Occupational Injuries Reported at Tygerberg Academic Hospital: 2008-2014

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ABSTRACT

Background

Occupational injuries constitute a huge burden worldwide with significant cost implications. The highest rates and numbers for occupational injuries are found within the healthcare industry in many countries. There is a lack of up-to-date South African statistics.

Methods

A retrospective cohort study with a cross-sectional component was performed at Tygerberg Academic Hospital. PERSAL and injury on duty data was analysed for a seven-year period ranging from 2008-2014.

Results

A total of 6971 employees contributed 21206.99 person-years from 1 January 2008 to 31 December 2014. Of these employees, 574 individuals sustained 715 injury events. Statistically significantly higher injury rates were found among Non-Clinical staff compared to Clinical staff for most variables assessed. Non-Clinical staff had a 1.91 times increased risk of injury relative to Clinical staff ($p<0.001$). However, Nursing Professionals had 1.4 times higher odds of injuries with worse outcomes (as measured by the number of sick days reported) ($p=0.021$).

Conclusions

Evidence based interventions need to be implemented to protect the South African healthcare industry workforce. Particular attention should be given to the musculoskeletal injury events among Nursing professionals. More research is required to confirm and clarify the trends identified within this research project.

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LIST OF ABBREVIATIONS

CSSD	Central Sterile Services Department
CFSW	Cooks and Food Service Workers
DOL	Department of Labour
EU	European Union
GDP	Gross Domestic Product
HHH	Household Aid
HIRA	Hazard Identification and Risk Assessment
ILO	International Labour Organization
IOD	Injury on Duty
LBP	Lower back pain
LL	Lower limb
MOI	Mechanism of Injury
MSI	Musculoskeletal Injury
NHI	National Health Insurance
NIOSH	National Institute for Occupational Safety and Health
NOS	Not Otherwise Specified
OSHA	Occupational Safety and Health Administration
PERSAL	PERsonnel and SALary (A government employee database)
STF	Slips, Trips and Falls
UK	United Kingdom
UL	Upper limb
USD	United States Dollars
WHO	World Health Organization

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"If I have seen further than others, it is by standing upon the shoulders of giants." - Isaac Newton

1. INTRODUCTION

The International Labour Organization (ILO), in a 2012 publication related to the economic costs of occupational injuries and diseases in developing countries, estimates that annually 317-million people suffer from work-related injuries. [1] Country specific ILO statistics are available for injuries per 100 000 population. Unfortunately, this information does not include South African data.[2] In comparison, ILO injury statistics indicating the absolute number of annually reported injuries contains South African data. The latest ILO statistics at the time of writing this paper is for the year 2015. Globally, the number of reported injuries for this year is 3 802 629. South African data on the number of injuries is available for years 2009, 2010 and 2013.[3] When compared to countries with a similar sized labour force (such as Spain and Italy) it is evident that reported rates are much lower in South Africa.* [4] Lower reported rates are most likely due to underreporting as opposed to a smaller burden of occupational injuries in SA. Underreporting has been highlighted in previous publications.[1,5–9] The lack of current aggregate South African injury data available from the ILO supports these claims.

Underreporting of occupational injuries means that an underestimation of the true effects of these incidents occurs. The ILO estimates that 4% of Gross Domestic Product (GDP) gets lost due to occupational injuries and diseases. Costs carried by countries are employer (direct and indirect), employee (loss of quality of life and loss of earnings) and those costs to society. Societal costs include those costs borne by the surrounding community because of the use of public health services and the cost of administering the National Compensation system.[1] Using the ILO estimates, 12.58 billion USD was lost in South Africa in 2015 due to occupational injuries and diseases.†[10] From the above information, it is evident that the prevention of occupational injuries is an important consideration for any occupational health service. One such service is the Occupational Health Clinic, Tygerberg Academic Hospital (TBH).

Tygerberg Academic Hospital is a 1 384-bed hospital situated within Cape Town, South Africa. The facility falls under Western Cape Government Department of Health. TBH Occupational Health Clinic provides a service to approximately 5 200 employees. Within Tygerberg Hospital

* ILO Labour force data allows for a comparison of the size of the workforce and the calculation of crude rates (numerator= total number of injuries, denominator=total size of labour force). [4]
† South Africa GDP for 2015 was 314.57 billion USD (United States Dollars). [10]

any occupational injury is governed by the Compensation for Occupational Injuries and Diseases Act 130 of 1993 (COIDA). When an occupational injury occurs, the office of the Compensation Commissioner gets notified through the completion of specific forms.

