (moderate work ability), and the maximum value was 49 (optimal work ability). As such, none of nurses fell within the poor work ability category (7-27 points). 17% of the respondents had moderate work ability scores (28-36 points); 37% had good work ability (37-43 points); and 31% had excellent work ability scores (44-49 points) (see Figure 16). The total work ability score could not be calculated for approximately 15% of the nurses.

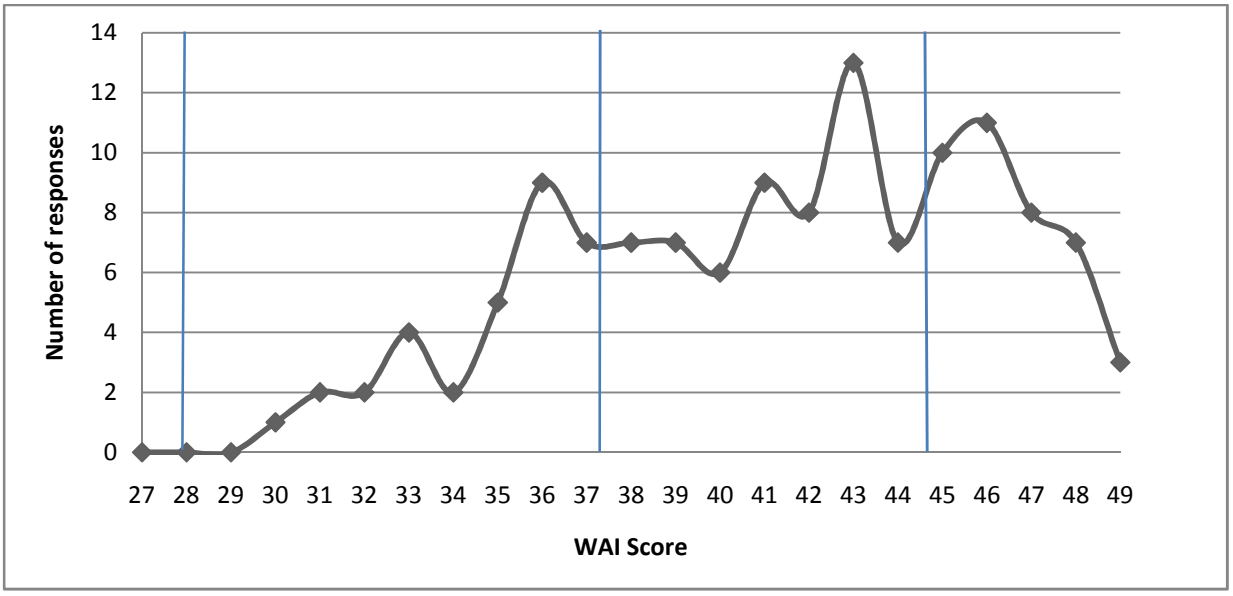



**Figure 16:** WAI score distributions of nurses in clinics and at Settlers Hospital in Grahamstown (N=129)

The WAI score was significantly related to a number of variables. It was negatively correlated with age (higher in younger people) ($r=-0.18$, $p<0.05$) and tenure (lower in those who had been working for longer) ($r=-0.20$, $p<0.05$). WAI scores were higher in males than in females ($r=-0.21$, $p<0.05$). While work ability scores were correlated with stature ($r=0.29$, $p<0.05$), they were not significantly associated with mass, BMI, waist girths, or waist-to-hip ratios. Other correlations showed WAI scores to be positively associated with house condition, access to electricity for cooking, and also satisfaction with life as a whole, with living conditions, health, as well as working conditions. Work ability was also closely linked to number of reported areas with musculoskeletal pain in

the past year (r=-0.39, p<0.05). As would be expected, the representative work ability scores were also correlated to each of the seven items from which it was comprised.

**Anthropometric Measures**

Stature and mass was measured for 97% of the sample. Three (2%) of the participants did not agree to having their stature and mass measured, and a scale and tape measure was not available for another one (0.67%) of the participants. Average stature (body height) for this sample was 1601mm (±75mm) for males and females combined, with a minimum of 1450mm, and a maximum value of 1840mm. The average height of the males was 1737mm (±77mm), and the average height for the females was 1589mm (±60mm). The average weight of the whole sample was 86.54kg (±20kg), ranging from 43.5kg to 151kg. The average weight of the females (87.32kg ±20.38kg), was higher than the average weight of the males (77.18 kg ±12.12kg) in the sample. See Table XVII.

**Table XVII:** Mean anthropometric measures for males and females in the sample (BMI = Body Mass Index, WHR = Waist-to-Hip Ratio, Standard Deviation indicated in brackets) (N=148)

| | **Stature (mm)** | **Mass (kg)** | **BMI** | **Waist Girth (cm)** | **WHR** |
|---|---|---|---|---|---|
| **Females** | 1589 (±60) | 87 (±20) | 35 (±8) | 102 (±16) | 0.89 (±0.06) |
| **Males** | 1737 (±77) | 77 (±12) | 26 (±3) | 91 (±10) | 0.84 (±0.07), |

The average Body Mass Index (BMI) for the sample was 34kg.m$^{-2}$ (±8 kg.m$^{-2}$), which is classified as obese. The lowest BMI value obtained was 18, and the highest was 57. The average female's BMI was 35, while the males' average BMI was 26. Of the sample as a whole, 3% of the nurses had BMIs below 20. 9% of the nurses had BMIs between 20 and 24.9 (normal, healthy range); 34% between 25 and 29.9 (overweight), and 62% above or equal to 30 (obese). Of those above 30, this 62% was comprised of 23% who had class I obesity (BMI: 30-34.9), 17% class II (BMI: 35-39.9), and 23% were classified as having class III obesity (BMI: ≥40), according to BMI classifications (James, 2004). See Figure 17 for an illustration of the BMI score distribution. BMI scores between the clinics and the hospitals were similar, as were the mean values for stature and mass.

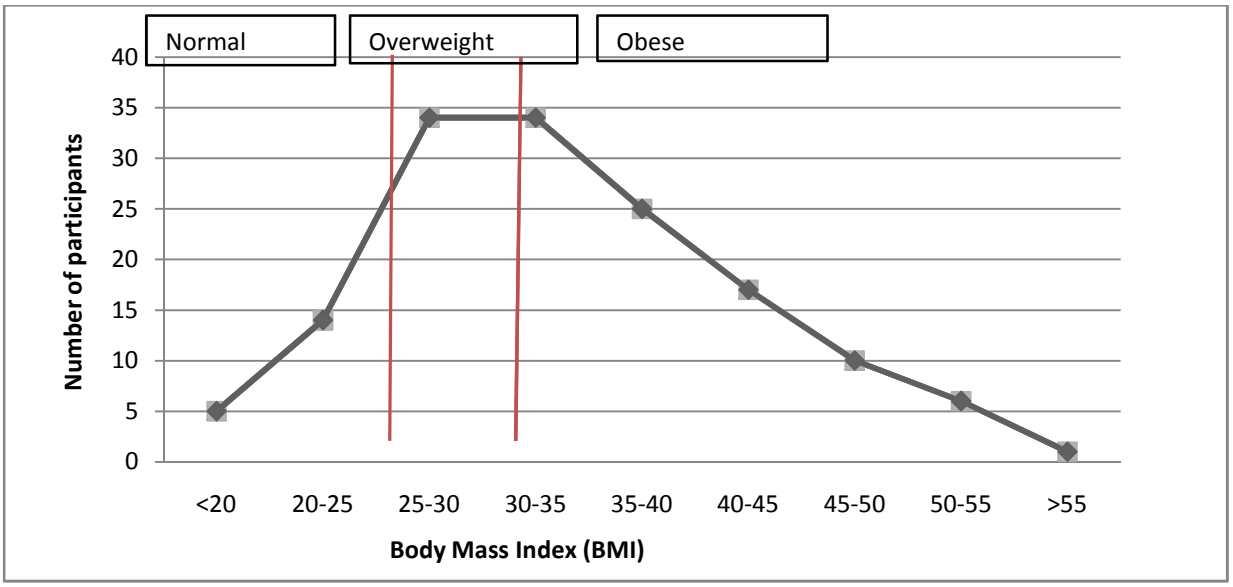



**Figure 17:** BMI score distribution of clinic and hospital nurses in the sample (N=147)

The mean waist girth for this sample was 101cm (±16cm). These values were very similar between the hospital and clinic staff. The average waist girth of females was 102cm (±16cm), while for males in the sample, it was 91cm (±10cm). These values are particularly high for the women, considering that the waist circumference cut-off points for central obesity used by the South African Demographic and Health Survey of 1998 used of ≥88cm and ≥102cm for women and men respectively (Puoane *et al.*, 2002). According to these risk classifications, 80% of the females and 8% of the males in the sample were at risk. These measures were taken over a layer of the participants' clothing, and so could have slightly elevated these results.

The waist-to-hip ratio (WHR) of participants was also calculated. For this sample, the mean WHR was seen to be 0.84 (±0.07). The average WHR for the males and females, were 0.89 (±0.06) and 0.84 (±0.07), respectively, which is above the risk zone of 0.80 for the women, yet below the risk zone of 0.95 for males (see McArde *et al.*, 2001). The lowest recorded WHR was 0.65, and the highest was 1.02, which were both for female participants. Two of the participants were pregnant at the time of the interview, and therefore their waist and WHR scores were not used, as these would not be relevant for

the purposes of these classifications. Of the females in the sample, 77% had WHRs of 0.80 or above, and 15% of the males had WHRs of above 0.95.

Mass, BMI, waist girth, and WHR were seen to be positively associated with age ($r=0.28$, $r=0.33$, $r=038$, $r=0.21$ respectively at $p<0.05$). Furthermore, BMI, waist girth, and WHR were associated with sex (higher values in females). Language, race, education, and income were also seen to be correlated with mass, BMI, and waist girth - as higher masses, BMIs, and waist girths were more common in black Africans, Xhosa speakers, and those with lower levels of education and income. These anthropometric variables were not seen to be closely linked with total energy intake or the other included dietary variables nor with type of recreational sport or exercise performed (at $p<0.05$).

**Dietary Recall**

The dietary recall information received from the nurses was analysed using FoodFinder dietary analysis software. From the data received from the programme, it was found that the mean energy intake per day for the sample as a whole was 4983kJ (±1793kJ), and was 6075kJ (±1535) for males and 4879kJ (±1786) for females. These mean energy intake values were similar for the clinic, day shift hospital workers, and night shift hospital workers (4943kJ ±1336; 5021kJ ±1698; and 4920kJ ±1693 respectively). Of the seven dietary variables listed in Table XVIII, the males had higher values for total energy, protein, fat, cholesterol, carbohydrates, and dietary fibre than the females, while females had a higher average value for total sugars. In comparison with Recommended Daily Allowances (Food and Nutrition Board, 2000), it can be seen that many values obtained from these analyses are below what would be anticipated. This may be due to short-comings in the capturing of these results.

In general, age was negatively associated with energy intake, as younger individuals had higher intakes ($r=-0.25$, $p<0.05$). Energy intake was also seen to be significantly higher in those that use electricity as their main fuel source for cooking ($r=-0.25$, $p<0.05$). Energy intake was seen to be positively correlated with the six other dietary

variables, most particularly with total protein, fat and carbohydrate, and least closely with starch and total sugars at a significance level of $p<0.05$.

**Table XVIII:** Average (±standard deviation) daily macronutrient intake of male and female participants. RDA values for age category 25-50 years according to the Food and Nutrition Board, Institute of Medicine, National Academics

| | **Females** | **RDA** | **Males** | **RDA** |
|---|---|---|---|---|
| **Total energy (kJ)** | 4879.74 (±1786,15) | 8372 | 6075.20 (±1535) | 11302 |
| **Total protein (g)** | 44.85 (±18.81) | 46 | 60.97 (±23.60) | 56 |
| **Total fat (g)** | 36.74 (±20.11) | ND | 50.96 (±20.31) | ND |
| **Cholesterol (mg)** | 153.40 (±124.93) | *** | 271.89 (±195.93) | *** |
| **Carbohydrates (g)** | 150.41 (±54.17) | 130 | 169.13 (±41.77) | 130 |
| **Total sugars (g)** | 40.77 (±26.09) | *** | 26.37 (±11.30) | *** |
| **Dietary fibre (g)** | 11.68 (±6.53) | 25** | 12.79 (±3.87) | 38** |

**refers to Adequate Intakes (AIs)

***as low as possible while consuming a nutritionally adequate diet

The values of total vitamin, mineral, elements, and amino acid intakes for each of the participants were also generated by the FoodFinder software. However, due to the nature of the dietary recall, and as only one 24 hour recall was undertaken per person, these values are unlikely to be accurate enough for a specific analysis. The participants were also not asked whether they took any dietary supplements such as pharmaceutical vitamins, which would alter the values generated.

## Smoking and Drinking

The majority of the nurses reported not smoking cigarettes or drinking alcohol. 65% of the nurses said that they never drink. 23% of the participants responded that they drink occasionally (less than one drink per month). 9% report drinking every week or fortnightly, while 2% drink about once a month. Similarly, with smoking, 85% of the nurses do not smoke, while 14% do. Of this 14%, 2% are those that smoke occasionally, while 12% smoke daily. Responses were not obtained for one participant.

Smoking and drinking habits were seen to be linked with sex ($r=-0.34$, $r=-0.33$ respectively, $p<0.05$) and smoking was correlated with race, or cultural background, ($r=-0.38$, $p<0.05$). 11% of the female nurses reported smoking, while 54% of the males in

the sample smoked (however, noting that there were 139 females, and only 13 males in the sample). Additionally, among the female sample, it was noted that 93% of the smokers (14 out of 15) were of the coloured racial grouping. Males were also seen to drink alcohol more frequently than females. While 90% of the females reported never drinking, or only drinking occasionally, this value was 54% for men. Conversely, 9% of the women, compared to 46% of the men in the sample, reported drinking monthly or weekly. The low number of males in the sample, again, may lead to imprecise conclusions. Smoking and drinking were also more prevalent in those with higher household incomes ($r=0.21$, $r=0.26$ respectively, $p<0.5$). Additionally, those who smoke, are also more likely to drink alcohol, or vice versa ($r=0.37$, $p<0.05$).

**Physical Activity**

The participants in the study were asked about the transport used to get to and home from work, as this may contribute to energy expenditure levels. Transport type was seen to be linked with age, tenure, and household income ($r=0.28$, 0.32, and 0.22 respectively, $p<0.05$). 15% of the nurses walked to and from work, 14% used contract transport, 33% used public transport (taxis) - for which they had to walk to and from the stop, 35% drive in a car, while 3% used a combination of the above. Contract transport refers to the transport which the hospital provides, and it picks the nurses up from their homes, and drops them off at work, and vice versa. As such, this option was not applicable for clinic nurses. Similar percentages of hospital and clinic nurses walked to work (17% and 14%), and used public transport (33% and 33% respectively), while a higher percentage of clinic nurses used cars to get to and from work than hospital nurses (47% and 33% respectively). Approximately 18% of the hospital nurses used contract transport. Many of the nurses that walked to work were those that lived in the nurses' residence on the hospital property, with the time taken to walk to and from the hospital usually taking around 2 to 5 minutes.

For those that walked to and from work, including those who lived on the premises, the average amount of time taken was 8¾ minutes. The average amount of time taken while driving in a car or in a taxi (private or public) was 13 minutes, ranging from 2 to 60

minutes, and driving in a car was generally quicker than driving in a taxi, as taxis need to pick up and drop off people en route. Those using public taxis had to walk in addition to this time, to or from the taxi stop, with an average of 12 minutes and a range of 1 to 40 minutes.

Participants reported the approximate amount of time they spend doing various household chores per day or per week. These tasks include those of preparing food, cooking, and washing dishes; washing clothes and ironing; cleaning their house, or fixing things around the house; doing gardening; shopping (including the time taken to get to and from the shops); as well as fetching water and feeding animals, if applicable. The amount of time the participants spent doing each of these activities per week was added together, in order to gain a unitary figure for the number of hours housework done. It is acknowledged that there may be relevant activities that are not included in this, as well as that different activities have different intensities, and some perform the same activity with more intensity than others, but this value can still be used as a useful approximation. The average amount of time participants spent on household chores was 15½ (±8) hours per week, using data of both males and females. This value was similar in males and females (15¾ and 15½ hours respectively). The minimum amount of time spent on these chores was 0 hours per week, and the maximum was 44 hours, displaying the disparity in the workload of individuals in the home situation.

The participants were additionally asked how much time they spent looking after children outside of work. About 40% of the nurses did not spend any time looking after children per week. Some (around 33%) looked after children for a few hours per week (around 1-14 hours, or on weekends); while others (approximately 22%), especially with young children, looked after them whenever they are not at work.

The participants were also asked how much time they spent performing physical exercise outside of work and besides the above-mentioned household chores. This included both recreational sports and exercises, such as going to the gym, as well as walking for both recreational as well as functional purposes. Around 43% of the

participants reported doing no exercise besides that done at work and in performing household chores. Many (around 35%) reported walking, including the time taken to walk to friends' houses, or to and from church, for example, as well as those who walk for the sake of exercise and recreation. A number (15%) of participants also did aerobic-type exercises, including that done at gym, or on fitness ergometers or treadmills, as well as exercises done at home. Around 3% report going jogging, and a further 4% performed sports including cycling, karate, soccer, rugby, and tennis. Type of exercise performed as well as kilojoules expended during exercise was correlated with stature ($r=0.25$, $r=0.23$ respectively, $p<0.05$).

The average amount of time that the participants spent watching television, and reading, was added together to generate a general unitary value for sedentary activities performed. The average amount of time spent on these activities was 18 hours per week, made up mostly of hours of watching television, with a range of 0 hours up to 53 hours per week. It is noted that some participants may perform another activity, such as cooking, while watching television, for example. Time spent watching television or reading was significantly correlated with health, job, and working condition satisfaction (although not with life and living condition satisfaction). It was also positively correlated with energy intake ($r=0.23$, $p<0.05$), although not with mass, BMI, waist girth, or WHR (at $p<0.05$).

The participants were asked how many hours of sleep they usually got per night. The night staff at the hospital were additionally asked how many hours of sleep they usually get during the days when they are working, as well as how many hours of sleep they usually get when they are not working. The mean number of hours of sleep obtained for the sample as a whole was 7.14 hours, with a minimum of 3.5 hours, and a maximum of 10 hours. For these mean calculations, the average hours of sleep for night shift workers when at work, and when not at work, were used. The mean number of hours sleep that the night shift workers got each day during the work week was 5.76 hours, ranging from 1 to 8.5 hours; while the mean number of hours sleep obtained by these nurses per night of an off-duty week was 8.10 hours, with a range of 4 to 13 hours.

## FACTOR ANALYSIS AND CANONICAL CORRELATIONS

As explained in the methodology chapter, factor analysis was performed in order to find common variance among the data. In so doing, factors are extracted which are seen to represent the associated variables. These factors may then be used as input from which canonical correlations may be calculated. Canonical correlations are used to determine the associations between sets of criterion and predictor variables.

### Factor analysis

Factor analysis was performed independently for four main categories in which the variables were placed, namely: 1) demographic or personal variables; 2) workplace considerations; 3) living conditions or lifestyle; and 4) the dependent variables of the study (Varimax normalised). Factor analysis was performed for each of these groups independently so that when canonical correlations were performed, the interaction between the independent and the dependent sets of factors could be analysed. Those variables with factor loadings of greater than 0.5 were considered to be included in the associated factor.

Based on the responses to the questions in the questionnaire, interview, anthropometric measures, as well as food data analyses, over 200 potential variables were generated. Refer to Tables XIII and XIV in Chapter 3 for a list of the variables in the study. Even prior to factor analysis, it was necessary to reduce the number of variables, by choosing the most appropriate variables for inclusion, in order for statistical analyses to be possible. All the variables considered to be "**personal or demographic variables"** (age, sex, home language, race, marital status, highest level of education, and stature) were included in the factor analysis. This data includes the inherent or background factors of individuals which are not specifically related to their living conditions or their working conditions, yet may never-the-less affect the dependant variables of this study. Two resulting factors were established from this data, accounting for 51% of the variance (see Tables XIX and XX). Factor 1 primarily accounts for the variables of language and race, while Factor 2 accounts mostly for sex, and stature of the subjects, as well as age, marital status, and highest level of education to a lesser extent.

**Table XIX:** Factor loadings for demographic and personal variables of the sample (N=152) (Varimax normalized). Extraction: Principal components (Marked loadings are > 0.50).

| | Factor 1 | Factor 2 |
|---|---|---|
| **Age** | 0.0642 | 0.5872 |
| **Sex** | -0.0952 | 0.7598 |
| **Language** | -0.9476 | -0.0179 |
| **Race** | -0.9333 | -0.0293 |
| **Marital status** | 0.0202 | 0.4125 |
| **Education** | 0.2173 | -0.2877 |
| **Stature** | -0.0231 | -0.7337 |
| **Explained variance** | 1.8305 | 1.7144 |
| **Proportion of total** | 0.2615 | 0.2449 |

**Table XX:** Eigenvalues for the two personal and demographic factors of the nursing sample. Extraction: principal components.

| Factor | Eigenvalue | % Total - variance | Cumulative - Eigenvalue | Cumulative - % |
|---|---|---|---|---|
| **1** | 1.8367 | 26.238 | 1.8367 | 26.238 |
| **2** | 1.7082 | 24.403 | 3.5449 | 50.641 |

For **"work considerations"**, the variables of 1) position at work, 2) whether the participant worked in a clinic or in the hospital, 3) the specific ward or clinic, 4) day or night shift, 5) tenure, and 6) satisfaction with working conditions, were included. It was not necessary to include the number of hours worked per week, as the vast majority of nurses worked 40 hours per week, and some were unsure of the exact mean number of hours worked. The specific sources of stress or dissatisfaction were excluded from this statistical analysis, and were used for descriptive purposes, as were the qualitative responses of best aspects of the job. Two factors were calculated from these considerations, accounting for 51% of the variance or these variables (see Tables XXI and XXII). Factor 1 primarily represents the variables of the workplace of the participants, while Factor 2 focuses the variables of tenure, as well as nursing position. Whether the nurses works during the day or the night is partially accounted for in Factor 1, while subjective satisfaction with working conditions is partially accounted for by both factors.

**Table XXI:** Factor loadings of workplace variables (Varimax normalised). Extraction: Principal components (Marked loadings are >0.50).

| | Factor 1 | Factor 2 |
|---|---|---|
| **Position** | -0.3414 | 0.6736 |
| **Clinic (1) or Hospital (2)** | 0.9361 | -0.0757 |
| **Ward or clinic** | 0.8696 | 0.0894 |
| **Day/ Night** | 0.3605 | -0.0926 |
| **Tenure** | 0.0425 | 0.7101 |
| **Satisfaction with working conditions** | 0.3281 | 0.3291 |
| **Explained variance** | 1.9886 | 1.0886 |
| **Proportion of total** | 0.3314 | 0.1814 |

**Table XXII:** Eigenvalues for workplace factors. Extraction: Principal components.

| Factor | Eigenvalue | % Total - variance | Cumulative - Eigenvalue | Cumulative - % |
|---|---|---|---|---|
| **1** | 2.0039 | 33.398 | 2.0039 | 33.398 |
| **2** | 1.0733 | 17.888 | 3.0772 | 51.286 |

**"Living conditions"**, as well as physical activity levels and dietary intake (**"lifestyle"** variables) were considered under the same grouping. Each of the variables considered in the "Living conditions" category was included for factor analysis, except for the number of people reliant on the income received. This information was found to be closely tied to the number of people residing in the household, and caused an imbalance of the proportion of variance explained for each variable in the analysis. The included variables, therefore, comprised of area of residence; type of house; roof condition; number of residents in household; main source of water; type of toilet; fuel used for lighting; fuel used for cooking; income received; number of grants received; and subjective satisfaction with living conditions.

In terms of physical activity and dietary recall data, it was necessary for relevant calculations and analyses to be performed on some of the data before the information could be included amongst the rest of the variables. Coding of variables into numbers was also necessary. For example, the areas of residence of the participants were coded from the addresses given into four main areas, namely: 1) middle-upper class Grahamstown, 2) middle-lower class Grahamstown, 3) Grahamstown East (township), and 4) outside of Grahamstown.

Mode of transport to/from work was coded into categories and included amongst the variables for factor analysis. The length of time spent getting to/from work was deemed unnecessary for statistical consideration, except in the cases where participants walked to/from work, or to/from public transport on the way to work. The estimated number of kilojoules expended per week during this walking was calculated per individual, while accounting for their body weight, based on the energy expenditure levels listed in McArdle *et al.* (2001). These values were added to the calculated number of kilojoules expended during recreational sport or exercise per week per individual, and listed amongst the variables. Type of exercise performed, if at all, was also coded and included as a further variable. The time spent performing various household chores per week was added together into a single variable score for each participant; as was the time spent watching television added to the amount of time spent reading per participant per week. A further variable listed was the amount of time spent looking after children, which was coded into categories of “never” “sometimes/occasionally” and “whenever not at work”.

Data from the 24 hour dietary recall was analysed using the FoodFinder programme, by recording each type and amount of foodstuff consumed by the individual each day. The software calculates approximately 145 dietary variables based on this analysis for each individual. These data variables, include, among many, macro-nutrients, vitamins, minerals, and amino acids, although the only food variables chosen for inclusion in the factor analysis were 1) energy, 2) total protein, 3) total fat, 4) cholesterol, 5) total sugars, 6) added sugar, and 7) total dietary fibre. Whether the participant smoked or not, was included, as was whether the participant consumed alcohol (“never” “occasionally” “monthly” or “weekly/fortnightly”.

**Table XXIII:** Factor loadings for the lifestyle and living condition variables in the study (N=152). Extraction: Principal components (Marked loadings are >0.50).

| | Factor 1 | Factor 2 | Factor 3 | Factor 4 | Factor 5 |
|---|---|---|---|---|---|
| **Area** | 0.0340 | 0.1879 | -0.0027 | 0.6029 | -0.1405 |
| **Type of house** | 0.1099 | -0.2103 | -0.1539 | 0.2567 | 0.3303 |
| **Roof condition** | 0.1597 | 0.2869 | -0.3247 | -0.4284 | 0.1155 |
| **Number of residents** | -0.0235 | -0.1130 | 0.6464 | -0.1172 | -0.0478 |
| **Water** | -0.0212 | 0.1548 | -0.0344 | 0.2615 | 0.1617 |
| **Toilet** | -0.1335 | 0.1317 | -0.1484 | 0.1264 | -0.2461 |
| **Lighting** | -0.0396 | 0.0782 | 0.5653 | 0.0171 | 0.2176 |
| **Cooking** | -0.2379 | 0.0807 | 0.5818 | 0.0226 | 0.0927 |
| **Income** | 0.0400 | -0.2333 | 0.0446 | -0.6783 | -0.1618 |
| **Number of grants** | 0.2717 | -0.0887 | 0.2478 | 0.3345 | 0.0918 |
| **Satisfaction with living conditions** | -0.0097 | 0.0501 | -0.2918 | -0.5182 | 0.1338 |
| **Smoking** | 0.2123 | -0.5609 | 0.1377 | -0.3423 | -0.0484 |
| **Drinking** | 0.0908 | -0.6658 | -0.0649 | -0.0852 | -0.0802 |
| **Hours sleep** | 0.0474 | -0.0314 | -0.2097 | -0.0593 | 0.1414 |
| **Transport type** | 0.0503 | 0.2998 | 0.2933 | -0.5845 | -0.0329 |
| **Housework (hours per week)** | 0.1559 | 0.2994 | 0.2828 | -0.0319 | 0.0760 |
| **Look after children** | 0.0438 | 0.0539 | 0.5676 | 0.0369 | -0.0439 |
| **Exercise** | -0.0494 | 0.1135 | 0.0671 | -0.1145 | 0.7318 |
| **kJ expended during exercise/walking each week** | 0.0262 | 0.1739 | 0.0024 | 0.1903 | 0.7866 |
| **TV/reading (hours per week)** | 0.2597 | -0.3404 | -0.2038 | 0.1801 | -0.0659 |
| **Energy intake (kJ)** | 0.9704 | 0.0218 | -0.0935 | -0.0305 | 0.0032 |
| **Total protein (g)** | 0.8604 | -0.1377 | -0.0199 | -0.0146 | 0.0219 |
| **Total fat (g)** | 0.8265 | -0.1830 | -0.0609 | -0.1398 | 0.0789 |
| **Cholesterol (mg)** | 0.6002 | -0.1611 | 0.0039 | 0.0049 | 0.2299 |
| **Carbohydrate (g)** | 0.8411 | 0.208353 | -0.112410 | 0.0491 | -0.0609 |
| **Total sugar (g)** | 0.4073 | 0.416582 | 0.123358 | -0.0281 | -0.1187 |
| **Total dietary fibre (g)** | 0.5020 | 0.428075 | -0.104859 | 0.1066 | -0.0743 |
| **Explained variance** | 4.1968 | 1.872769 | 2.029739 | 2.1413 | 1.6186 |
| **Proportion of total** | 0.1554 | 0.069362 | 0.075176 | 0.0793 | 0.0600 |

From the resulting 27 variables of living condition and lifestyle data, 5 factors were extracted, with 44% of the variance being explained (see Tables XXIII and XXIV). Factor 1 was seen to represent the variables associated with diet. Factor 2 represents the smoking and drinking habits of the participants, as well as the variables of time spent watching television and reading, and time spent doing housework to a lesser extent. Factor 3 represents the variables of number of residents in the house, main

source of fuel for lighting and cooking, and time spent looking after children. Factor 4 mostly incorporates the variables of area of residence, level of income, type of transport used, and subjective satisfaction with living conditions. It was also the factor with the highest loadings for number of grants received, roof condition, and type of access to water at home, compared to the other factors. Finally, Factor 5 represents the aspects of type of exercise and energy expenditure, as well as housing type, and sanitation facilities, to a lesser extent.

**Table XXIV:** Eigenvalues for lifestyle and living condition factors. Extraction: Principal components.

| Factor | Eigenvalue | % Total - variance | Cumulative - Eigenvalue | Cumulative - % |
|---|---|---|---|---|
| **1** | 4.2667 | 15.8024 | 4.2667 | 15.8025 |
| **2** | 2.3136 | 8.5687 | 6.5802 | 24.3712 |
| **3** | 2.0471 | 7.5820 | 8.6274 | 31.9532 |
| **4** | 1.7123 | 6.3419 | 10.3397 | 38.2951 |
| **5** | 1.5196 | 5.6283 | 11.8593 | 43.9233 |

In terms of **dependent variables**, 10 eventual variables were included for factor analysis. Anthropometric measures were considered to be dependant variables, as they depend on lifestyle factors such as diet and physical activity levels, as well as being health indicators. Included variables of these measures were mass, BMI, waist girth, and waist-to-hip ratio (WHR). BMI grants a basic indication of obesity, while waist girth and WHR (calculated using waist and hip girth measures) grant an indication of regions of adiposity, associated with various cardiovascular conditions. Satisfaction ratings are intended to grant a general indication of the levels of well-being of each of the participants. These satisfaction ratings include those of satisfaction with life as a whole (general satisfaction), health satisfaction (which may, or may not, be linked to objective levels of health), job satisfaction, and the associated intent to leave nursing.

A simplified version of the Nordic questionnaire was included in the questionnaire given to the participants. In terms of complex statistical procedures, it was decided that inclusion only of the number of areas in the body that have been sources of musculoskeletal ache, pain, or discomfort in the past year, would be sufficient. The

specific areas of musculoskeletal stress, as well as whether the trouble has interfered with daily activities in the past year, or caused trouble in the past week, would be reserved for descriptive purposes. Finally, with regards to the Work Ability Index (WAI), the total WAI score was included in the factor analysis. Each of the questions comprising the WAI, as well as which of the 51 listed diseases reported by each of the participants, were retained for a more detailed descriptive analysis.

**Table XXV:** Factor loadings for the dependent or health-related variables of the study (Varimax normalised). Extraction: Principal components (Marked loadings are >0.50).

| | **Factor 1** | **Factor 2** | **Factor 3** |
|---|---|---|---|
| **Life satisfaction** | -0.1331 | 0.8079 | 0.0941 |
| **Health satisfaction** | 0.0054 | 0.5542 | 0.4564 |
| **Job satisfaction** | 0.0180 | 0.8488 | 0.0213 |
| **Intent to leave** | -0.4075 | -0.2670 | -0.2174 |
| **Number of MSDs** | 0.0031 | -0.0565 | -0.7279 |
| **WAI score** | -0.0644 | 0.1766 | 0.7848 |
| **Mass** | 0.9417 | -0.1035 | 0.0564 |
| **BMI** | 0.9180 | -0.1597 | -0.0081 |
| **Waist girth** | 0.9505 | -0.0963 | -0.1748 |
| **WHR** | 0.4384 | 0.1414 | -0.3111 |
| **Explained variance** | 3.0136 | 1.8514 | 1.5412 |
| **Proportion of total** | 0.3014 | 0.1851 | 0.1541 |

**Table XXVI:** Eigenvalues for the dependent or health-related, factors of the study. Extraction: Principal components.

| **Factor** | **Eigenvalue** | **% Total - variance** | **Cumulative - Eigenvalue** | **Cumulative - %** |
|---|---|---|---|---|
| **1** | 3.1536 | 31.5356 | 3.1536 | 31.5355 |
| **2** | 2.1311 | 21.3113 | 5.2847 | 52.8468 |
| **3** | 1.1216 | 11.2156 | 6.4062 | 64.0624 |

Three factors were extracted from the dependant variables (the health-, well-being-, and work ability-related variables), and these factors accounted for 64% of the variables' variance (see Tables XXV and XXVI). Factor 1 was mostly comprised of the anthropometric variables. Factor 2 was comprised predominantly of the life, health, and job satisfaction variables; while Factor 3 chiefly represented the number of MSDs and work ability.

## Canonical Correlation

There were 12 resulting factors that were extracted from the variables included in the factor analysis procedure. Nine of these factors were independent, while three were dependent factors (see Figure 18). These factors, for each participant, were used as input in STATISTICA (Version 8) software, as data from which canonical correlations could be calculated. Ideally, there should be at least 20 times the number of participants as the number of included factors (STATISTICA Electronic Manual, 2008). However it was not possible in this case to reduce the number of factors any further without losing valuable information, and for practical reasons it would not have been possible to obtain many more than 152 participants.