The forms requiring completion include, amongst others, -

- Form W.CL. 2- Employer's Report of Accident
- Form W.CL. 3- Notice of Accident and Claim for Compensation
- Form W.CL. 4- First Medical Report in Respect of an Accident
- Form W.CL. 5- Final or Progress Medical Report in Respect of an Accident
- Form W.CL. 6- Resumption Report

The employer keeps copies of these records. At Tygerberg Academic Hospital, processing of all W.CL. documents occurs at the Injury on Duty Office. An analysis of the occupational injury records kept at the injury on duty office has not yet been carried out. Access to these records and the analysis of the data contained therein can provide insights into reported injury rates among employees, those employee groups most at risk of injury and what the biggest risks in the workplace are.

The results of such an analysis of occupational injury data can be used to target high-risk groups within the hospital for intervention. It can also be used to formulate mechanisms and programmes to address risk factors. Identified inefficiencies in the quality and completeness of injury and illness records can be improved on. Knowledge of the scale of the problem and the underlying cause and distribution of occupational injuries can guide future interventions to render the workplace safer for all employees, visitors and clients. Noting the above, the following study aims to evaluate occupational injuries occurring among employees within the TBH setting over a 7-year period from 2008-2014.

2. LITERATURE REVIEW: HEALTHCARE INDUSTRY NON-FATAL OCCUPATIONAL INJURIES

2.1. Introduction

The World Health Organization (WHO) estimates that there are approximately 59 million healthcare workers globally.*(11) Hospitals comprise an environment in which approximately 35% of healthcare workers function.(12) Those employed within the hospital setting encompass not only the clinical staff but also non-clinical trades including housekeeping, food service, security, porters, administrative staff and those responsible for equipment and building maintenance. These trades have health and safety hazards associated with them. Hazards present in the hospital setting include:

- Biological hazards such as blood-borne pathogens, latex, medical waste and airborne diseases;
- Chemical hazards such as cleaning agents, formaldehyde and surgical smoke;
- Ergonomic hazards including computer workstations and patient handling;
- Hazardous drugs such as aerosolized medications and anaesthetic gases;
- Radiation, both ionising and non-ionizing types; and
- Psychosocial factors related to shift work, stress and workplace violence.(13)

The risk of not only occupational diseases but also occupational injuries arises from exposure to hazards in the hospital setting.

2.2. Rates and Numbers

National statistical data in several countries highlight the increased risk of occupational injuries among healthcare workers.† United States (US) Bureau of Labour Statistics data shows that annually, since 2009, the highest number of reported nonfatal occupational injuries has occurred in the Healthcare and Social Assistance industry. This trend has continued to 2015

* The WHO included all paid workers employed in organizations or institutions whose primary intent is to improve health (that is both clinical and non-clinical occupations)

† It should be noted in this and following sections that direct comparison across and within countries should be done cautiously due to differences in reporting. The information is presented in either rates or as absolute numbers (makes direct comparison impossible due to a lack of denominator data. However, and notably, trends and patterns can be observed.

with 562 300 reported events in this year compared to 425 700 incidents in the Manufacturing sector (next highest industry).*(14)

The United States Occupational Safety and Health Administration (OSHA) has recognised the increased risk of occupational injuries among healthcare workers. In response, OSHA published a fact-book titled "Caring for Our Caregiver- Facts about Hospital Worker Safety" in 2013.(15) Using data from the US workforce, the publication includes information on the number of recorded work-related injuries and illnesses in US hospitals, the most common causes and types of injuries and those occupational groups within the hospital who are most at risk. OSHA recorded statistics show injury rates in hospitals three times that of many other professional and business services. Although rates had decreased across all sectors, healthcare sector rates fell at a much slower pace. Hospitals had more recorded sick leave days than the construction, manufacturing and private industries. Work-related injuries outnumbered illnesses, with injuries accounting for 93% of the total cases reported and illnesses accounting for the remaining 7%.(15)

Canadian nonfatal injury statistics for 2015 indicate that by industry Health and Social Services had the highest number of Lost Time Claims. A total of 41 111 claims were recorded for this year compared to Manufacturing, the next highest category, which reported 33 013 claims.†(16) Findings from the 2013/4-2015/6 United Kingdom labour-force survey include that for nonfatal injuries Human Health and Social Work activities had the highest averaged estimated days lost among all industries counted in the survey. The average estimated days lost was 564 000 compared to manufacturing, the next highest industry, which reported 563 000 days lost.(17) Non-fatal injuries reported by the health and social work sector in Ireland comprised the highest proportion, 19.2% (1490 incidents), of all occupational injuries in 2014-15. This was followed by manufacturing with 17.5% (1358 incidents).(18)

European Union (EU) non-fatal occupational injury statistics for the year 2014 display slightly different results. Human Health and Social Work Activities accounted for 11.5% of non-fatal occupational injuries. This was the 4th largest proportion of non-fatal occupational injuries after

* Note that these and the following statistics are the most recent statistics available on the respective national websites at the time of writing this manuscript.

† A "lost time claim" is defined as an injury where a worker is compensated by a Board/Commission for a loss of wages following a work-related injury (or exposure to a noxious substance), or receives compensation for a permanent disability with or without any time lost in his or her employment (for example, if a worker is compensated for a loss of hearing resulting from excessive noise in the work place).(163)

the Manufacturing, Construction and Wholesale and Retail Trade economic activities.[19] Australian workforce data from a 2009/10 survey found that the Health Care and Social Assistance industry had an injury rate of 42.8 per million hours worked. This was the second highest work-related injury frequency rate after the Accommodation and Food Services industry (61.9 per million hours worked).[20]

No recent national occupational injury data specific to the healthcare industry was found for South Africa or the Sub-Saharan African region.* It is estimated that the true burden of occupational injuries within the South African Healthcare context shows a similar pattern to that found internationally and is largely underestimated.

In summary, although data is not reported in a standardised and consistent manner across countries, Health and Social Work constantly report higher non-fatal occupational injury rates and numbers than other industries.† This provides strong evidence that employees within the South African healthcare industry may be at an increased risk for non-fatal occupational injuries compared to other sectors. Empirical data to confirm this hypothesis is currently not readily available from the South African Department of Labour or the Compensation Commissioner.

2.3. Chief Causes of Injuries Reported

2.3.1. Cause: Manual Handling‡

Manual handling forms a ubiquitous part of work across most hospital occupations (clinical and non-clinical) and involves both patients and inanimate objects. It has been cited as the main contributor to occupational injuries in healthcare in official statistics published by the United States (US), Ireland, the United Kingdom (UK) and Australia. In the United Kingdom, Ireland and Australia manual handling accounts as a trigger for one-quarter to a third of reported occupational injuries. The exact proportions are UK 25%, Ireland 29.7% and Australia 30%.

* The most recent occupational injury statistics on the Department of Labour (DOL) website are for 1999.[164] The Compensation Commissioner's office was contacted for more updated statistics. A response is still pending at the time of writing this document.

† It is important to note that these statistics refer to the Healthcare and Social industry as a whole, as opposed to specific occupations. Therefore, injuries for both clinical and non-clinical employees employed in the Healthcare and Social industry would have been included in the reporting.

‡ Manual Handling refers to bending down, lifting, carrying, pushing, pulling, twisting leg or ankle, twisting or turning.[18]

In the United States, this proportion is slightly higher, with 48% of all healthcare occupational injuries caused by manual handling.[15,18,21,22]

The risks of sustaining occupational injuries associated with manual handling have been recognised across many sectors outside of healthcare. This has led to the development of standards, such as the National Institute for Occupational Safety and Health (NIOSH) lifting equation and the ILO Maximum Weight Convention, as well as many country/region-specific legislation and guidelines.*[23–30] To address this hazard in the South African context the SA Department of Labour is in the process of promulgating Ergonomic Regulations.†[31] These guidelines and standards need unique application within the context of patient interaction. Patients are alive and at times uncooperative and erratic.[32,33] Both patient and staff safety must be taken into consideration. Often staff prioritise patient safety over their own wellbeing. [15,34] This brings specific challenges as opposed to only handling inanimate objects which are also a risk.

The biomechanical model for handling and lifting is used to explain the occurrence of injuries during manual handling tasks.[32,35,36] This model likens the human body to a mechanical system functioning at a subconscious level. The main parts of this mechanical system are the skeletal system, muscles and joints. This biomechanical system can withstand a range of stresses (or loads). Anything outside this range may result in injury or illness. These stresses can be divided into postural stress and task-induced stress. Postural stress denotes mechanical stress as a result of the orientation of the body parts over time. Task-induced stress refers to a mechanical effort exerted in performing a specific task. A high biomechanical load due to either or a combination of these stressors predisposes to musculoskeletal injury.[37] Both types of stress would be experienced by a hospital employee, for example in moving a heavy item or positioning a patient in a specific manner (for example during a specific procedure).‡

Quantitative assessment of a hospital employees' biomechanical loads during patient handling is an important consideration. A recent study quantitatively assessing lumbar loads when performing nine tasks ranging from positioning or removing a bedpan to patient lifting was

* NIOSH is a research agency focused on the study of worker safety and health and forms part of the U.S. Centres for Disease Control and Prevention (CDC)
† Draft Ergonomic Regulations are out for comment at the time of writing this manuscript[31]
‡ "Hospital employee" is used as opposed to "healthcare worker" as non-clinical staff (such as porters) may be called upon to assist in moving patients

conducted in a laboratory setting. The investigators found that several of the tasks resulted in disc-compressive forces exceeding the maximum recommended limit of 4.4kN.* These forces were due to both postural and mechanical stresses.[38] This corresponds with findings from other studies highlighting the increased biomechanical loads associated with patient handling.[39,40]