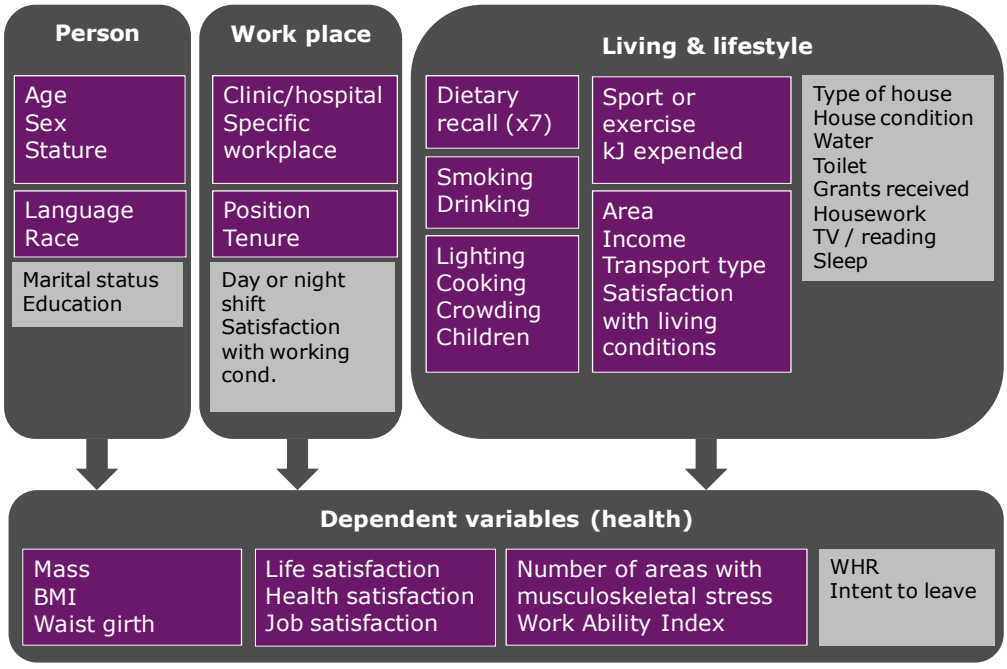



**Figure 18:** Factors extracted for the categories of demographics, living conditions and lifestyle, workplace considerations, and health and wellbeing. The variables in the lightly shaded boxes indicate the variables that were not included in the factor (factor loadings <0.50).

Three roots were extracted when the abovementioned factors were used as input for the canonical correlation. These roots, or eigenvalues, can be interpreted as the proportion of variance accounted for by the correlation between the respective canonical variates (STATISTICA Electronic Manual, 2008). The eigenvalues for the

three roots obtained from this data were 34%, 24%, and 10% respectively. All (100%) of the variance for the dependent variables was extracted, while only 39% of variance for in the left set (independent variables) was extracted (see Table XXVII). Of this 39% of variance, 17% was accounted for by the first root, 10% for the second root, and 12% by the third root of the left set. The variance for the right set was made up almost equally by each of the roots (34%, 35%, and 31% respectively).

**Table XXVII:** Canonical analysis summary. Canonical R: 0.58125; $Chi^2(27)=114.89$; p=0.0000 .

| | **Left Set (Predictor)** | **Right Set (Criterion)** |
|---|---|---|
| **Number of variables** | 9 | 3 |
| **Variance extracted** | 38.7818% | 100.000% |
| **Total redundancy** | 9.2248% | 23.0451% |
| **Variables: 1** | Demographic Factor 1 | Health Factor 1 |
| **2** | Demographic Factor 2 | Health Factor 2 |
| **3** | Living Condition Factor 1 | Health Factor 3 |
| **4** | Living Condition Factor 2 | |
| **5** | Living Condition Factor 3 | |
| **6** | Living Condition Factor 4 | |
| **7** | Living Condition Factor 5 | |
| **8** | Work-Related Factor 1 | |
| **9** | Work-Related Factor 2 | |

In looking more closely at the correlations between the independent and dependent factors, one can also work out the direction of the correlation between the variables. In order to do this, it is important to consider the direction of the values for the variables in factor analysis, as well as the direction of the relationship in the canonical correlation.

In the first root, the second dependant factor (life, health, and job satisfaction) had the greatest factor loadings. This corresponded with the factors of 1) language and race; 2) area of residence, income, transport type, and satisfaction with living conditions; and with 3) position, and tenure. As such, greater satisfaction levels were associated with the white, English speaking group, or less with black Africans and Xhosa speakers. Those with higher socioeconomic statuses, in terms of area of residence, income, transport type, as well as those with higher satisfaction with their living conditions, had higher life, job, and health satisfaction. Additionally, higher health, life, and job

satisfaction levels were found in those with higher position and tenure. All of these variables are seen to relate to each other, as those in previously favoured (or less disadvantaged) racial groups, and those with higher position and tenure, are seen to be those with higher income or socio-economic statuses.

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**Table XXVIII:** Factor structure for the criterion (right set) and predictor (left set) variables for each root

| | **Root 1** | **Root 2** | **Root 3** |
|---|---|---|---|
| **Factor Structure, left set** | | | |
| **Demographic Factor 1** | 0.5373 | -0.5927 | -0.1221 |
| **Demographic Factor 2** | -0.4760 | 0.1609 | -0.5736 |
| **Living Factor 1** | 0.2842 | 0.0368 | 0.1659 |
| **Living Factor 2** | -0.1525 | 0.6007 | 0.0613 |
| **Living Factor 3** | -0.4019 | -0.3028 | -0.3175 |
| **Living Factor 4** | -0.6402 | -0.1542 | 0.0993 |
| **Living Factor 5** | 0.1194 | 0.0647 | 0.0694 |
| **Working Factor 1** | 0.1760 | -0.0560 | -0.2105 |
| **Working Factor 2** | 0.5215 | 0.0019 | -0.7650 |
| **Factor Structure, right set** | | | |
| **Health Factor 1** | -0.3337 | 0.7647 | -0.5513 |
| **Health Factor 2** | 0.9282 | 0.1356 | -0.3466 |
| **Health Factor 3** | 0.1916 | 0.6782 | 0.7094 |

**Table XXIX:** Variables included in each of the associated factors in the canonical correlation procedures. (-) or (+) refer to the direction of the relationship of the variables.

| **Root** | **Predictor Factors** | **Criterion Factors** |
|---|---|---|
| **1** | • Language and race (-)<br>• Area, income, transport type, satisfaction with living conditions (+)<br>• Position and tenure (+) | • Life, health and job satisfaction (+) |
| **2** | • Language and race (+)<br>• Smoking and drinking (-) | • Mass, BMI, waist girth (+)<br>• Number of MSDs (-) and WAI score (+) |
| **3** | • Age, sex and stature (+)<br>• Position and tenure (-) | • Mass, BMI, waist girth (-)<br>• Number of MSDs (-) and WAI score (+) |

Factors from each of the original categories of demographic factors, living conditions, and working conditions, were seen to correspond with the dependant variables. As such, these factors are fundamentally linked (common variance), and hence it would not have make sense to calculate the canonical correlation with each of these factors

independently with the dependant factors. See Table XXVIII for the factor structure of the left (independent) and right (dependent) sets, and Table XXIX for a breakdown of the variables associated with each factor.

For the second root, the dependant factors of both the anthropometric variables, as well as of the number of MSDs and the WAI score, had the highest loadings. These factors correlated with the independent factors of 1) language and race, and 2) smoking and drinking habits, and time spent on sedentary activities. Therefore, there was an association of those with greater anthropometrics (higher levels of obesity), fewer MSDs and greater work ability (better health), with black, Xhosa speaking Africans, and with those who smoke and drink infrequently, and who spend less time on sedentary activities. It makes sense that these independent variables were linked, as it was noted that the black, Xhosa-speaking participants tended to have higher BMIs, masses, and waist girths than the other racial groups, as well as lower levels of smoking and drinking. It is interesting to note that these individuals were seen to have fewer MSDs and better work ability, as usually higher levels of obesity and central adiposity are associated with higher levels of disease and poor health.

The third, and final, root primarily represented the dependant factor of number of MSDs and WAI score, while also representing anthropometric variables. These correlated with the highest loadings on the independent variables of 1) age, sex, stature, and 2) position and tenure. As such, the males, younger, and taller individuals, as well as those with lower position and tenure, generally had lower BMIs, masses, and waist girths, and this was associated with better levels of health according to MSD and WAI score indicators.

It was apparent that some of the independent factors were not seen to be correlated with the dependent factors. Such factors include those of 1) diet, 2) number of residents in household, main source of fuel for cooking and lighting, and time spent looking after children, 3) type of exercise, and energy expended during exercise per week, as well as, 4) workplace.

# CHAPTER 5: DISCUSSION

## BASIC FINDINGS

### Demographics

The age, sex, and race distributions in the sample are comparable to those cited in Hall (2004) regarding the nursing workforce in South Africa. Regarding sex, 92% of this sample were female, and 8% male, which compares with the respective numbers of 93% and 6% in South Africa in general (percentages may not add up to 100 due to rounding). This is not surprising, as nursing worldwide is seen to be a predominantly female profession. This factor has ergonomic importance, as females are generally shorter, lighter, and physically weaker, than their male counterparts. Equipment and tasks should therefore be designed and modified accordingly. Psychosocial factors should also be considered, as females are typically seen to have differing social and familial roles, which in turn may interact with work demands and responses (Jafry and O'Neill (2000).

The mean age category for the participants in this study was 41-50 years. More specifically, 14% were under 30 years, 21% were between 31 and 40 years, 39% were between 41 and 50 years, while 25% were 51 years and older. In comparison to this, respective values of 16%, 38%, 33%, and 14% were reported for South African nurses as a whole (Hall, 2004). It can therefore be seen that there were more nurses in the older age categories in this study than in the general South African nursing population. Chui *et al.* (2007) report the average age of employed nurses in UK and Germany to be 41 and 39 years respectively, and 31 years for the Taiwanese nurses in their study. Of these Taiwanese nurses, only 8% were older than 40 years. The relatively older nurses in the current study could be a positive indication of health and work ability. This is because health and work ability detriments are often associated with increasing age, along with early retirement, for example. The older mean ages of nurses in the current study could also potentially be due to the "healthy worker effect" as younger nurses may

leave nursing in pursuit of other professions, while the relatively older nurses who are able to cope with the work demands, remain in the job.

When looking at the differences in the age distribution curve between workplaces, it was seen that clinic nurses had higher percentages of nurses working in the oldest (>61 years) age category, than hospital staff. This may be due to the less physically strenuous nature of the work in the clinics, or also due to nurses in retirement being called back to work on contract, for increased pay. Furthermore, there were much lower percentages of night staff in the younger (21-30 years) and oldest (>61 years) age categories, than the day staff. This seems to indicate that those who are either just starting in nursing, or approaching retirement, are not willing or able to work night shift work. This may be due to the mental as well as physical demands that night work imposes compared to work during the day. Social factors, such as co-ordinating time to take care of young children at home, or family responsibility, may also play a role.

In terms of race, in this study 70% were black Africans, 22% were coloured, and 7% white; while Hall (2004) reports that 70% of the entire South African nursing population is African, 11% coloured, 5% Indian, and 14% white. Although these values are comparable, regional factors may also have a role to play in these racial distributions. Hall and Erasmus (2003) report on racial distributions of practicing nurses in the public health sector of South Africa, for which 78% are black Africans, 13% are coloured, 7% white, and 2% Indian, which shows a slightly higher discrepancy from the current study's data, which also looks at nurses in the public sector. According to the 2001 census, approximately 79% of the South African population as a whole are African, 9.5% are White, 9% are Coloured, and 2.5% are Indian or Asian (Statistics South Africa, 2004). As such, the nursing workforce appears to show a general reflection of the racial demographics of the South African population as a whole.

It was evident, however, that the racial proportions were unequal when considering those working in the municipal clinics versus those working in the hospital. There were no whites working in the clinics, 13% coloureds, and 87% black Africans; while in the

hospital 66% were African, 29% were coloured, and 6% were white. This could, in a large part be due to the location of the municipal clinics compared to the hospital. The majority of the clinics are located in township areas (residence predominantly of black Africans), while the hospital is in town (home to a mix of races). People may tend to work nearer to where they live, and language and cultural differences in the general clientele of the workplaces may also play a role in this.

The language of the nurses were seen to reflect racial groupings, as most of the nurses were Xhosa speaking (65%), fewer were Afrikaans (25%), and still fewer were English (5%) speaking. According to observations, most of the black Africans in the sample were Xhosa speaking, most of the coloureds were Afrikaans speaking, and the white participants were generally either English or Afrikaans. According to the South African census, 8% of the population speak English, 13% Afrikaans, and 78% speak one of the other 11 official languages in South Africa at a first language (Statistics South Africa, 2004).

In this regard, it is also noteworthy that all of the participants chose to fill in the questionnaire in English, despite having other first languages at home. Some participants said that English is the language that they are accustomed to using in the work environment, and that is why they would prefer the English questionnaire. It seems, according to this, that English appears to be the dominant language of communication in the healthcare system. Additionally, the majority of the education systems in South Africa appear to use the English medium in which to teach or study, and hence many individuals are more confident reading and in writing in English compared to other home languages. None of the nurses showed any objection, either, to having the interview conducted in English, and as such translators were not required. Differences in understanding of the questions could potentially have been caused by language differences, and as such exaggerate the effects of language and race on the health and well-being of the participants.

**Workplace considerations**

The South African Nursing Council register (2001) reports that 49.5% of nurses in South Africa are Nursing Professionals, 41% are Enrolled (Staff) Nurses and Nursing Auxiliaries, while 9.5% are students. While the current study did not investigate student nurses, 51% of the participants were Professional Nurses (including nurses managers), and 48% were Staff Nurses or Nursing Assistants, when excluding the caregivers in the sample. The ratio between nursing positions was also seen to differ between clinics and hospitals, as the clinics had a higher proportion of Professional Nurses to Staff Nurses and Nursing Assistants compared to the hospital. Care-givers were seen to work in the clinics as well as the wards in the hospital; however, the numbers of these were not quantified for the purposes of this project.

Regarding tenure, it was evident that 28% of the participants had been in nursing for less than 5 years, while there was a steep decline in nurses who had been in nursing for categories above 5 years. This could possibly be due to a high number of new recruits, yet it could also display a high drop-out rate of those starting in nursing, and then pursuing alternate career or job courses. The distribution curve of those working from 5 to over 35 years generally reflects the age distribution curve of nurses from 21 to over 61 years of age, as there are more nurses in the age category of 41-50 years compared to the other age categories, and who had been working for 20-24 years.

Job satisfaction is seen to be a determinant of nursing performance, quality of care, and cost containment (Keuter *et al.*, 2000). Furthermore, job satisfaction and work stress are major contributing factors to intent to leave and turnover rates in nursing (Coomber and Barriball, 2007). In the sample, 40% and 13% reported being satisfied or very satisfied with their jobs, respectively, while 12% were neither satisfied nor dissatisfied, 19% were dissatisfied, and 9% were very dissatisfied. These job satisfaction levels were correlated with intent to leave in this sample ($r=0.23$, $p<0.05$).

Job satisfaction in nurses may be influenced by a variety of factors. These include changes in the organisational climate or the work environment, as well as demands

from patients, perceived job image, levels of job enrichment, professional recognition, personal growth opportunities or promotional opportunities, workload, dissatisfaction with work hazards, relationships with co-workers and medical staff, autonomy, leadership styles, time for patient care, and family support and religion (Keuter *et al.*, 2000; Coomber and Barriball, 2007; Tzeng, 2002). Furthermore, high levels of strain are placed on healthcare workers due to the global shortage on nurses and adds to the workloads faced. High emotional exhaustion and greater job dissatisfaction in nurses is found to be associated with patient-to-nurse ratios (Aiken *et al.*, 2002). Inadequate working conditions, low wages, lack of resources to work effectively, limited career opportunities, and educational opportunities are factors driving nurse migration (Sveinsdottir *et al.*, 2006). Sveinsdottir *et al.* (2006) also state that occupational stress among nurses is associated with a variety of personal and institutional factors, such as the physical environment, workload, personal responsibility, role conflicts, work relationships, the home/work interface, work experience, and education, in addition to the organisational structure and management attributes.

Participants were asked to indicate three aspects which caused the most stress or dissatisfaction at work, from a predefined list of 14 variables. This was in order to give insight into the work conditions of the nurses. Salary or pay, and high workload or time pressure, were the most commonly cited reasons for stress and dissatisfaction at work in this sample, being indicated by 60% and 56% of the nurses respectively. Demands from patients was indicated by 29% of the participants, while risk of contracting or living with HIV/AIDS by 23%. Mental or emotional strain, opportunities for promotion or personal growth, relationships with superiors, lack of equipment or supplies, professional recognition, the work environment, work organisation or management, and balancing work demands were further aspects considered in this list, and were noted as among the highest three sources of stress or dissatisfaction by between 10% and 20% of the participants. Physical strain, and relationships with staff members were seen to be the least common causes for stress and dissatisfaction in this sample, with less than 10% indicating these as a problem.

Coomber and Barriball (2007) notes that the importance of salary or pay to nurses is related to culture, and that it is difficult to determine without a detailed knowledge of the wider social and economic climate in which it functions. Zelnick and O'Donnell (2005) reports that in the South African context, low salaries are commonly viewed as the primary reason for nurses seeking work overseas. This may be because of perceived inequality of pay with high workloads and levels of responsibility, as well as compared to other occupations (Cowin, 2002; Fletcher, 2001).

High workload due to understaffing is evident globally, and hence it was not surprising that the sample cited high workload and time pressure as causes for stress and dissatisfaction at work. Additionally, the Eastern Cape province of South Africa has lower nurse to population ratios than other provinces in the country, and the public healthcare sector, for which the nurses in this study work, have lower ratios than the private sector in general (Hall and Erasmus, 2003). The high workload of nurses is related to the consideration of demands from patients, which was indicated as a main source of stress by 29% of the respondents.

Hall and Erasmus (2003) noted that healthcare workers in the public sector experience high levels of tension due to general staff shortages, unhygienic conditions, poor or outdated equipment, poor remuneration, and long shifts, while HIV/AIDS has also added to the physical and emotional demands of healthcare workers in South Africa. Much of the care South African nurses provide is focused on taking care of those infected with HIV/AIDS (Hall, 2004). The HIV/AIDS epidemic has impacted nurses in terms of increased workloads, exposure to infection, and stressed morale (Hall, 2004).

As such it was evident that sources of stress and dissatisfaction in this sample included factors unique to the country of study. Therefore, it is likely to be beneficial to consider local challenges, in addition to global ones, when looking at sources of stress and dissatisfaction, and possible intervention strategies in workplaces.