A study evaluated the risk of injuries resulting from patient handling activities. It was performed in a cohort of hospital employees over a seven-year period. They found that patient handling Injury rates were highest for nursing occupations, radiology technicians, emergency medical transport services and patient transporters. The largest proportion of patient handling injuries were from lifting patients (24.9%) while almost equal proportions were due to transfers (15.5%), repositioning (12.6%) or pulling a patient up in a chair or bed (13.7%). A smaller proportion (4.3%) resulted from preventing or catching a patient from falling.[41]
Results from this cohort found that patient handling and other manual handling tasks (lift/push/pull equipment) contributed equally to the burden of musculoskeletal injuries during the period observed.[42]
Therefore, both patient handling activities and other manual handling tasks can be viewed as a risk in the healthcare environment.

2.3.2. Cause: Slips, Trips and Falls (STF)

Within the United Kingdom, STF are the main trigger, resulting in 27% of reported occupational injuries among healthcare workers.[21] OSHA publications have highlighted STF as the second most common event leading to injuries. OSHA statistics indicate that STF is responsible for 25% of hospital worker injuries resulting in days away from work.[15] Falls are the underlying mechanism in 8% of Australian injuries.[22]

As with manual handling, STF have been recognised as a huge contributor to occupational injuries across other industries beyond healthcare.[43–46] The literature makes a clear differentiation between falls on the same level versus “stepping into air” (falls on steps and stairs or from heights) due to different causal mechanisms involved. This differentiation is not always made in occupational injury statistics. Regarding falls on the same level, slipping occurs when there is insufficient friction between the shoe sole/foot and the floor surface. This results

* This was defined as the maximum allowable load limit for young females using German reference ranges (as opposed to NIOSH values). The maximum allowable load limit for females > 60 years was 1.8kN.

in an imbalance in the forward and rear forces acting on the individual and may lead to a loss of posture control. A trip may occur when the foot comes into unexpected forcible contact with an object or person. Both “slips” and “trips” act as triggers and may result in falls.[47]

There are four important aspects to consider in the causation of STF.[47] Using the ILO “structure of accidents” framework these four aspects can be said to comprise various immediate and contributory causes to STF injuries.[48]

The first two aspects, biomechanics and slipperiness perception are said to influence fall frequency and outcome.[47]
Biomechanics includes slip and trip factors and these in turn influence balance and stability. Additional factors related to biomechanics include:

- Walking speed- an increased cadence increases the friction requirement and reduces balance and stability;
- Load Carrying- in normal walking arm movement allows for postural correction. This ability is reduced during load carrying and increases the risk of slipping;
- Footwear- influences friction requirements and balance and stability; and
- Ageing workforce- the age-related decrease in musculoskeletal strength influences friction perception and stability.[47]

The second aspect influencing STF is slipperiness perception. This relates to the psychophysical perception of the external environment. Important processes include proprioceptive feedback, tactile sensation and vision.[47]

The third aspect to consider in STF causality is tribology. This is defined as “the study of surfaces moving relative to one another”.[49] In the context of STF, tribology includes friction variation, the footwear tread pattern, floor and shoe wear and tear, the floor and footwear surface textures and floor cleaning and solid containment.[47]

The fourth and last aspect in the causal pathway of STF is organisational influences. These encompass the upstream organisational factors that affect work systems and organisation, the workplace environment, allocation of tasks and type of equipment used. Organisational influences shape the circumstances and the context in which STF occupational injuries occur.[47]

Each of these aspects and their component immediate and contributory causes is relevant to and demand important consideration within the healthcare industry.

US, Canadian and South African studies have investigated STF across all healthcare occupations over time periods ranging from 3-10 years using retrospective record reviews. These studies have identified some of the causes for STF mentioned above.

Two papers were published investigating STF over a 3 and 4-year period in Canada. Similar results were found in both papers. The highest rates for STF were among facility support workers followed by community health workers.* Community health workers and support workers had an increased risk for STF injuries compared with registered nurses. An increased risk was found over the age of sixty years. Females were found to have an increased risk in one study and higher rates with increased costs in the other. The floor (slippery or uneven) and workplace (design, space and storage) were notable contributing factors. Rates of STF were higher in winter. (50,51)

Similarly, the South African study, conducted over a 3-year period, found that the highest number of reported injuries were among non-clinical staff.† A significant association was found between either non-clinical work, female sex or age 50 and above and STF injuries. (52) A US study conducted over a 3-year period only assessed clinical staff and did not include non-clinical support staff. Nursing professions had the highest percentage of injuries among the clinical staff. Females had the highest proportion of reported injuries.(53) Both this study and the South African one did not assess specific details related to causality such as seasonal variation, workplace design and floor and footwear information. Two US studies reviewed STF records for an 8 and 10-year period. In both studies, a major contributor to STF was liquid contamination (water, other fluids, grease, wax and gel). High STF injury rates were found among non-clinical staff and older employees. A statistically significant increased risk for females was found in one of the studies. (54,55)

The top ten STF hazards identified by the CDC/NIOSH have taken all four causal aspects into account. Factors related to tribology are floor contaminants, poor drainage of pipes and drains, indoor and outdoor walking surface irregularities and weather conditions (ice and snow). Organisational factors are workplace design (inadequate lighting, stairs and handrails, the

* Facility support workers comprised food service workers, kitchen staff, laundry workers and housekeepers.
† This group comprised cleaning, laundry, artisan and administrative staff.

improper use of floor mats and runners and tripping hazards and equipment (step-stools and ladders).*[56] Biomechanics and slipperiness perception are intrinsic to all the top ten hazards. Upstream organisational factors are not mentioned. However, more research in this area is needed.[47]

2.3.3. Cause: Assault

The UK reports that for 2015/16, 21% of all reported non-fatal occupational injuries within healthcare were due to physical assault.[21] This was the third most common cause after manual handling and STF. Within the US, rates for workplace violence incidents were much higher within Health and Social Assistance (7.8 per 10 000 full-time employees) than other industries (less than 2 per 10 000 full-time employees) in 2013.[57] Within Ireland aggression, shock, fright or violence was the second largest contributor to healthcare non-fatal occupational injuries in 2015/16. This cause resulted in 19.8% (N=310) of all incidents reported.[18] These types of incidents are thought to be largely underreported. Among healthcare occupations Nursing professionals are viewed as a group at an increased risk of workplace violence.[57] Exploratory case studies across regions found that within South Africa 61% of participating health care personnel had experienced at least a single incident of physical or psychological violence in the preceding year.[58] Within South Africa Nursing personnel have been highlighted as most at risk. A higher incidence was noted in the public sector compared to the private sector particularly pertaining to physical assault. Patients were the main perpetrators in both the public and private healthcare sectors.[59]

2.4. Chief Type of Injury Reported: Musculoskeletal Injuries (MSI)

Evaluating statistics and reports of musculoskeletal disorders in the healthcare industry should be conducted with caution since variation in definitions exists. Some definitions will include the acute presentation of conditions related to overuse and overload as occupational diseases, others as occupational injuries. In South Africa, some musculoskeletal disorders are listed in Schedule 3 of the COIDA as occupational diseases.

The US, Australian and Canadian data highlight the high proportion of musculoskeletal injuries in the Healthcare Industry. In both the US and Australia “sprains and strains” are the most

* Tripping hazards defined as clutter (including loose cords, hoses, wires, medical tubing)

common type of injury. This kind of injury accounts for 25% of injuries in Australia and 54% in the US. [15,22]

In a seven-year review of Canadian Healthcare Worker's Compensation data, musculoskeletal injuries formed the most common time-loss claims in all provinces. These injuries frequently occurred during direct patient care activities.[60]

Within the European Union workers within the Health and Social Services sector report the highest rate of musculoskeletal disorders (MSDs).* Among females, rates for MSDs are higher in the healthcare sector than across all other sectors.[61] Within the UK health and social care sector 37% of all reported occupational illnesses are MSDs.[21]

As with the chief causes of injuries, musculoskeletal injuries form a significant proportion of all reported occupational injuries across other sectors.[17,19,20,62,63]

MSI are biomechanical in nature. Risk factors influencing causation include genetics, morphology (age, body size), workplace biomechanical hazards (high postural or task-induced stress) and psychosocial factors (work satisfaction, stress and organisation). These are two central assumptions made in all postulated theories explaining the causality of MSI. Proposed causal theories are the multivariate interaction theory, differential fatigue theory, cumulative load theory and overexertion theory.[64]

A brief description of each theory is outlined below:

- Multivariate interaction theory- injuries are an interactive process between the four risk factors (genetic, biological, mechanical and social/organisational) and the weight of each risk factor in an individual. This theory take into account the complexity of the factors acting on an employee concomitantly;
- Differential fatigue theory- tasks not designed to match the individual may result in asymmetry of muscle loading. Muscles are fatigued at different rates creating kinetic imbalances. Eventually, this may lead to unnatural joint motions which may result in increased tissue stress and injury;
- Cumulative load theory- repeated loading of the musculoskeletal system without adequate recovery time results in cumulative fatigue. This ultimately reduces the