The question of how often the participants thought about leaving nursing was asked to grant an indication of intent to leave. Most of the nurses in the sample (58%) did not consider leaving nursing. 23% thought about leaving nursing sometimes per year, 10% thought about it sometimes per month, 1% sometimes per week, and 4% thought about it sometimes per day. In a study by Aiken *et al.* (2001), it was found that more than three in ten nurses in England and Scotland, and more than two in ten in the United States were planning to leave nursing within the following year. Aiken *et al.* (2001) further found that the percentages of nurses planning to leave their jobs in the following year, were found to be higher for those under 30 years of age than the general population, in all five countries surveyed. This finding may provide insight into the high number of nurses that had been in nursing for fewer than 5 years in the current study's sample, than those that had been in nursing for longer, as many may leave nursing before they had been in the profession very long. Additionally, it was found that for the current sample, age was negatively correlated with intent to leave ($r=-0.20$, $p<0.05$). Hence, those that were younger showed greater intention to leave nursing than those who were older. This finding was not completely expected, as it was thought that those approaching retirement would show more intent to leave than the younger nurses. However, perhaps those who had been in nursing longer had learnt to cope with the pain and stress of working nursing work. Additionally, younger nurses may have other demands, such as looking after young children at home.

Workplace was seen to be correlated with physical and mental work ability, with those working in the hospital having higher scores than those working in clinics ($r=0.32$ and $r=0.39$ respectively, $p<0.05$). Simultaneously, according to basic correlations, those in the clinic reported higher levels of stress or dissatisfaction due to demands from patients, and due to the work environment, than those in the hospital ($r=-0.34$ and $r=-0.25$ respectively, $p<0.05$).

Regarding day versus night shift work, a few low correlations were evident, including higher numbers of MSDs in the ankles or feet in night staff ($r=0.23$, $p<0.05$), greater stress or dissatisfaction due to HIV/AIDS ($r=0.26$, $p<0.05$), and higher instances of

mental health disorders ($r=0.27$, $p<0.05$) in night staff. Night shift work can influence workers' eating and sleeping patterns as well as their family and social life (Ahasan, 2002). A lack of tolerance to shift work may result in a general malaise, accumulated fatigue, and loss of harmony in circadian rhythm as well as digestive and neurological problems (Ahasan, 2002). Ahasan (2002) also notes that human adaptation to shift work is additionally influenced by individuals' cognitive, psychosocial, economic and cultural characteristics.

**Living conditions and income**

When it comes to living conditions, 65% of the participants lived in formal brick houses (or 71%, if including RDP housing), and 25% in flats, townhouses, or cottages. In comparison with this, data from the South African Census reveals that 56% of South Africans reside in free-standing (formal brick) houses, and about 13% in flats, townhouses, or cottages (Statistics South Africa, 2004). Black Africans are more likely to live in traditional dwellings or shacks than other racial groupings (Statistics South Africa, 2004). Only 2% and 1% of the sample reported living in traditional housing and informal housing or shacks respectively, compared to the higher levels of 15% and 16% in the whole population. Those living in shacks (informal housing) are often those who are unemployed, and this is associated with poverty. As inequality and type of housing are closely linked, it appears that this sample were among higher income groups than the majority of the South African population (Ngwane *et al.*, 2002).

Around 45% of the sample lived in Grahamstown East (township area), 31% in central Grahamstown, 13% in Grahamstown West (upper-middle class), and 10% outside of Grahamstown. Møller reports that around 72% of Grahamstown East residents live in brick or cement block houses, 16% in traditional houses, and in 12% informally built structures. Traditional and informal houses are rare in western and central Grahamstown. Regarding housing quality, Møller (2008) records that 51% of the houses surveyed in Grahamstown East reported that the roof of their house leaked in the past year, compared to 29% in the current sample.

The mode for the number of people residing per represented household in the sample was 4. 34% had from 1 to 3 people in their household, 58% from 4 to 6 people, and 7% lived in a house with 7 or more residents. Møller (2008) reports that the average household size in Grahamstown East was 4 people, ranging from 1 to 17, while Alebiosu (2005) reported that 60% of township dwellers in the sample came from a family of 4 to 6 members. Motloung and Mears (2002) report that the size of South African households can contribute to the level of poverty, due to the high dependency ratio. The number of people reliant on income generated from the household, in the current study, was seen to generally reflect the number of people residing in the household, as 34%, 52% and 12% used this income for 1-3 people, 4-6 people, and 7 or more people, respectively. However, there was a slightly higher number of people relying on the income received by the household, than those living in the household.

In terms of water supply, 74% of the participants had piped water inside their houses, and 21% in their yards, while 32% and 29% of the population as a whole had such access respectively. Møller (2008) reported that 83% of Grahamstown East residents had access to piped water on site or within the dwelling. Problems associated with communal water schemes include the risk of disease transmission (Thomas *et al.*, 2002). Only 4% of the participants obtained water from a communal stand, compared to 23% of the whole population (Statistics South Africa, 2004). This would provide another cue to the economic status of the study sample. Furthermore, while 95% of the participating nurses used flush toilets at home, this was only the case for 54% of South Africans when the census was taken in 2001, and for 64% of Grahamstown East residents in 2007. It is also noted that 95% and 88% of the sample used electricity as the primary source of fuel for lighting and cooking respectively, while this was only the case in 70% and 51% of South Africans as a whole. Grahamstown East access to electricity was 83% (Møller, 2008). Access to such amenities could, however, have changed to some degree since the census was taken.

It therefore appears that the participants in this sample have better living conditions in terms of housing and access to amenities than the average South African. Clearly,

100% of the sample in this study were employed, which is not the case of the whole South African population, as it is shown that only 34% of the population aged 15-65 years are employed (Statistics South Africa, 2004). The Makana IDP (2008) states that 42% of the population in the Makana Municipality, in which Grahamstown is located, were not economically active. Employment is likely to bring along with it an improved standard of living. This may, additionally, be associated with educational level. According to the census, 18% of the South African population had received no schooling, 6% had completed primary school, 20% had completed secondary school (Grade 12) as their highest level of education, and 8% had some form of tertiary education (Statistics South Africa, 2004). Meanwhile, about 5% of the present study's sample had Grade 12 as the highest level of education received, while the rest had received some form of tertiary education.

Average household income noted by participants of this study was between R5001 and R10000 per month, which was the case in 50% of respondents. 23% had incomes below this, and 26% above. Social grants were received by 35% of households represented by the sample, compared to 51% of households in Makana, and 64% in Eastern Cape (Makana IDP, 2008). Møller (2008) also reported that 44% of Grahamstown East residents received child support grants, and 29% received old-age pensions. 16% of individuals across South Africa are reported to receive some form of grant (Department of Health, 2004). It was seen that the number of social grants received was positively associated with the number of residents per household ($r=0.27$, $p<0.05$), as well as negatively associated with position at work and level of income ($r=-0.21$ and $r=-0.18$ respectively, $p<0.05$). As such those households with lower incomes are more likely to receive social grants than those with higher incomes. Møller (2008) reports the average income of Grahamstown East residents to be R1100, and although only about half of the participants reside in Grahamstown East, it is likely that the respondents were in the upper income bracket of township dwellers. Additionally, the participants would be amongst the 35% of Grahamstown East households who receive income from regular jobs (Møller, 2008).

**Levels of subjective satisfaction**

Levels of subjective satisfaction were measured in order to gain an understanding the well-being of participants. The modal value of satisfaction for each of the responses for life, health, job, living condition, and working condition satisfaction was that of satisfaction. It was also seen that these responses were related to each other at a significance level of $p<0.05$, and as such, satisfaction (or dissatisfaction) in each of these areas is associated with satisfaction levels in each of the other areas. This could be because each of these factors influence the others. Personality traits, as well as mood of respondents while filling in the questionnaire, could also have influenced the general responses to these questions. Life satisfaction was seen to be more highly correlated with satisfaction with living conditions ($r=0.77$, $p<0.05$), than the other satisfaction ratings, although it was also closely correlated with job satisfaction ($r=0.51$, $p<0.05$). Job satisfaction was seen to be closely correlated with satisfaction with working conditions ($r=0.58$, $p<0.05$). Intent to leave nursing was not correlated with life, living condition, or health satisfaction, but was negatively correlated with job satisfaction and satisfaction with working conditions ($r=-0.23$ and $r=-0.21$ respectively, $p<0.05$). As such satisfaction with ones job and working conditions had a greater influence on intent to leave ones job, than background characteristics of the worker did.

Studies have investigated the association between level of education and job satisfaction, but have, however, yielded inconsistent results (Coomber and Barriball, 2007). For example, Rambur *et al.* (2003) and Yin and Yang (2002) found that job dissatisfaction decreased with higher educational level in Taiwan. However, Lu *et al.* (2002), as well as Piko (2006) found a significant negative correlation between educational attainment and job satisfaction. Meanwhile other studies, such as those by Fang (2001) and Larrabee *et al.* (2003), found no significant correlations. Piko (2006) further found that female workers had reported lower levels of job satisfaction than males. The current study did not display any significant correlations between job satisfaction and level of education, nor between job satisfaction levels and sex.

**Musculoskeletal strain**

Nursing personnel are commonly reported to have high levels of musculoskeletal strain, and low back pain in particular (MNA, 2006; Menzel *et al.*, 2004; Yorio and Ferguson, 2002; Lee and Chiou, 1994; and Highnett, 1996). Musculoskeletal disorders (MSDs) experienced by nursing personnel have been seen to include low back pain (LBP), as well as neck, shoulder, arm, wrist, and knee disorders - including sciatica, rotator cuff injuries, epicondylitis, and carpal tunnel syndrome, more specifically (Weber, 2006; Daraiseh *et al.*, 2003). Early signs of MSDs include persistent pain, restricted joint movement, or soft tissue swelling (Weber, 2006). Manual patient handling is reportedly the major cause of these injuries (Menzel *et al.*, 2004; Yorio and Ferguson, 2002). An association between psychosocial factors and musculoskeletal disorders has also been found (Josephson *et al.*, 1997; Janowitz *et al.*, 2006; Menzel *et al.*, 2004; Furlow, 2002).

90% of the participants in the present study reported musculoskeletal ache, pain, or discomfort in at least one body part in the past 12 months, and 23% reported musculoskeletal trouble in the past week. Josephson *et al.* (1997) recorded prevalence of MSD symptoms to be 33%-36% in nursing personnel over four consecutive years. Menzel *et al.* (2004), on the other hand, found a seven day prevalence rate of 62% for musculoskeletal discomfort in at least one body part in their study. Results of musculoskeletal strain in this study can also be compared to another study on South African nurses, by Botha and Bridger (1997), for which similar regions were shown to have high musculoskeletal strain ratings. Lower back pain was reported by 47% of this sample; neck, arm and shoulder pain by 77%, upper back pain by 28%, ankles and feet also by 28%, 20% in the wrists or hands, and 18% for the hips or legs. In comparison, Botha and Bridger's (1997) sample reported 63%, 65%, 31%, 40%, 8%, and 18% for the above-mentioned areas respectively. As such, this sample appeared to have lower levels of low back pain and pain in the ankles and feet; higher levels of neck, arm, shoulder, wrist and hand pain; and similar levels of upper back pain and pain in the hips or legs. However, differences in methodology of the studies, and question categories, may account for some of these differences.

Other studies using the Nordic Musculoskeletal Questionnaire have shown prevalence rates of 69% for moderate ongoing symptoms of the neck, shoulder, upper and lower back in Swedish nurses, and 61% of back pain of German nurses (Josephson *et al.*, 1997; Hofman *et al.*, 2002). Prevalence of MSDs disorders of nursing personnel in Josephson *et al.*'s (1997) study also showed a high proportion of symptoms in the shoulder region, as well as in the neck and back. Trinkoff *et al.* (2002) reported prevalence rates of 46%, 35%, and 47% of MSD problems within the previous year in the neck, shoulder, and back respectively, and 72.5% reported an MSD problem in at least one of these sites. The current study evidenced rates of MSD trouble in the neck, shoulder, upper and lower backs to be 32%, 36%, 28%, and 47% respectively.

Back injury is considered to be one of the most widespread occupational hazards in the nursing profession (Highnett, 1996). Buckle (1987) reported the annual risk of back pain for the nursing profession to be 400-500 nurses per 1000, which is similar to the 47% of this sample who reported ache, pain or discomfort in the lower back in the previous year. The MNA (2006) also reports similar findings, as it states that worldwide, back injuries to nurses have an annual prevalence of 40-50%. Meanwhile, Lee and Chiou (1994) report the one-year prevalence of low back pain (LBP) in a study of young nurses in Taiwan to be 70%. Louw *et al.* (2007) state that the four major musculoskeletal conditions leading to disability include osteoarthritis, rheumatoid arthritis, osteoporosis, and low back pain. Additionally, Louw *et al.* (2007) reports that LBP is the most prevalent musculoskeletal condition, and the most common cause of disability in developed nations. Potential risk factors for LBP were seen to be the female gender, levels of smoking, and a history of LBP (Louw *et al.*, 2007). Musculoskeletal disorders account for about 4.3% of disability adjusted life years in the developed world, and only about 1% in developed nations (Louw *et al.*, 2007).

There were fewer reports of musculoskeletal ache, pain, or discomfort amongst the clinic nurses compared to the hospital nurses in this study. This would be expected as the clinic nurses do not perform many manual patient handling tasks, while hospital nurses do. Only 3% of the clinic nurses reported musculoskeletal trouble interfering with

their work in the past twelve months, while this was reported by 24% of the hospital nurses. Similar proportions of hospital and clinic nurses, however, reported having musculoskeletal trouble in the past 7 days (26% and 23% respectively). This could indicate that the effects, rather than the causes of musculoskeletal strain, were more evident when comparing hospital and clinic nurses. When it comes to the numbers of body regions with musculoskeletal ache, pain, or discomfort in the past 12 months, clinic nurses were more likely to have such discomfort in one body region, while hospital nurses reported more areas.

Menzel *et al.*'s (2004) study on 113 nursing staff in the United States found that although age was not correlated with the prevalence of musculoskeletal discomfort, the prevalence of musculoskeletal discomfort was much higher in females (66%) than in males (31%). Occupational classification has also been seen to influence work-related musculoskeletal disorder (WMSD) risk, as nursing assistants were seen to have significantly higher physical workloads than other nursing categories (Menzel *et al.*, 2004). In the current study, age, sex, and occupational position were not significantly correlated with the number of reported body regions with musculoskeletal ache, pain, or discomfort (at $p<0.05$).

**Work Ability Index**

Most of the participants rated their subjective work ability according to lifetime best and in terms of the mental and physical demands of the job relatively highly, and most of the participants were relatively certain that they would be able to continue working two years from now. This is a positive indication, as most of the nurses felt themselves capable and able to perform their jobs without difficulty. Mean Work Ability Index (WAI) scores for the participants were classified as good, and none of the respondents were classified as having poor work ability.

In terms of diseased diagnosed by a physician, 43% of the respondents did not record having any of the listed conditions, and 56% indicated that they either did not have a disease, or that the disease did not cause any hindrances. Injuries from accidents were

reported relatively frequently, with 28 respondents (19%) reporting at least one injury in the back, arm/hand, leg/foot, or other part of the body. Musculoskeletal disease was also not infrequent, as 8% reported having a back disorder, 9% had sciatica, 6% were diagnosed with arthritis, 5% had a musculoskeletal disease affecting the limbs, and 2% had another type of musculoskeletal disease. Hypertension was the most commonly reported disease in the sample, with 20% being diagnosed with this condition. Diabetes was evident in 6% of the sample. Repeated infections of the respiratory tract, including tonsillitis, acute sinusitis, and acute bronchitis were also relatively frequent, being reported by 10% of the sample.

According to the SADHS, 9% of men, and 19% of women in South Africa are reported to have high blood pressure (Department of Health, 2004). These values are thus comparable to rates of hypertension in this study. Additionally, urban dwellers were more likely to report high blood pressure than rural dwellers, and most of the present sample dwell in urban areas (Department of Health, 2004). Hypertension in the current sample correlated positively with age, as well as with the anthropometric variables of mass, BMI, waist girth, and WHR (at $p<0.05$). Diabetes, in turn, was reported by 3% of urban and 2% of rural men, and 4% of urban, and 3% of rural women in South Africa (Department of Health, 2004). Thus diabetes rates were higher in the study sample than in South Africans as a whole. This could be because of the relatively higher incidences of obesity in this sample compared to the total population, along with its association with increased risk of cardiovascular and metabolic disease. It is also not unlikely that as the current sample is composed of workers the healthcare industry, there is a higher rate of diagnosis for this sample, than the general populace. Diabetes, like hypertension, was positively correlated with age ($r=0.31$, $p<0.05$), although not with any anthropometric measures at $p<0.05$.

In terms of the “mental resources” item of the WAI, most of the participants indicated, on a 5-point scale, that they were either often (37%) or sometimes (37%) able to enjoy their regular daily activities. Most of the nursing personnel (55%) responded that they had always been active and alert recently, and most of them (54%) responded that they

have continuously been full of hope for the future recently. As such, out of these three items, the participants were least likely to be able to enjoy their regular daily activities, however in general, positive responses were received from all three questions. Responses of all of these three questions were correlated to levels of subjective satisfaction with health ($r= 0.19$, $0.23$, and $0.18$ respectively, $p<0.05$). These three responses were also all positively correlated with each other at $p<0.05$.

WAI scores were correlated to a high number of variables, which supports its usefulness in providing a unitary measure of health, satisfaction, and work ability. It was negatively correlated with age (higher in younger people) ($r=0.18$, $p<0.05$) and tenure (lower in those who had been working for longer) ($r=0.20$, $p<022$), and it appeared that length of time spent in nursing had a greater effect on reducing work ability than age in itself. WAI scores were also higher in males than in females ($r=-0.21$, $p<0.5$). This could be because of the generally higher levels of physical strength in males than in females, hence having a protective effect against physical strains or ailments. The male participants additionally had lower levels of obesity than the female participants. However, while work ability scores were correlated with stature ($r=0.29$, $p<0.05$), they were not significantly associated with mass, BMI, waist girths, or waist-to-hip ratios. This is interesting to note, as BMI, waist girths, and WHR are also often used as indicators of health.