* Standardised prevalence rate= 4283 per 100,000 workers

threshold level above which injuries occur. Cumulative fatigue results in tissues more vulnerable to injuries; and

- Overexertion theory- Overexertion implies physical effort beyond the threshold limits of the musculoskeletal system. Physical effort is a function of force generation, duration, posture changes and movement.[65]

These theories are not independent as more than one may be relevant to a single musculoskeletal injury event. When looking at a diverse workforce such as the healthcare industry different causal mechanisms apply to various occupational groupings. This is important in developing appropriate prevention strategies.[64]

Although MSI has a complex causation, adjustable risk factors can be identified and addressed in the workplace. Several studies have explored MSI in nurses and physiotherapists.[66–72] However, few researchers have explored MSI for other occupations within the healthcare industry. A Canadian study exploring MSI across clinical and non-clinical workers found that facility support service workers and care aids had a high relative risk of MSI compared to registered nurses. Both groups had the highest incidence rates across all occupations assessed.* Ergonomics (awkward posture and force) and STF caused the most MSI injuries. However, non-patient care occupations had a higher percentage of STF. Patient handling was the work process in most (59%) of MSI in direct patient care occupations. In comparison in non-patient care occupations, the majority of MSI (55%) occurred during material/equipment handling.[73]

An American study investigated MSI among a cohort of hospital employees over a seven-year period. High rates of injuries and worker's compensation claims were found among female and black workers compared to their counterparts. Occupational groups with high injury rates were nurses (inpatient and nurses' aide) and non-clinical groups.† Regarding the mechanisms of injuries, 62% were due to manual handling activities (patient handling and lift/push/pull of equipment) and 28% were due to STF.‡[42]

These studies highlight the risk of MSI for both clinical and non-clinical occupations and the contribution of manual handling and STF to MSI. Within the healthcare sector, a significant

* Rates calculated per 100 person-years
† Dietary service, housekeepers, laundry staff, lab animal technicians, medical supply assemblers and skilled craft.
‡ Lift/push/pull equipment = 31% and patient handling = 31%

proportion of MSI is caused by manual handling (patient and equipment handling) and STF. There is a need for more healthcare based research focusing on MSI across both clinical and non-clinical occupational groups.

2.5. Individual Occupational Categories

Variation in the injury risk across occupations is an important consideration when investigating the scope, cause and distribution of occupational injuries within healthcare.

There is a paucity of publications providing aggregate occupational injury data comparing risk in clinical to non-clinical employees within hospitals.

Research focusing on specific injury details may compare occupational groups as seen with STF and MSI.[42,50–52,54,55,73] However, this is also limited to a few publications.

The focus of research within the healthcare industry more often centres around a specific occupational group and their risk of injury. The following section discusses those specific occupational groups highlighted as having an increased injury risk in the previous sections, where literature is available.

2.5.1. Support Service Workers.

Support service workers encompass different occupations notably food service workers, porters, cleaners and household staff. They comprise part of the non-clinical workforce. Literature exists exploring injuries among cleaners and food service workers.

2.5.1.1. Cleaners and Housekeeping Staff

Cleaners and household staff in all establishments have been recognised as an occupational group exposed to many different hazards resulting in health problems.[74–76] Within the healthcare environment, they have been studied in both high, middle and low-income countries with various findings. Musculoskeletal problems and STF were a common theme.

Both American and Canadian longitudinal studies found higher injury rates for cleaners than other hospital employees. The Canadian study found musculoskeletal injury rates over double that of other employee groups. MSI comprised 59% of all injuries among cleaners followed by contusions (13%). The most common cause of MSI were manual handling tasks (67%) with a smaller percentage due to STF (10%).[77]

The American study found STF and manual handling incidence rates higher among housekeepers compared to other employees. The most common type of injury among

housekeeping staff were strains (30%) and contusions/abrasions (29%). The lower back, wrists and lower limbs (knees and ankles) were the most affected.[78]

A Brazilian and two Nigerian cross-sectional studies investigated injuries and health problems among hospital cleaners using questionnaires. In the Brazilian setting, sharp injuries and falls were the most common injuries. The hands and fingers were the most affected in contrast to the wrists in the American setting.[79]

The Nigerian study investigating injuries found that burns, falls and NSI were the most commonly reported accidents. Falls were attributed to biomechanics (inappropriate footwear), slipperiness perception (poor vision) and tribology (nature of floor, wet and damp floor and improper cleaning). Organisational influences were not mentioned.[80] The second Nigerian study investigating health problems found that the most common workplace health-related problems among cleaners were lower back pain and muscular and joint pain.[81]