Chiu *et al.* (2007) found that work ability of nurses in their study varied among hospital type and department, and that it was also closely related with the quality and safety of the work environment as well as leisure time management. This included factors such as financial resources, freedom, physical safety and security, health and social care, home and physical environment (i.e. pollution, noise, traffic, and climate), opportunities for developing new information and skills, and participation in recreation/leisure activities. Chiu *et al.* (2007) also found that nurses working in outpatient department services, and supply units, had significantly higher average age, work experience and WAI scores than the nurses working in operating rooms, emergency or intensive care units, and medical and surgical wards. In the current study, WAI scores were not

significantly correlated to workplace, income, or time spent performing household chores, watching television or reading, or sport or exercise performed.

**Dietary recall**

Average dietary recall values of the sample were particularly low compared to RDA values. This is likely to be, at least in part, due to underreporting that is common with 24 hour recalls (NIH, 2002). It is also probable that while foodstuffs eaten were accurately reported, the portion sizes used as input of the Food Finder Analysis Program were too small. However, this under-reporting and under-recording is likely to be evident throughout the sample, and thus it is still possible to use this data to analyse difference between groups of individuals in the sample.

It was seen that males had higher total energy intakes than the females of the sample, which would be anticipated, as males generally eat more than females. Total energy intake values were similar according to the workplaces of those working in a clinic, as day staff in the hospital, or as night staff. Total energy intake values were not correlated to mass, BMI, waist girths, or WHRs, nor with kilojoules expended during exercise performed (at $p<0.50$). Total energy intake was also not correlated with language, race, or income variables ($p<0.05$).

**Smoking and drinking**

14% of the sample reported smoking, either occasionally (2%), or daily (12%), with 11% of the females, and 54% of the males being smokers. Data from the SADHS (Department of Health, 2004) reveal that in South Africa, approximately 31% of men, and 8% of women aged 15 years and above smoke daily, while in the Eastern Cape, 36% of men and 7% of women smoke. Most of the nurses in the present study (65%) never drank alcohol, 23% occasionally and 2% monthly, while 9% reported drinking every week or fortnightly. Alcohol consumption by South Africans was reported by 45% of men and 17% of women (Department of Health, 2004). As such, it appears that the study sample had generally higher levels of smokers than in South Africa as a whole, yet lower levels of drinkers.

Levels of smoking and drinking in the present study were correlated to sex, as males were more likely to smoke and drink than the female participants ($r=-0.34$, $r=-0.33$ respectively, $p<0.05$). Smoking was also correlated with language and race, as it was less common among Xhosa speaking Africans ($r=-0.38$, $p<0.05$). Smoking and drinking were also more prevalent in those with higher household incomes ($r=0.21$, $r=0.26$ respectively, $p<0.5$). Additionally, levels of smoking and drinking were correlated, showing an association between these health-related risk behaviours ($r=0.37$, $p<0.05$). It is possible that the higher levels of smoking in this sample than the population in South Africa, could be related to the stress of nursing work. The lower levels of drinking, perhaps, could be related to exhaustion from work, and hence having less time to spend in social activities.

**Physical activity levels**

Many routine daily activities involve a level of moderate physical activity (NIH, 2002). This includes household chores, as well as mode of transport to work, which may involve walking. Participants in the study were asked about the amount of time taken per week in performing a variety of household chores, the mode of transport to work and the time taken to get there, as well as the nature and duration recreational sports or exercise performed.

Regarding mode of transport to and from work, 15% usually walk, 14% use contract transport, 33% use public transport (which entails walking to and from the taxi stop), and 35% use cars. Average amount of time spent performing household chores, according to predefined list of chores, was 15½ hours per week. Many (43%) of the participants reported doing no exercise besides that done at work or that of carrying out household chores, while 35% reported walking, and 18% perform exercises at home, at gym, or on the sports field. The average amount of time that participants spent watching television, along with the time spent reading, was 18 hours per week. On average, nurses in the sample slept 7 hours per night.

It was seen that the number of kilojoules expended during exercise or during walking to or from work, was negatively correlated with household income ($r=-0.22$, $p<0.05$). This variable, along with type of exercise performed, was correlated with stature, although not with the sex of participants, and was also positively correlated with levels of active/alertness reported in the WAI at a significance level of $p<0.05$. Transport type was associated with age, race, tenure, as well as income received ($r=0.28$, $-0.22$, $0.32$, and $0.22$, respectively, $p<0.05$). Time spent performing housework was negatively correlated with time spent reading and watching television ($r=-0.21$, $p<005$). As such those who spent less time doing housework probably had more time to spend on sedentary activities. However, time spent watching television and reading was also positively linked with satisfaction with health, job, and working conditions ($r=0.19$, $0.21$, and $0.23$ respectively, $p<0.05$). Such sedentary activities were also positively correlated with energy intake, as well as alcohol consumption ($r=0.23$, and $0.22$ respectively, $p<0.05$) . Hours of sleep was seen to be negatively correlated with musculoskeletal pain in the neck, as those who slept for longer had fewer instances of such pain ($r=-0.30$, $p<0.05$). Some of these correlations could, however, be due to coincidence.

**Anthropometric data**

Average stature for the males and females of this study were 1737mm and 1589mm respectively, and 1601mm for the sample as a whole. Average weights were 77kg for the males, 87kg for the females, and 87kg for the whole sample. These values can be compared to norm values of the “reference man” and “reference woman”, as mentioned in McArdle *et al.* (2001), whose statures are 1740mm and 1638mm for males and females respectively, and their masses are 70kg and 56.7kg respectively. While statures of the current sample were comparable to these reference values, it was seen that the females in the study, in particular, outweighed reference body masses.

Average BMI was 34 for the sample as a whole, and 26 and 35 for males and females respectively. This classifies the average female participant as obese, and the average male as slightly overweight. Furthermore, 62% of the sample as a whole were considered obese according to BMI classifications. According to waist girths, the

average female had a waist girth of 102cm, and the average male, 91cm. The SADHS used the values of 88cm for women and 102cm for men, as values over which central obesity is seen to be evident (Department of Health, 2004). According to these classifications, 80% of the females in the sample had waist girth measures that were too high, in terms of associated health risks. The average female in the sample was also placed in a risk zone according to WHRs, as while the average WHR for females and males in the sample were 0.84 and 0.89 respectively, risk zones are seen to be WHRS over 0.80 and 0.95 for females and males respectively (McArdle *et al.*, 2001).

These findings could be of concern, due to reported association between obesity, or central obesity more specifically (as inferred from BMI, waist girth measures, and WHRs), and the prevalence of diseases such as hypertension, type II diabetes, cardiovascular disease, gallstones, dyslipidaemia, metabolic syndrome, osteoarthritis, sleep apnea, and certain forms of cancer (Wyatt *et al.*, 2006). The South African Demographic and Health Survey (Department of Health, 2004) reported that 9% of men in this country, and 23% of adult women were obese, while 21% and 29% were overweight, respectively. Few individuals in the current study (1%) were underweight (BMI<18.5), in comparison to the rates of 12% and 6% in South Africans as a whole (Department of Health, 2004). Mean BMI scores from the SADHS data were 23 for men, and 27 for women. As such, the subjects in this sample had higher levels of obesity than rates in the country as a whole. James (2004) reports that globally, obesity is more prevalent in woman than in men, and this was seen to be the case for this study sample.

Puone *et al.* (2008) note that in South Africa, it is white middle-aged men and black women who were most affected by obesity. While there were too few white men in the sample to make a generalisation, it was noted that black women were those with higher levels of obesity than other population groups. This was also the most represented population group in the study. Regional factors may have a part to play in the high levels of obesity in this study, as it is evident that obesity is more prevalent in urban rather than rural populations, and the sample predominantly comprised of those living in

urban areas. Cultural factors may also have a role to play, as well as genetic differences in Xhosa individuals compared to those in other groupings. Walker *et al.* (2001) attributes factors of genetics, culture, ethnicity, diet, physical activity levels, as well as socioeconomic status to the incidence. Cultural and traditional perceptions, preferences, and acceptance regarding body size also influences body size (Wyatt *et al.*, 2006). For example, in the African community in South Africa, it perceived as desirable to be overweight, as it is a means of reflecting affluence, the husband's ability to provide for his wife and family, as well as being associated with people who are not suffering from HIV/AIDS (Puoane *et al.*, 2002). Walker *et al.* (2001) also found that obesity is more life-threatening to some populations than others. For example, BMI was associated with all-cause mortality as well as coronary heart disease mortality, in white but not in African women. Perhaps this is the case in the current study sample too.

Age and level of education are also seen to explain BMI variation (Puone *et al.*, 2002). These factors were both seen to be correlated with mass, BMI, as well as waist girth measures in the current study, with r values ranging from 0.17 to 0.38 at a significance level of $p<0.05$. Mass, BMI, and waist girths were also correlated with household income received ($r=-0.20$, $-0.20$, and $-0.19$ respectively, $p<0.05$). It was seen that those who were older, and those with lower levels of education, and lower income received had higher masses, BMIs, and waist girths. James (2004) notes that in most countries there is a clear inverse relationship between educational level or socioeconomic status and obesity prevalence, and hence obesity is increasingly seen as a feature of the poor. It was interesting that this finding was affirmed even in this study, where there was not a particularly great range of differing levels of education ($r=0.17$ to $0.18$, at $p<0.05$). Wyatt *et al.* (2006) explains that quality of diets may improve with higher household incomes. Walker *et al.* (2001) considers diet and physical activity levels to be the most influential factors for the incidence of obesity. In this study, however, mass, BMI, and waist girths were not seen to be significantly associated with total energy intake, nor with exercise performed. Another variable that correlated significantly with each of the variables of mass, BMI, and waist girth, was that of intent to leave, and an inverse relationship was evident ($r=-0.26$, $-0.20$, and $-0.24$ respectively, $p<0.05$).

The anthropometrics of this sample can be compared with other studies, such as that by Botha and Bridger (1997), who studied 100 nurses in private hospitals in the Western Cape of South Africa. The average stature for these nurses was 1630mm, with an average weight of 72kg, and a BMI of 27, while over a quarter of this sample had BMI's of over 30. The current study therefore had a slightly shorter, yet considerably heavier sample than that of Botha and Bridger (1997), as there were more than double the number of nurses in this study that were considered obese according to BMI classifications. These differences could be in part due to regional factors, and due to the general increase in the prevalence of obesity rates since the time of Botha and Bridger's (1997) study. Additionally, that study was performed on nurses in private hospitals, while most of the nurses in the current study worked in the public sector, and racial demographics along with associated anthropometrics, are commonly seen to vary between public and private workplaces.

Botha and Bridger's (1997) study, furthermore, displayed an association between body size of nurses, and injury prevalence. Stature as well as abdominal depth displayed significant positive correlations with lower backache, while negative correlations were found between stature and grip reach and the prevalence of shoulder/arm pain. The main associated correlation in this study was that of musculoskeletal disorders in the ankles or feet, which were correlated to mass, BMI, as well as waist girth ($r=0.22$, 0.22, and 0.27 respectively, $p<0.05$).

## STATISTICAL RELATIONSHIPS

Factor analysis and canonical correlations were performed in order to determine relationships between the data. Factors were extracted from each of the categories of 1) demographic/personal variables, 2) workplace-related variables, 3) living condition and lifestyle variables, and 4) the variables that are influenced by the variables in the first three categories, namely health and well-being data. These factors extract associated variables in each category, and summarise these variables into a single number. Twelve resultant factors were extracted, with between 44% and 64% of the variance for

each of the categories being explained. The variables with factor loadings of greater than 0.5, were included in the associated factor.

The demographic/personal factors were 1) language and race, and 2) age, sex, and stature. The workplace factors were composed of 1) clinic versus hospital and specific ward or clinic, and 2) position and tenure. Five living condition or lifestyle factors were extracted, namely 1) dietary variables: energy, total protein, total fat, cholesterol, carbohydrate, and total dietary fibre, 2) smoking and drinking levels, 3) number of residents in household, amount of time spent looking after children, and sources of fuel for lighting and cooking, 4) area, household income, satisfaction with living conditions, and transport type, and 5) type of exercise performed, and number of kilojoules expended during exercise per week. Finally, for the health and well-being variables, there were three factors, namely: 1) mass, BMI, and waist girth, 2) life satisfaction, health satisfaction, and job satisfaction, and 3) number of areas with musculoskeletal ache, pain or discomfort, and WAI score.

These factors summarised the number of variables into sets for both the independent (or “predictor”) and dependent (or “criterion”) data. These data sets could then be used as input from which canonical correlations could be calculated. Three roots were extracted during the canonical correlation procedure. The first root explained 34% of the variance between the predictor and criterion factors. As such, the associations of this root explained more variance, or were higher, than any of the other canonical correlations. It associated the criterion factor of life, health, and job satisfaction, with the predictor factors of 1) language and race, 2) area, income, transport type, and satisfaction with living conditions, and 3) position and tenure. These associations tended to reveal that those with higher socio-economic statuses, along with higher position and tenure at work, were those with higher levels of satisfaction with their health, jobs, and lives in general. As this was the primary root extracted, most of the variance in this study was explained by associations with the psychological factors of satisfaction levels, followed by the variance explained by associations with anthropometrics, work ability, or musculoskeletal strain.

It was noted that factors relating to demographics, living conditions, and working conditions, were seen to cumulatively affect the criterion factor. In the first root it was seen that cultural factors (demographics), living conditions, as well as position and tenure at work were related to variation in health and well-being, and in particular with life, health, and job satisfaction. As such the effects of each of these on the health, well-being, and work ability of the nurses could not be determined for each of these factors independently. This affirms assumptions made when determining the most appropriate statistical measures to use, as it was decided that it would not be appropriate to calculate the relationship between each of the sets of predictor factors with the criterion factors independently. There may be underlying features influencing each of these categories, or overlap between the variables. For example, white, English speakers in South Africa, in general, have higher incomes, more access to formal transport, and live in higher socio-economic areas than their black, Xhosa speaking counterparts (due to the residual effects of apartheid). Additionally, those with higher positions and tenure at work, receive higher levels of income, thus relating to the previously mentioned factor.

The second root accounted for 24% of the variance from that remained after the first root was extracted. In the second root, higher mass, BMI, and waist girths, fewer MSDs, as well as higher Work Ability Index (WAI) scores, were associated with language and race, and levels of smoking and drinking. It was unexpected that higher anthropometric variables were associated with better WAI scores and fewer MSDs, as high masses, BMIs and waist girths are usually associated with higher level of disease. Although mass, BMIs and waist girths in this sample were correlated with the prevalence of hypertension, these variables were not correlated with WAI scores. It was also seen that the black, Xhosa speaking Africans in this sample tended to have higher masses, BMIs, and waist girths, as well as lower levels of smoking and alcohol usage than the other population groups. This would therefore account for the interaction of the demographic and lifestyle factors of this root. From this data, it appears that while Xhosa Africans had higher anthropometric variables, they also had fewer numbers of MSDs as well as higher WAI scores, and this was also associated with lower levels of smoking and

drinking. Race and cultural factors are therefore seen to affect levels of health, or at least subjective perceptions of health.

The third, and final, root explained 10% of the remaining variance after the first two roots were extracted. The third root, in contrast to the second root, revealed that when a greater number of MSDs and lower WAI scores were associated with lower anthropometric measures, there was an association with sex (males), lower age, greater stature, lower position, and lower tenure. The males of the sample generally had higher WAI scores, and lower anthropometric measures (besides stature) than the females. Additionally, younger individuals, along with those with lower position and tenure, also displayed lower masses, BMIs and waist girth values. Greater stature is also, naturally, related to the male gender, as well as lower BMI scores. Being male, as well as being younger, and having spent less time in nursing, appears to place one at a lower risk for developing MSDs and lowering WAI scores, than those who are female, and who are older and have spent a long time in the nursing profession.

Dietary factors were not seen to have a clear effect on this data, and nor were physical activity levels. Physical activity levels may not have had an effect due to the relatively high physical workload associated with nursing, as well as the relatively low amounts of recreational sports and exercise undertaken by the sample. Diet, in this sample, did not appear to affect mass, BMI, or waist girth, when looking at basic correlations between the data. It did not generally appear to be associated with health or well-being either.

Working in a clinic versus in a hospital, or the specific workplace, also did not appear to have any clear effect on the criterion factors. This is interesting to note, due to the differing nature of tasks performed and working conditions between the hospital and the clinics. Nurses in the clinic, for example, are not required to perform patient handling tasks, as opposed to the high physical workloads imposed on hospital nurses, and work shifts between hospital and clinic staff also vary greatly. Patient handling tasks are generally seen to be a main cause for musculoskeletal disorders (MSDs), and shift work may place additional strain on the individual. Workloads between wards in the hospital

and between different clinics also vary. However, in this sample, the workplace did not appear to be highly associated with health or well-being, compared to the influence of the other demographic, living condition, or work-related considerations.

Assess to amenities of source of fuel for lighting and cooking, number of residents per household, and time spent looking after children also did not have any clear effect on criterion sets in this analysis. Low variance among the sample could also explain lack of association between this data and the health and well-being variables. For example, the vast majority of participants (95% and 88% respectively) used electricity as their main source of fuel for lighting and cooking.

In order to summarise the findings, it was seen that health and well-being (as inferred from levels of health, life, and job satisfaction, WAI scores, number of areas with musculoskeletal strains, and anthropometric data of mass, BMI and waist girth), was affected by language and race; age, sex and stature; position and tenure; area of residence, household income, mode of transport, satisfaction with living conditions; and levels of smoking and drinking. Language and race, as well as position and tenure, appeared to have the greatest amount of association with the health and well-being factors; while life, health and job satisfaction was the criterion factor that was most influenced by the predictor factors.

# CHAPTER 6: SUMMARY, CONCLUSION, AND RECOMMENDATIONS

## OVERVIEW OF STUDY

This study examined the effects of living- and workplace-related factors on the health, subjective well-being, and work ability of nurses in Grahamstown. Questionnaires, interviews, and anthropometric measures were taken to gather data in this regard, and data capturing was performed in Settlers Hospital, and seven municipal clinics within Grahamstown city (N=152). Factor analysis and canonical correlations were performed in order to analyse the relationships between data of basic demographics, living condition variables, lifestyle variables such as diet and physical activity levels, working conditions, and data on subjective satisfaction levels, musculoskeletal strain, Work Ability Index (WAI) scores, and anthropometrics. Such findings were intended to undercover aspects affecting the health, well-being, and work ability of nurses, and to analyse the relationship between these aspects. Following this, appropriate recommendations could be made, from which ergonomic implementations as well as policies could be informed.

## SUMMARY OF PROCEDURES

The subject sample comprised of 120 nurses from Settlers Hospital (87 day staff, and 33 night staff), and 32 nurses from the seven municipal clinics located within the city of Grahamstown, in the Eastern Cape province of South Africa. The participants were requested to complete a questionnaire, which was available in English, Afrikaans, or isiXhosa. Following this, a one-on-one interview was conducted with each participant, and anthropometric measures of stature, mass, waist girth, and hip girth were taken. The questionnaires included multiple choice-styled questions regarding various aspects such as age, sex, marital status, highest level of education received, position held at work, length of time spent in nursing, type of housing, access to water, electricity, and sanitation, number of residents per household, monthly household income received, along with aspects regarding factors causing stress or dissatisfaction at work, general satisfaction levels, intent to leave nursing, areas of the body experiencing musculoskeletal stress, as well as the WAI (Tuomi *et al.*, 2006). In the interview, a 24-

hour dietary recall was undertaken, and various questions were put forward regarding mode of transport to work, household chores performed, and sport or exercise performed, in order to gain an understanding of the physical activity levels of participants. Additionally, levels of smoking and drinking were recorded. The anthropometric measures of stature and mass could be used to calculate the Body Mass Index (BMI) of participants, while waist and hip girth measures could be used to calculate Waist to Hip ratios (WHR), which could be used as in indication of the presence of obesity.

Statistical procedures performed, in addition to Pearson-Product Moment and partial correlations, included factor analysis and canonical correlations. Factor analysis was performed in order to identify common variance among the data, and in so doing summarise related variables into a factor. Nine predictor factors, and three criterion factors were extracted. Using these factors sets, canonical correlations could be performed, in order to identify which of the predictor and criterion sets are associated, and the nature of these associations.

## SUMMARY OF RESULTS

The response rate of those filling in questionnaires at each of the workplaces was approximately 71%. The mean age category of the participants was 41-50 years, and 92% of the participants were female. Most of the nurses were Xhosa speaking (65%), while 25% spoke Afrikaans, and 5% spoke English as a first home language. Associated with this, 70% of the nurses were black Africans, 22% were coloured, and 7% were white. Clinics tended to have higher percentages of black African participants, and fewer coloured and whites than the hospital. Around 46% of the respondents lived in Grahamstown East, 31% in central Grahamstown, 13% in Grahamstown West, and 10% lived outside of Grahamstown. Most of the residents (65%) lived in formal brick houses, 25% lived in flats, townhouses or cottages, 6% in RDP housing, 2% in traditional housing, and 1% in informal housing. The mean number of residents per household was four. Regarding water supply, 74% had access to piped water in their houses, 21% relied on piped water from a tap in their gardens, and 4% used communal

water supplies. 95% had working flush toilets, and most of the nurses used electricity as their primary source of fuel for lighting and cooking (95% and 88% respectively). Mean household income level was between R5001 and R1000 per month, after tax, with 50% of the participants falling into this bracket. Social grants were received by 35% of the respondents.

The nurses were generally satisfied with their living conditions, working conditions, jobs, health, and lives as a whole. However, greatest sources of stress and dissatisfaction at work were seen to be largely that of salary or pay, and high workloads. Best aspects of the job, reported by most of the respondents, was that relating to patient care and seeing sick people getting better again. Most (58%) of the nurses never thought about leaving nursing, 23% thought about it sometimes per year, and 15% thought about it monthly, weekly, or daily. Many (28%) of the nurses had been in nursing for less than 5 years, which may point to a high rate of new recruits, yet also a potentially high number of individuals entering nursing but changing job or career courses.

The nursing sample reported relatively high levels of musculoskeletal strain, with 47% of the nurses having experienced lower back ache, pain, or discomfort in the previous twelve months. Pain in the shoulders, neck, and upper back were the next most frequently affected areas. 23% experienced musculoskeletal strain in the previous seven days, and 19% reported that it interfered with work in the past year. Hospital nurses tended to experience a higher number of musculoskeletal strains than the clinic nurses, probably due to the manual patient handling which is evident in the hospital, but not in the clinics. Work ability scores for the nurses ranged from 27 (moderate) to 49 (excellent/optimal), with a mean rating of 41 (good work ability). WAI scores were associated with age, tenure and sex. The relationship between WAI and age is well evidenced in literature on the topic (Chiu *et al.*, 2007).

It was evident that obesity was a problem among the sample, as according to BMI classifications 62% of the sample were considered obese. Obesity was particularly prevalent among the female participants compared to the males. The average BMI

score for the sample was 34kg.m$^2$. Mean waist girths and waist to hip ratios for the females in the sample also fell within risk categories. However, besides from the relationship to higher levels of hypertension, such anthropometric measures were not seen to be associated with WAI scores, or general levels of musculoskeletal strain or discomfort. It was also seen that diet and physical activity levels were not correlated with mass, BMI, waist girths or WHRs in this study.

It was seen that the variables in the categories of demographics, workplace considerations, and lifestyle and living conditions, were associated. This could be because of joint underlying causes. These factors cumulatively affect the health and well-being of nurses, in terms of subjective satisfaction ratings, WAI scores, and musculoskeletal strain. The main findings evident were that socio-economic status was closely linked with satisfaction, or well-being, of the participants. Additionally, it was seen that Xhosa Africans smoked and drank alcohol less frequently than other population groups, and these factors were associated with higher WAI scores, fewer areas in the body experiencing musculoskeletal strain, along with higher masses, BMIs, and waist girths. When lower masses, BMIs, and waist girths were associated with higher WAI scores, and fewer musculoskeletal complaints, it was seen to be in those with lower positions and tenure, along with males, those who were younger, and those with taller statures.

## CONCLUSION

Demographic factors, work-related factors, and living condition and lifestyle factors were all related to the criterion factors of satisfaction ratings, musculoskeletal strain, WAI scores, as well as mass, BMI, and waist girth. The strongest association was between the variables of language, race, socio-economic status, position and tenure, with ratings of subjective satisfaction with health, jobs, and life as a whole. BMI, mass, and waist girth measures did not appear to have a clearly directed influence the amount of musculoskeletal strain experienced, nor work ability scores. No significant associations were made with dietary or physical activity factors and the dependent factors. Nor were places of work, or access to basic amenities and number of residents per household,

canonically correlated with the dependent factors of satisfaction, WAI scores, number of areas with musculoskeletal pain, or anthropometric variables.

The null hypothesis of this project stated that personal characteristics, living conditions, and working conditions do not cumulatively affect the health, well-being, and work ability of nursing in Grahamstown. It was evident, however, that there were significant canonical correlations and associations between the dependent and independent variables of the study. Living and working conditions were seen to cumulatively effect the health, well-being, and work ability of nurses in Grahamstown. In response to this, therefore, the null hypothesis of the study could be tentatively rejected.

In terms of general findings, the sample was seen to have higher incomes, and access to housing and basic amenities than the average South African. Low salaries and high workload, however, were potentially problematic. Although the work ability scores of the participants were good, high levels of musculoskeletal strain were evident. Musculoskeletal strain was most evident in the lower back region, and musculoskeletal pain affected work more in the hospital, in comparison to the clinic nurses. High levels of obesity were prevalent among the sample, although apart from its correlation with the incidence of hypertension, it did not appear to affect work ability.

## RECOMMENDATIONS

Based on the findings gained from this research, it would be recommended that ergonomics interventions in workplaces should consider aspects of the workers' backgrounds. Age, sex, stature, language and race, along with factors such as socio-economic status, influences the well-being of employees, along with aspects relating to the work environment. Such interventions could assist in reducing the prevalence of musculoskeletal disorders, as well as to protect nurses against declining work ability. These interventions aim to benefit both the worker in terms of health and well-being, as well as the workplace in terms of improved productivity, patient care, and reduced worker compensation costs.

Further research could look at whether similar findings are evident in different occupational groups, and also in different geographical locations. It could also consider other aspects such as psychological and sociological variables. A more thorough workplace assessment could be performed, as well as more in depth analysis of living conditions. Data could be gathered in a less subjective manner, if appropriate. This study attempted to be as thorough as possible in terms of the information gathered, while still having a large sample size. However, a larger sample size would have been advantageous.

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## APPENDICES

## APPENDIX A: LETTER TO MANAGEMENT

RHODES UNIVERSITY
Grahamstown • 6140 • South Africa
HUMAN KINETICS & ERGONOMICS
Tel: (046) 603 8468 • Fax: (046) 603 8934 • e-mail: m.goebel@ru.ac.za/j.mcdougall@ru.ac.za

Dear Manager or Nurse Supervisor

**Re: Participation in a research project**

I am a Masters student in Human Kinetics and Ergonomics (HKE) at Rhodes University, and am studying the effects that living and working conditions have on the health, well-being, and work ability of nurses in the Eastern Cape. The results of my study aim to give insight into aspects in which municipal or company interventions would be most beneficial.

An initial interview with the manager and a basic workplace assessment will be necessary to contribute to the value of this study. This will entail an overview of the work environment, as well as a basic understanding of the workload of the nurses in the facility. Following this, the main part of the study revolves around questionnaires which I have compiled for the nurses to complete. The questionnaires will cover areas such as the basic demographics of the nurses, living and working conditions, diet and physical activity levels, subjective satisfaction levels, and work ability. Additionally, measures including the of the height and weight of nurses will be obtained if agreed upon by the nurses themselves. All questionnaires will be anonymous, and the data will only be used for the purposes of this research. A copy of the questionnaires is attached so you may have a look at it.

I hope to interview the managers of each of the clinics and hospitals, as well as to have these questionnaires answered by all nurses within Grahamstown, as well as further regions in the Eastern Cape, so that my study will be as accurate and representative as possible. Each of the questionnaires should take approximately twenty minutes to complete.

Feedback shall be given to the healthcare facility, and for the nurses, at the end of the year (2009), once the results have been compiled and examined. This feedback will contain possible areas and means of intervention so as to improve the well-being of those working in the facility, as well as to improve work quality and productivity.

Yours sincerely

Jodi Hodgskiss
g04h3234@campus.ru.ac.za

## APPENDIX B: LETTER OF INFORMATION

RHODES UNIVERSITY
Grahamstown • 6140 • South Africa
HUMAN KINETICS & ERGONOMICS

Tel: (046) 603 8468 • Fax: (046) 603 8934 • e-mail: m.goebel@ru.ac.za/j.mcdougall@ru.ac.za

### Letter of Information

Dear nurse

**Re: The cumulative effects of living and working conditions on the health, well-being and work-ability of nurses in the Eastern Cape**

I am a Masters student in Human Kinetics and Ergonomics (HKE) at Rhodes University. For my research, I am studying the effects that living and working conditions have on the well-being and work ability of nurses in the Eastern Cape. The results of my study may be used to inform policies as well as intervention strategies, so as to improve worker well-being as well as company productivity.

In so doing, I am sending questionnaires out to nurses in hospitals and clinics in the Eastern Cape. Various questions will be asked, including those of your age, education, position at work, length of time in nursing, as well as living conditions, which includes household access to basic amenities. Other questions will ask about how much physical activity you do, what you usually eat each day, possible musculoskeletal pain and injury, as well as your level of health. Some measures of your stature, mass, waist and hip girth, will also be measured if you agree to it. Some photographs of your workplace may also be taken. All your answers and measurements will be kept anonymous and confidential, and you do not have to answer any question if you do not want to.

You will receive feedback about your basic health status relative to normative values, and be given some information about how to keep healthy. At the end of the study, I will give the overall results and recommendations of my study to the manager at your workplace, who will then pass the information on to you. This information will not contain any personal details or answers of the individual participants. Following this research, a follow-up study may also be performed in order to gain more in-depth information regarding the results found.

Thank you very much for your interest in participating in this research.

Yours sincerely

Jodi Hodgskiss
g04h3234@campus.ru.ac.za

This research has been supervised and ethically approved by the Department of Human Kinetics and Ergonomics at Rhodes University. If you wish to contact this department for any reason, please phone (046) 603 8468 or email j.mcdougall@ru.ac.za

## APPENDIX C: INFORMED CONSENT FORM

### Informed Consent Form

I, _____, have been fully informed of the research project entitled: **"The cumulative effects of living and working conditions on the health, well-being and work ability of nurses in the Eastern Cape",** and hereby give my consent to act as a subject in the above named research.

I am fully aware of the procedures involved as well as the potential risks and benefits associated with my participation, as explained to me verbally and in writing. In agreeing to participate in this research I waive any legal recourse against the researchers of Rhodes University, from any and all claims resulting from personal injuries or offense experienced whilst partaking in the investigation. This waiver shall be binding upon my heirs and representatives.

I understand that I may express any concerns about my participation in the study to the researcher. I realise that I may withdraw from the study at any time in the event of unusual circumstances, concerns that I did not originally expect or for other reasons. I am aware that my anonymity will be protected at all times, and agree that all the information collected will be aggregated and may be used and published for statistical or scientific purposes.

I have read that information sheet accompanying this form and understand it. Any questions, which may have occurred to me, have been answered to my satisfaction.

**PARTICIPANT**

| _____ | _____ | _____ |
|---|---|---|
| (Print name) | (Signed) | (Date) |

**PERSON ADMINISTERING INFORMED CONSENT**

| _____ | _____ | _____ |
|---|---|---|
| (Print name) | (Signed) | (Date) |

**WITNESS**

| _____ | _____ | _____ |
|---|---|---|
| (Print name) | (Signed) | (Date) |

## APPENDIX D: INTERVIEW WITH MANAGEMENT

Hospital/Clinic:_____
Nurse Manager:_____
Date:_____

# Questions for management:

**Staffing levels and size of clinic/hospital:**

1) How many nurses work here (in total and per day)? Are there any vacancies?

_____
_____

2) How many doctors work here? Or how many days a week is there a doctor here?

_____
_____

3) How many support staff (cleaners/cooks etc.) are employed here?

_____
_____

4) How many rooms are in this clinic?

_____
_____

5) How many beds does this hospital/clinic have? How many beds are currently occupied?

_____
_____

6) How many patients usually visit per day? And on a day when the doctor is here?

_____
_____

7) Other?

_____
_____

**Work organisation:**

1) What are the working hours for nurses in this clinic/department?

_____
_____

2) What rest breaks are provided for nurses in this clinic? And are they taking the rest breaks?

_____
_____

3) What divisions are present in this clinic/hospital, and how are staff organised?

_____
_____

4) Do nurses ever work overtime? Are any patients sent away at the end of the day without receiving care?

_____
_____

**Work tasks:**

1) What are the tasks most commonly performed by nurses here?

_____

_____

2) What other tasks are performed? (e.g. lifting/moving patients, giving medication, performing tests, cleaning patients, dressing wounds, inserting catheters, feeding patients)

_____

3) What is the most common disorder presented by patients?

_____

_____

4) Is most of the work the nurses perform spent sitting/standing/walking?

_____

5)What is the usual working pace for the nurses (e.g. slow/steady/brisk/fast)?

_____

6) Do the nurses often have to exert intense physical effort such as carry loads?

_____

7) What are the most common injuries or sicknesses reported by nurses here?

_____

_____

8) Is there a high absenteeism and turnover rate here?

_____

9) What would you say are the most stressful or difficult aspects of working in this job, and in this environment?

_____

_____

**Working conditions:**

1) Is the building sufficient for the needs of this clinic/hospital?

_____

_____

2) Do you have sufficient equipment to provide optimal healthcare?

_____

_____

3) Do you have the necessary supplies (e.g. gloves, facemasks, needles etc.)?

_____

_____

4) Is there sufficient amounts of medication for the patients? What runs out most often?

_____

_____

5) What type of qualifications do the nurses here have? Is this sufficient?

_____

6) What do you think are the major factors hindering optimal healthcare here?