2.5.1.2 Cooks and Food Service Workers (CFSW)

There is a lack of literature investigating injuries among cooks and food service workers (CFSW) in the healthcare industry. MSI was the most prevalent type of injury in a Canadian study. Ergonomics factors and STF resulted in most MSI. The comparison of injuries among CFSW to other occupations was not made.[82]

2.5.2. Nurses

Studies have consistently shown that musculoskeletal injuries are the most common type of injury in nurses with the back most often affected.[83,84] Some South African studies have investigated lower back pain (LBP) in nurses.[85–88] However, not all lower back pain can be linked to a specific occupational injury. This was demonstrated in a study in Durban where only 17.5% of reported LBP was attributed to a specific injury on duty.[86]

There is a scarcity of South African data specifically investigating occupational back injuries among nurses and the causal mechanisms involved, such as that performed elsewhere. This literature cites manual handling (lifting and transferring patients) as common mechanisms for back injury.[89–92]

2.6. Additional Considerations

2.6.1. Age

Young workers are considered a higher risk for occupational injuries.[93] Studies in the healthcare industry investigating an association between age and injury rates have found different results.[94][95] Rates for STF increased with age while in comparison rates for other injury types were highest in younger age categories in a US study.* In contrast, a Canadian study found no overall association between age and injury rates. However, younger employees had an increased risk of cut/puncture injuries and a decreased risk of MSI.

2.6.2. Job Tenure

A relationship between job tenure and occupational injury rates have been found across different industries in previous studies. New employees are consistently found to be at an increased risk for sustaining occupational injuries.[96–98] There is a rarity of studies investigating this relationship within the healthcare industry alone. No association between job tenure and injury rates among healthcare employees was found in a Canadian study.[95]

2.6.3. Sex

Higher rates of occupational injury in men compared to women have been found across industries. However, women had an increased risk for MSI in a few industries including health care and social assistance/services.[99,100] Women had an increased risk of MSI and injuries overall in a study investigating injuries among female healthcare workers.[101]

2.6.4. Socioeconomic Status (SES)

The highest incidence rates were found among employees in lower SES groups. However, this effect was largely mediated and explained by differences in job tenure, organisational and psychosocial factors and workplace demands.[102–104] These results indicate that factors inherent to the work requirements and environment as opposed to education and income play a greater role in occupational injuries in the hospital environment.

2.7. Relevance in South African Healthcare Context

The above indicates that in many countries the healthcare industry has high rates and numbers of nonfatal occupational injuries. STF and manual handling cause the most injuries. MSI are the most common type of occupational injury within the healthcare industry. This mirrors

* Other injury types measured were overexertion, contact with objects and equipment, assaults and violent acts

patterns seen in other sectors. Both the non-clinical and clinical healthcare workforce are at risk. Females are at an increased of MSI. Conflicting evidence has been found for job tenure and age.

It is important to take a step back and consider the implications of these results for the South African health workforce.

2.7.1. Health workforce

South Africa has an average of 140 nurses per 100 000 population. This is lower than the average of 737.5 per 100 000 population among industrialised countries.[105] The health workforce is a scarce and critical resource. A stable workforce is essential to achieving quality patient care and the broader goals of implementing National Health Insurance (NHI) and achieving the United Nations Sustainable Development Goals. A high rate of occupational injuries may lead to prolonged incapacity and cessation of employment for those affected. This has implications for the stability of the workforce.[106,107]

2.7.2 Economic implications

The healthcare industry had one of the highest total costs for occupational injuries and diseases in an analysis of costs across US industries.*[108] As an exempt employer the Western Cape Government Health carries all direct costs and some indirect costs associated with occupational injuries in its workforce.†This can place financial strain on the employer in a currently constrained fiscal climate.[109]

2.7.3 Patient safety

Patient safety is a key domain within the National Core Standards.[110] Employee safety relates to this. Patient safety has been connected to healthcare worker safety.[111][112] High injury rates can negatively influence patient outcomes for example, through staff shortages and suboptimal performance by the employee due to incapacity.[113][114] There is the increased realisation that staff and patient safety are interdependent and not independent. The importance of the relationship of non-clinical occupations to patient safety has also been explored.[115] Although limited evidence exists, improving the health and safety of the healthcare workers benefits patients and ultimately benefits the organisation.[34,116]

* Occupational injury and illness costs analysed were direct, indirect and quality-of-life costs

† Indirect costs include employer productivity losses, which include recruiting and training replacements for injured workers. It also encompasses administrative costs, which include administering workers' compensation programs.