_____

## APPENDIX E: ENVIRONMENTAL CHECKLIST

# ‘Walk-through’ survey report: risk identification

(To be completed in consultation with co-responsible agents)
(**To score:** Circle your choice. Sum the circled number. If sum of circled items exceeds 80 conduct a RISK assessment)

### Site conditions: (indoors/outdoors)

| | Good | Satisfactory | Poor | Very poor | Unsatisfactory |
|---|---|---|---|---|---|
| Visibility | 1 | 2 | 3 | 4 | 5 |
| Noise | 1 | 2 | 3 | 4 | 5 |
| Temperature | 1 | 2 | 3 | 4 | 5 |
| Ventilation | 1 | 2 | 3 | 4 | 5 |
| Workspace confinement | 1 | 2 | 3 | 4 | 5 |
| Vibration exposure | 1 | 2 | 3 | 4 | 5 |
| Safety equipment | 1 | 2 | 3 | 4 | 5 |
| Underfoot stability | 1 | 2 | 3 | 4 | 5 |
| Toxins | 1 | 2 | 3 | 4 | 5 |
| Other (specify) | 1 | 2 | 3 | 4 | 5 |

### Worker preparedness

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Previous occurrences of back pain | (Never) | 1 | 2 | 3 | 4 | 5 | (Frequent) |
| Familiarity with task/operation | (Experienced) | 1 | 2 | 3 | 4 | 5 | (Novice) |
| Level of awareness of safety principles | (Good) | 1 | 2 | 3 | 4 | 5 | (Poor) |
| Distraction potential | (Low) | 1 | 2 | 3 | 4 | 5 | (High) |
| Use of protective gear | (Effective) | 1 | 2 | 3 | 4 | 5 | (Ineffective) |

### Organisational involvement

| | Very Good | | | | Very Poor |
|---|---|---|---|---|---|
| Worker cooperative interaction | 1 | 2 | 3 | 4 | 5 |
| Adequacy of team/cohort size | 1 | 2 | 3 | 4 | 5 |
| Work-rest ratio provisions | 1 | 2 | 3 | 4 | 5 |
| Incident-report facilitation | 1 | 2 | 3 | 4 | 5 |
| Overall safety provision status/ level of feasible mechanication | 1 | 2 | 3 | 4 | 5 |

### Incidence rate

| | Rare | | | | Frequent |
|---|---|---|---|---|---|
| Turnover rate | 1 | 2 | 3 | 4 | 5 |
| Absenteeism | 1 | 2 | 3 | 4 | 5 |
| Complaints of minor sprain/strain | 1 | 2 | 3 | 4 | 5 |
| Near-miss situations | 1 | 2 | 3 | 4 | 5 |
| Past accidents/mishaps | 1 | 2 | 3 | 4 | 5 |
| Product damage | 1 | 2 | 3 | 4 | 5 |
| Indications of stressed morale | 1 | 2 | 3 | 4 | 5 |

## APPENDIX F: QUESTIONNAIRE FOR NURSING PERSONNEL

RHODES UNIVERSITY
*Where leaders learn*

# Demographics

(Please tick or cross the appropriate block for each question)

**D1. How old are you?**

Less than 20 years ☐
21-30 years ☐
31-40 years ☐
41-50 years ☐
51-60 years ☐
Over 61 years ☐

**D2. What is your sex?**

Male ☐
Female ☐

**D3. What is your home language?**

English ☐
Afrikaans ☐
isiXhosa ☐
Other: please specify_____

**D4. What is your race group?**

White ☐
Coloured ☐
Black African ☐
Indian ☐
Asian ☐
Other: please specify_____

**D5. What area do you live in? (Please specify)**

Street:_____
Suburb:_____
Town/City:_____

**D7. What is your marital status?**

Unmarried ☐
Married ☐
Unmarried but living with partner ☐
Separated ☐
Divorced ☐
Widow/widower ☐

# Work factors

**W1. What is the highest level of education you have attained?**

1 year nursing certificate ☐
2 year nursing certificate ☐
3 year nursing diploma ☐
2 year bridging course ☐
4 year nursing diploma or equivalent ☐
Bachelor of nursing science (BCur) ☐
BA Cur or BA Nur – postgraduate ☐
BNurs or BCur Honours equivalent ☐
Masters+ ☐
Other: please specify:_____

**W2. What position do you hold at work?**

Nursing assistant ☐
Staff nurse ☐
Professional nurse ☐
Nurse manager ☐
Other: please specify:_____

**W3. How many hours, on average, do you work per week, including overtime?**

Day shifts: _____ hours
Night shifts: _____ hours

**W4. For those working in a hospital: If applicable, what ward you work in?**

Maternity ☐
Paediatrics ☐
Surgical ☐
Medical ☐
Emergency ☐
O.P.D ☐
Gynaecology ☐
Operating theatre and CSSD ☐
ARV services ☐
X-rays ☐
Intensive care unit (ICU) ☐
High care ☐
Palliative care ☐
Long-term care ☐
Sterilizing department ☐
Other: please specify_____

**W5. For those working in a clinic: If applicable which primary health care service do you provide? You may tick more than one block if appropriate.**

Health promotion, prevention and rehabilitation/treatment ☐
Treatment of minor ailments, trauma and emergency ☐
Mother-child and women's healthcare ☐
Integrated nutrition care ☐
HIV/ Aids and sexually transmitted infections ☐
TB ☐
Communicable diseases ☐
Non-communicable conditions ☐
Geriatric services ☐
Mental health and substance abuse ☐
Oral health ☐
Occupational health ☐
Youth health services ☐
Other: please specify_____

**W6. How long have you been working as a nurse?**

Less than 5 years ☐
5-9 years ☐
10-14 years ☐
15-19 years ☐
20-24 years ☐
25-29 years ☐
30-34 years ☐
More than or equal to 35 years ☐

# Living conditions

**L1. What type of house do you live in?**

Formal brick house (non-RDP) ☐
RDP housing ☐
Flat/townhouse/cottage ☐
Traditional housing ☐
Shack/informal housing ☐
Other: please specify_____

**L2. Does your roof leak when it rains?**

Yes, always ☐
Often/most of the time ☐
Seldom/a little ☐
No, never ☐

**L3. How many people live in your home?**

1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐
6 ☐ 7 ☐ 8 ☐ 9 ☐ 10 or more ☐

**L4. What is the main source of water you use for your home?**

Piped water in house ☐
Piped water in yard ☐
Public tap less than 200m away ☐
Public tap more than 200m away ☐
River, dam, or spring ☐
Water tank or borehole ☐
Other: Please specify_____

**L5. Do you currently have a working toilet facility within your property?**

Flush toilet ☐
Chemical toilet ☐
Ventilated pit latrine ☐
Pit latrine ☐
Bucket system ☐
No toilet/ toilet broken ☐

**L6. What is your primary fuel source for cooking and for lighting in your house?**

**For lighting:**

Electricity ☐
Paraffin ☐
Candles ☐
Other: please specify_____

**For cooking:**

Electricity ☐
Paraffin ☐
Wood ☐
Other: please specify_____

# Income received

**I1. Approximately how much income, after tax, does your household (all the members residing in your house) receive in a month, including social grants?**

Less than R5 000 ☐
R5 001 - R10 000 ☐
R10 001 - R15 000 ☐
R15 001 - R20 000 ☐
R20 001 - R25 000 ☐
R25 001 - R30 000 ☐
More than R30 001 ☐

**I2. How many people rely on this income, as stated above (whether they reside in the house or not)?**

1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐
6 ☐ 7 ☐ 8 ☐ 9 ☐ 10 or more ☐

**I3. How many social grants does your household receive? This includes, for example, pension, disability, and child support grants.**

0 ☐ 1 ☐ 2 ☐ 3 ☐ 4 or more ☐

## Subjective ratings

**S1. How satisfied are you with your life as a whole these days?**

Very dissatisfied ☹☹ ..... ☐
Dissatisfied ☹ ..... ☐
Neither satisfied or dissatisfied😐 ..... ☐
Satisfied ☺ ..... ☐
Very satisfied ☺☺ ..... ☐

**S2. How satisfied are you with your living conditions?**

Very dissatisfied ☹☹ ..... ☐
Dissatisfied ☹ ..... ☐
Neither satisfied or dissatisfied😐 ..... ☐
Satisfied ☺ ..... ☐
Very satisfied: ☺☺ ..... ☐

**S3. Generally, how satisfied are you with your health?**

Very dissatisfied ☹☹ ..... ☐
Dissatisfied ☹ ..... ☐
Neither satisfied or dissatisfied😐 ..... ☐
Satisfied ☺ ..... ☐
Very satisfied ☺☺ ..... ☐

**S4. Overall, how satisfied are you with your job?**

Very dissatisfied ☹☹ ..... ☐
Dissatisfied ☹ ..... ☐
Neither satisfied or dissatisfied😐 ..... ☐
Satisfied ☺ ..... ☐
Very satisfied ☺☺ ..... ☐

**S5. How satisfied are you with your working conditions?**

Very dissatisfied ☹☹ ..... ☐
Dissatisfied ☹ ..... ☐
Neither satisfied or dissatisfied😐 ..... ☐
Satisfied ☺ ..... ☐
Very satisfied ☺☺ ..... ☐

**S6. What do you think are the most stressful or dissatisfying aspects of your job? Please indicate three of the aspects that you consider most stressful.**

The workload and time pressure ..... ☐
Physical strain ..... ☐
Mental or emotional strain ..... ☐
Demands from patients ..... ☐
Relationships with staff members ..... ☐
Relationships with superiors ..... ☐
Work organisation or management ..... ☐
The work environment (e.g., the building, cleanliness, lighting, noise levels) ..... ☐
Lack of equipment or supplies ..... ☐
Risk of contracting or living with HIV/Aids ..... ☐
Salary or pay ..... ☐
Opportunities for promotion or personal growth ..... ☐
Professional recognition ..... ☐
Balancing household and work demands ..... ☐
Other: please specify: ☐

_____
_____
_____

**S7. What is (/are) the best aspect(/s) of your job?**

_____
_____
_____

**S8. How often do you think about leaving nursing?**

Never ..... ☐
Sometimes per year ..... ☐
Sometimes per month ..... ☐
Sometimes per week ..... ☐
Sometimes per day ..... ☐

# Musculoskeletal strain

**M1 Have you at any time during the last 12 months had trouble (ache, pain, discomfort) in:**

| | No | Yes |
|---|---|---|
| Neck | ☐ | ☐ |
| Shoulders | ☐ | In the right shoulder ☐<br>In the left shoulder ☐<br>In both shoulders ☐ |
| Elbows | ☐ | In the right elbow ☐<br>In the left elbow ☐<br>In both elbows ☐ |
| Wrist/Hand | ☐ | In the right wrist/hand ☐<br>In the left wrist/hand ☐<br>In both wrists/hands ☐ |
| Upper back | ☐ | ☐ |
| Low back (small of the back) | ☐ | ☐ |
| One or both hips/thighs | ☐ | ☐ |
| One or both knees | ☐ | ☐ |
| One or both ankles/feet | ☐ | ☐ |

M2. Have you at any time during the last 12 months been prevented from doing normal work (at work or at home) because of the trouble? Yes ☐ No ☐
If yes: In which body part(/s)?_____

M3. Have you had any trouble during the last 7 days? Yes ☐ No ☐
If yes: In which body part(/s)_____

# Health Questionnaire (the Work Ability Index)

**H1. Current work ability compared to lifetime best**

**Assume that your work ability at its best has a value of 10 points. How many points would you give your current work ability? (0 means that you cannot currently work at all)**

0 1 2 3 4 5 6 7 8 9 10
completely unable to work — work ability at its best

**H2. Work ability in relation to the demands of the job**

**How do you rate your current work ability with respect to the *physical* demands of your work?**

Very good ☐
Rather good ☐
Moderate ☐
Rather poor ☐
Very poor ☐

**How do you rate your current work ability with respect to the *mental* demands of your work?**

Very good ☐
Rather good ☐
Moderate ☐
Rather poor ☐
Very poor ☐

**H3. Number of current diseases diagnosed by a physician**

**In the following list, mark your diseases or injuries. Also indicate *whether a physician has diagnosed* or treated these diseases. For each disease, therefore, there can be 2, 1, or no alternatives marked.**

| | | Yes: Own opinion | Yes: Physician's diagnosis |
|---|---|---|---|
| | **Injury from accident** | | |
| 01 | Back | ☐ | ☐ |
| 02 | Arm/Hand | ☐ | ☐ |
| 03 | Leg/Foot | ☐ | ☐ |
| 04 | Other part of body. Where, and what kind of injury? _____ | ☐ | ☐ |
| | **Musculoskeletal disease** | | |
| 05 | Disorder of the upper back or cervical spine, repeated instances of pain | ☐ | ☐ |
| 06 | Disorder of the lower back, repeated instances of pain | ☐ | ☐ |
| 07 | (Sciatica) pain radiating from the back, into the leg | ☐ | ☐ |
| 08 | Musculoskeletal disorder affecting the limbs (hands, feet), repeated instances of pain | ☐ | ☐ |
| 09 | Rheumatoid arthritis | ☐ | ☐ |
| 10 | Other musculoskeletal disorder. What?_____ | ☐ | ☐ |

| | | Yes: Own opinion | Yes: Physician's diagnosis |
|---|---|---|---|
| | **Cardiovascular disease** | | |
| 11 | Hypertension (high blood pressure)..... | ☐ | ☐ |
| 12 | Coronary heart disease, chest pains during exercise (angina pectoris)..... | ☐ | ☐ |
| 13 | Coronary thrombosis, myocardial infarction..... | ☐ | ☐ |
| 14 | Cardiac insufficiency..... | ☐ | ☐ |
| 15 | Other cardiovascular disease. What?_____ | ☐ | ☐ |
| | **Respiratory disease** | | |
| 16 | Repeated infections of the respiratory tract (also tonsillitis, acute sinusitis, acute bronchitis). | ☐ | ☐ |
| 17 | Chronic bronchitis..... | ☐ | ☐ |
| 18 | Chronic sinusitis..... | ☐ | ☐ |
| 19 | Bronchial asthma..... | ☐ | ☐ |
| 20 | Emphysema..... | ☐ | ☐ |
| 21 | Pulmonary tuberculosis..... | ☐ | ☐ |
| 22 | Other respiratory disease. What? _____ | ☐ | ☐ |
| | **Mental disorder** | | |
| 23 | Mental disorder or severe mental health problem (e.g. severe depression, mental disturbance)..... | ☐ | ☐ |
| 24 | Slight mental disorder or problem (e.g. slight depression, tension, anxiety, insomnia)..... | ☐ | ☐ |
| | **Neurological and sensory diseases** | | |
| 25 | Problems or injury to hearing.... | ☐ | ☐ |
| 26 | Visual disease or injury (other than refractive error)..... | ☐ | ☐ |
| 27 | Neurological disease (for example, stroke, neuralgia, migraine, epilepsy)..... | ☐ | ☐ |
| 28 | Other neurological or sensory disease. What?_____ | ☐ | ☐ |

| | | Yes: Own opinion | Yes: Physician's diagnosis |
|---|---|---|---|
| | **Digestive disease** | | |
| 29 | Gall stones or disease..... | ☐ | ☐ |
| 30 | Liver or pancreatic disease..... | ☐ | ☐ |
| 31 | Gastric or duodenal ulcer..... | ☐ | ☐ |
| 32 | Gastritis or duodenal irritation.. | ☐ | ☐ |
| 33 | Colonic irritation, colitis..... | ☐ | ☐ |
| 34 | Other digestive disease. What?_____ | ☐ | ☐ |
| | **Genitourinary disease** | | |
| 35 | Urinary tract infection..... | ☐ | ☐ |
| 36 | Kidney disease..... | ☐ | ☐ |
| 37 | Genital disease (e.g. fallopian tube infection in women or prostatic infection in men)..... | ☐ | ☐ |
| 38 | Other genitourinary disease. What?_____ | ☐ | ☐ |
| | **Skin disease** | | |
| 39 | Allergic rash/ eczema..... | ☐ | ☐ |
| 40 | Other rash. What?_____ | ☐ | ☐ |
| 41 | Other skin disease. What?_____ | ☐ | ☐ |
| | **Tumour** | | |
| 42 | Benign tumour..... | ☐ | ☐ |
| 43 | Malignant tumour (cancer). Where?_____ | ☐ | ☐ |
| | **Endocrine and metabolic diseases** | | |
| 44 | Obesity..... | ☐ | ☐ |
| 45 | Diabetes..... | ☐ | ☐ |
| 46 | Goitre or other thyroid disease. | ☐ | ☐ |
| 47 | Other endocrine or metabolic disease. What?_____ | ☐ | ☐ |
| | **Blood diseases** | | |
| 48 | Anaemia..... | ☐ | ☐ |
| 49 | Other blood disorder What?_____ | ☐ | ☐ |
| | **Birth defects** | | |
| 50 | Birth defect. What?_____ | ☐ | ☐ |
| | **Other disorder or disease** | | |
| 51 | What?_____ | ☐ | ☐ |

**H4. Estimated work impairment due to diseases**

**Is your illness or injury a hindrance to your current job? Circle more than one alternative if needed.**

There is no hindrance/ I have no diseases ..... ☐
I am able to do my job, but it causes some symptoms..... ☐
I must *sometimes* slow down my work pace or change my work methods ..... ☐
I must *often* slow down my work pace or change my work methods ..... ☐
Because of my disease, I feel I am able to do only part-time work..... ☐
In my opinion, I am entirely unable to work..... ☐

**H5. Sick leave during the past year**

**How many *whole days* have you been off work because of a health problem (disease or healthcare or for examination) during the past year (12 months)?**

None at all..... ☐
At the most 9 days ..... ☐
10-24 days ..... ☐
25-99 days ..... ☐
100-365 days ..... ☐

**H6. Own prognosis of work ability two years from now**

**Do you believe that, from the standpoint of your health, you will be able to do your current job *two years from now*?**

Unlikely ..... ☐
Not certain..... ☐
Relatively certain..... ☐

**H7. Mental resources**

**Have you recently been able to enjoy your regular daily activities?**

Often ..... ☐
Rather Often..... ☐
Sometimes ..... ☐
Rather seldom..... ☐
Never ..... ☐

**Have you recently been active and alert?**

Always..... ☐
Rather Often..... ☐
Sometimes ..... ☐
Rather seldom..... ☐
Never ..... ☐

**Have you recently felt yourself to be full of hope for the future?**

Continuously ..... ☐
Rather often ..... ☐
Sometimes ..... ☐
Rather seldom..... ☐
Never ..... ☐

Thank you for completing this questionnaire!
Please return this form, and go to the researcher to complete the final part of this survey.

## APPENDIX G: INTERVIEW WITH NURSING PERSONNEL

# Dietary Recall

**What did you eat yesterday?**
**Please list all the things that you've eaten in the last 24 hours, giving portion sizes, and mentioning how the food was prepared. The diagrams provided may assist you in this.**

| Food | Serving Size | Preparation |
|---|---|---|
| | | |
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**Is this a usual diet for you? Y/N**
**Were you at work (or on an off day)? Y/N**
**Are you pregnant or breastfeeding? Y / N**

**How many cigarettes do you smoke per week or per day? _____**
**How many glasses of alcoholic beverages do you drink per week? _____**

| | |
|---|---|
| Stature (m) | |
| Mass (kg) | |
| Waist circumference (cm) | |
| Hip circumference (cm) | |

# Physical Activity Checklist

**How do you get to and from work, and how long does it usually take you?**

| | |
|---|---|
| **Walk** | **Time taken:** |
| **Bicycle** | **Time taken:** |
| **Public transport** | **Time taken:** |
| **Car** | **Time taken:** |
| **Other (please specify)_____** | **Time taken:** |

**If applicable, what is your second or other most common means of transport to and from work? State when/ how commonly this is used (e.g. if raining):_____**

| | |
|---|---|
| **Walk** | **Time taken:** |
| **Bicycle** | **Time taken:** |
| **Public transport** | **Time taken:** |
| **Car** | **Time taken:** |
| **Other (please specify)_____** | **Time taken:** |

**How much time do spend performing the following physical activities? This includes both household chores as well as leisure activities. If the activity is performed every day, answer in hours per day, or if not every day, in hours per week.**

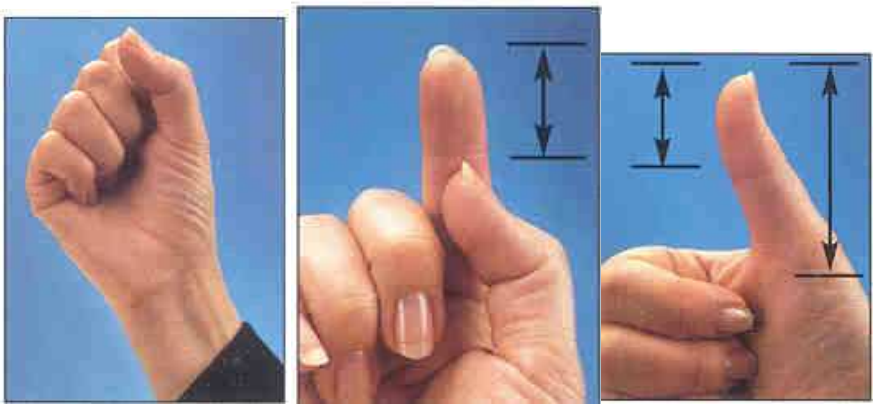
| Activity | Hours per day | Hours per week |
|---|---|---|
| **Housework:** | | |
| **Preparing food, cooking, and washing up** | | |
| **Washing clothes, and ironing** | | |
| **Cleaning house/DIY** | | |
| **Working in the garden** | | |
| **Shopping, including walking to shop if applicable** | | |
| **Looking after children** | | |
| **Studying, or using a computer** | | |
| **Other (specify): e.g. fetching water, feeding animals** | | |
| **Recreational activities:** | | |
| **Brisk walking (not including walking to work)** | | |
| **Moderate aerobic exercise or sport (e.g. Swimming, Jogging, Cycling, Tennis, Squash, Soccer):_____** | | |
| **Vigorous activity/exercise (e.g sprinting)** | | |
| **Weight-bearing exercise (e.g. Lifting weights at a gym)** | | |
| **Watching TV or video** | | |
| **Reading a book** | | |
| **Other (specify):_____** | | |

**Is nursing your only job? If not, what other work do you do? _____**

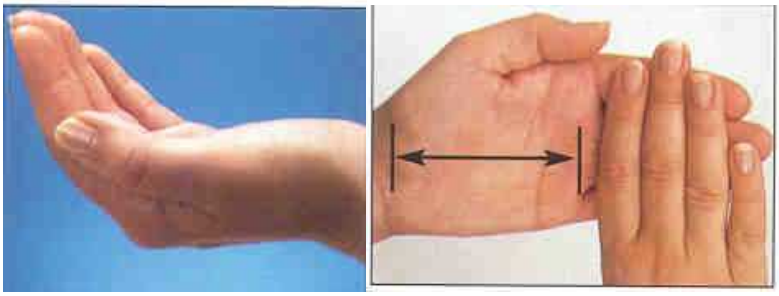
**How many hours sleep do you usually get each night /day? _____**

## APPENDIX H: PICTURES OF SERVING SIZES

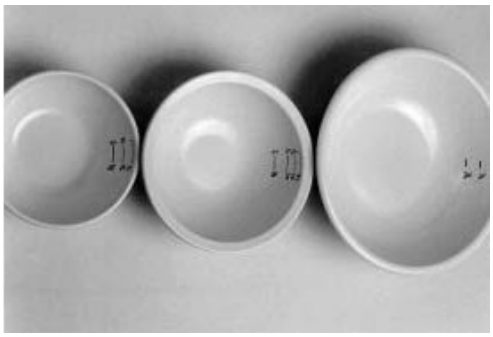
**PORTION SIZES**



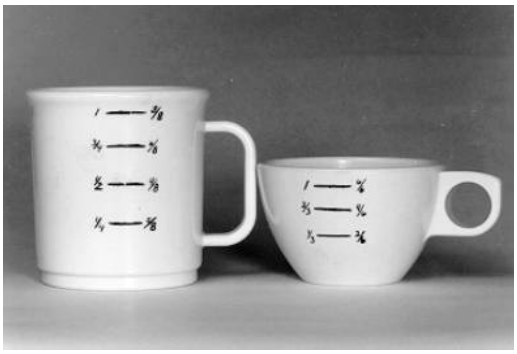
**The size of your fist refers to a medium sized fruit or vegetable (i.e. apple, orange, potato), the size of your fingertip refers to one teaspoon (i.e. sugar, butter on bread), the size of your thumb refers to one tablespoon**



**Your cupped hand refers to approximately 45 g (i.e. a cupped hand of chopped vegetables or rice), the palm of your hand refers to a medium portion of cooked meat, poultry or fish**



**Small Medium Large**



**Mug Cup**

RHODES UNIVERSITY
*Where leaders learn*

# HEALTH GUIDELINES

This pamphlet contains some guidelines to let you know a bit more about your level of health, and some suggestions that may help you to live healthier and happier lives. It includes aspects such as your weight, the food you eat, and the physical activity that you do.

## Body Mass Index (BMI)

Body mass index (BMI) is the ratio between your stature (or body height) and your body weight (or mass). This is calculated by dividing your weight, in kilograms by the square of your height, in metres.

(i.e. $BMI = \frac{\text{Mass (kg)}}{\text{Stature}^2\ (m^2)}$)

A normal, healthy BMI is one that is between 18.5 and 25kg/m$^2$. Any value above or below this indicates an increased health risk. BMI values of above 25 are associated with higher instances of hypertension (high blood pressure), coronary heart disease, and stroke.

BMI categories are defined as follows:

- < 18.5: underweight
- 18.5 – 25: normal
- 25 - 30: overweight
- > 30: obese

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Rhodes University
Website: www.ru.ac.za/hke

## Waist-To-Hip Ratio (WHR)

People usually gain weight either mostly around their waist-line, or in the hip and thigh region, as is shown in the picture below. Those that have more fat around the abdominal or waist area, are at a higher risk of diseases such as type 2 diabetes, heart problems, hypertension and stroke.


Picture taken from:
http://charlesgoldman.files.wordpress.com/

Your waist-to-hip ratio (WHR) is a way of calculating the type of body shape that you have. WHR is calculated by dividing the girth (or circumference) of the narrowest part of your waist, by the girth of the widest part of your hip

(i.e. $WHR = \frac{\text{Waist girth (cm)}}{\text{Hip girth (cm)}}$)

A healthy WHR is said to be one that is below 0.8 for women, and 0.9 for men. Meanwhile, a WHR above 0.8 for women, and 0.9 of men, shows an increased health risk.

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## The Work Ability Index (WAI)

The work ability index (WAI) is a questionnaire designed to give an idea of how well a worker is able to perform at work, and if worker support is needed. It also aims to slow down the general decrease of work ability in workers as they get older.

These are the work ability categories:

- 7-27 points: poor
- 28-36 points: moderate
- 37-43 points: good
- 44-49 points: excellent

If work ability is excellent, it is important to try keep it that way. It is also important that those with good work ability avoid work and life-style features that could decrease it. Moderate work ability can be improved by alterations in diet, exercise, sleep and rest, social activities, and other hobbies and study. Medical rehabilitation, and increased professional knowledge may also be necessary. Problems and risks in the work environment and work organisation should also be fixed. Poor work ability may also be restored by remodelling the work organisation.

Improvements in the work environment may, for example, include a decrease in difficult work postures and movements, improvements in tools and work spaces, and improved feedback and support systems.

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Rhodes University
Website: www.ru.ac.za/hke

## A Healthy Diet

The food you eat can influence your weight, the way you feel, and the amount of energy that you have. It is important to eat the right types of foods so that your body has all the nutrients it needs to function properly. It is also important to try to eat the right portions of food each day.

e food pyramid
ture taken from: nudoserialpelo files.wordpress.com

The diagram above shows the ideal amounts of each type of food to be eaten in a day. Starches and grains, including bread, maize-meal, potatoes, and cereal, are the food-types that are eaten the most, and wholegrain products are generally healthier than refined foods. It is also recommended that you eat at least 5 servings of fruit or vegetables each day, and about 2-3 servings of milk or dairy products. Food such as meat, fish, chicken, eggs, nuts, or beans should also be eaten each day. Fatty or oily food, and foods with lots of sugar should be limited. It is also recommended that you drink 6-8 glasses of water every day.



## Exercise

It is recommended that people should do some type of physical activity for at least 30 minutes on 3 days of the week. This activity can involve walking at a brisk pace, or participating in recreational sport such as swimming, jogging, playing tennis or soccer, or going to the gym to exercise. Exercise is also performed at work, such as when lifting things, climbing stairs, or when walking around. Other forms of exercise includes doing gardening and housework.

Benefits of exercise include weight reduction, faster metabolism, improved circulation or blood supply in the body, improved flexibility and mobility, strengthened joints and stronger muscles, as well as other benefits such as improved moods, and better sleep.

If you are recently starting a new sport or fitness program, it may be necessary to go to a doctor or medical practitioner to give you advice on which activity will suit you best, and to make sure that it will be good for your health. The intensity, length of time you spend exercising, and number of days you spend exercising per week may also change according to your health and level of fitness.

Aerobic exercises such as walking or doing star jumps is good for losing weight. Resistance exercise (or strength training) such as lifting weights in a gym is good for strengthening your joints and muscles.

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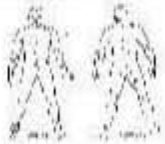
## Musculoskeletal Strain

Nursing tasks, especially those performed in hospital settings, place various strains on the human body. It is linked with a high incidence of lower back pain, as well as shoulder pain, and other musculoskeletal problems. These stressful tasks can include patient-handling, bending over patients, and also sitting or standing for long periods at a time. Also, many injuries are caused from strain placed on the body over long periods of time, and not from a single load or stress placed on the body.

Improved lifting techniques, using mechanical assistance, or assistance from staff members to help lift or move patients can help to reduce the pain or discomfort caused from patient-handling. Alternating work tasks can also help. Ensuring work breaks are taken in which you can change you posture (such as from standing to sitting, or from standing to walking)., can also reduce the total strain placed on your body.



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Rhodes University
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## APPENDIX J: ETHICAL APPROVAL FROM RHODES UNIVERSITY

# Human Kinetics and Ergonomics Ethics Committee Report

RHODES UNIVERSITY
*Where leaders learn*

**Student Name:** Jodi Hodgskiss

**Type of Research:** Master of Science thesis

**Project Title:** The cumulative effects of living and working conditions on the work ability and well-being on nurses in the Eastern Cape district

**Supervisor:** Dr. Swantje Zschernack

**Report compiled:** March 4, 2009

**HKE Ethics Committee Comments**

| Reviewers | Comments |
|---|---|
| **A** | **Final application form approved** |
| **B** | **No further concerns** |
| **C** | **Ok, no concerns** |

| Approved ✓ | Approved, on condition that suggestions have been effected | Request for rework and resubmission | Rejected |
|---|---|---|---|

**Remark:**

The final application has been unanimously approved by the members of the Human Kinetics and Ergonomics (HKE) Ethics Committee.

Signed

Miriam Mattison.

Chairperson
Human Kinetics and Ergonomics Ethics Committee

## APPENDIX K: ETHICAL APPROVAL FROM THE MUNICIPAL DEPARTMENT OF HEALTH



**From:** "Somyalo PrimHealth" <primhealth@makana.gov.za>
**To:** <m.goebel@ru.ac.za>
**Sent:** 20 March 2009 12:02 PM
**Subject:** Research project

Dear Ms Hodgskiss

**RE: permission to conduct a research in Municipality Clinics.**

This serves to inform you that your request to undertake a survey in our clinics has been approved.

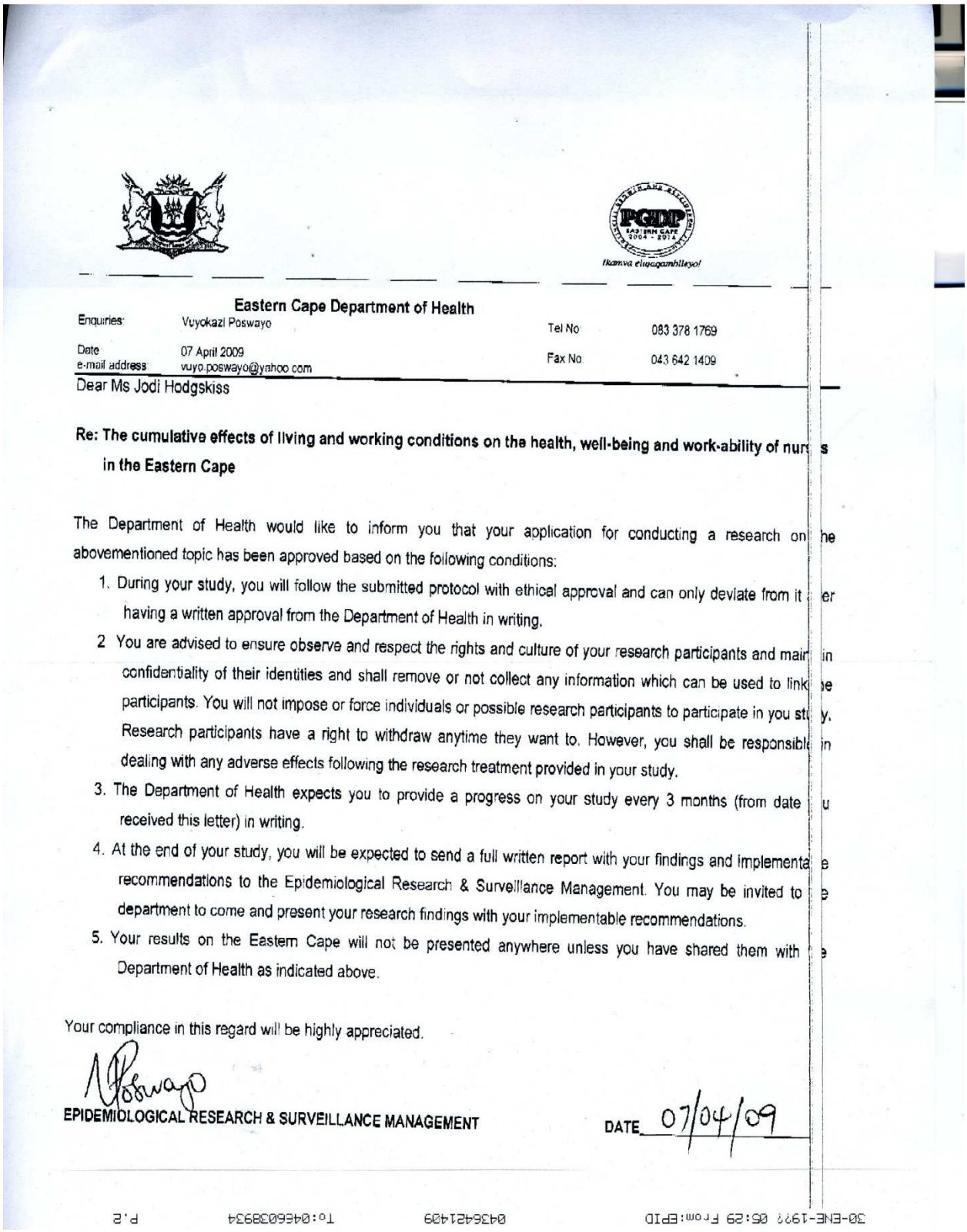
Yours sincerely

L.Somyalo

Assistant Director Primary Health Care

2009/04/15

## APPENDIX L: ETHICAL APPROVAL FROM THE PROVINCIAL DEPARTMENT OF HEALTH



Ikamva elivagambileyo!

**Eastern Cape Department of Health**

Enquiries: Vuyokazi Poswayo
Tel No: 083 378 1769
Date: 07 April 2009
e-mail address: vuyo.poswayo@yahoo.com
Fax No: 043 642 1409

Dear Ms Jodi Hodgskiss

**Re: The cumulative effects of living and working conditions on the health, well-being and work-ability of nurs s in the Eastern Cape**

The Department of Health would like to inform you that your application for conducting a research on he abovementioned topic has been approved based on the following conditions:

1. During your study, you will follow the submitted protocol with ethical approval and can only deviate from it er having a written approval from the Department of Health in writing.
2. You are advised to ensure observe and respect the rights and culture of your research participants and mair in confidentiality of their identities and shall remove or not collect any information which can be used to link e participants. You will not impose or force individuals or possible research participants to participate in you st y. Research participants have a right to withdraw anytime they want to. However, you shall be responsible in dealing with any adverse effects following the research treatment provided in your study.
3. The Department of Health expects you to provide a progress on your study every 3 months (from date u received this letter) in writing.
4. At the end of your study, you will be expected to send a full written report with your findings and implementa e recommendations to the Epidemiological Research & Surveillance Management. You may be invited to e department to come and present your research findings with your implementable recommendations.
5. Your results on the Eastern Cape will not be presented anywhere unless you have shared them with e Department of Health as indicated above.

Your compliance in this regard will be highly appreciated.

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EPIDEMIOLOGICAL RESEARCH & SURVEILLANCE MANAGEMENT

DATE 07/04/09

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