2.8. Putting it All Together: A Need for Further Research

As described, the rates and numbers of occupational injuries among the healthcare industry workforce are a concern in several countries. Negative consequences of the high burden of occupational industries can affect the healthcare workers, patients and the employer.

However, these results cannot be directly extrapolated to the South African context. Accident causation theory explicitly states that environment and worker characteristics are important contributory factors.[48] The South African healthcare environment and employees are very different to those from which much healthcare occupational injury literature is derived. Good quality, reliable, up-to-date South African specific statistics and research are needed.

Such valuable, relevant research informs action and allows employers to meet their obligations under the Occupational Health and Safety Act (No. 85 of 1993).[117] Appropriate resources can be allocated efficiently and effectively through identifying the presence and degree of the healthcare workplace hazards and risks. Occupational injury interventions can be tailored to the needs of the workforce as opposed to taking a "one size fits all" approach.

While waiting for the National governing structures to release reliable industry statistics this research aims to add to the local repository of knowledge within the Western Cape Provincial Health Department. This will be achieved through exploring the distribution of and contributory factors toward occupational injuries among healthcare workers at a tertiary facility. Improved knowledge and insight can be used to guide future health and safety policies and the implementation of effective safety systems and preventative measures, making the workplace studied safer for all.

3. METHODOLOGY

3.1. Research Objectives and Aims

3.1.1. Objectives

i. To describe the incidence rate of occupational injuries reported by staff members at TBH during the study period
ii. Determine whether there are differences in cause and distribution of injuries reported across Clinical and Non-Clinical staff
iii. Determine whether there are differences in cause and distribution of injuries reported by different staff employment categories
iv. Determine whether there are any identifiable risk factors for sustaining an occupational injury within the study population

3.1.2. Aims

i. To determine baseline demographics and characteristics of all staff members included in the study
ii. To determine baseline demographics and characteristics of all staff members reporting injuries.
iii. To determine the work process associated with injuries sustained amongst different staff employment categories.
iv. To determine the place of injury associated with injuries sustained amongst different staff employment categories.
v. To determine the mechanisms of injuries sustained amongst different staff employment categories.
vi. To determine the type of injuries sustained amongst different staff employment categories.
vii. To determine the body regions most affected during injuries sustained amongst different staff employment categories.

3.2. Study Design

The study was conducted using a retrospective cohort study design, with a nested analytical cross-sectional component. A historical cohort was established comprising all contract and permanent employees of Tygerberg Hospital. Those staff members sustaining injuries were compared to non-injured staff members. Using this type of study design allowed for calculating the effect of measured variables on the probability of developing an injury (relative risk) which

would not have been possible using a different study design. A retrospective design was used as the data was available and allowed for analysis over a greater time frame than a prospective cohort study design would have allowed. A descriptive cross-sectional component was used to analyse the various injuries sustained within the cohort.

3.3. Setting

The study was set within Tygerberg Academic Hospital (TBH), the Western Cape Government Department of Health. Data collection took place from November 2015- March 2016. Data was obtained from the Injury-on-Duty office and the PERSAL database via Human Resources. PERSAL is the PERsonnel and SALary Information System of Government civil servants. Ethics approval was obtained from the Stellenbosch University Health Research Ethics Committee, Tygerberg Hospital (ethics reference: S15/02/016) and the National Health Research Database: Western Cape Health Research Committee (reference: WC_2015RP31_119)

3.4. Participants

3.4.1. Study Population

To establish the retrospective cohort, all contract and permanent employees of Tygerberg Academic Hospital (TBH) were included. The population cohort was established on the 1 January 2008. It was a dynamic cohort in that all employees who joined the workforce during the study period were added to the cohort and all employees who left the workforce were removed from the cohort. The time contributed by each employee to the cohort was used in the calculation of incidence density as part of the person-years denominator. The time in employment was deemed the time “at risk” of sustaining an occupational injury.

Inclusion Criteria:

Employees were included in the study if they met all of the following inclusion criteria:

1. A TBH employee- permanent or contract
2. Registered on the PERSAL database
3. Must be eligible to claim compensation in terms of the Compensation for Occupational Injuries and Diseases Act (i.e. meet the definition of “employee” in this Act)
4. Must be in active employment between 01 January 2008- 31 December 2014

Exclusion Criteria:

Persons were excluded from the study if any one of the following criteria was present:

1. Staff not directly employed by the hospital (for example, locum or agency staff)
2. Staff at or above the retirement age of 65 years

3.4.2. Sampling

All the available injury-on-duty records were analysed, therefore no sampling was performed. Because all the records were used it was considered representative of the reported injury on duty incidents at Tygerberg Academic Hospital over the study period.

3.5. Data Sources and Collection

Employment records for the period 2008-2014 were obtained from Human Resources, TBH. This data was extracted from the PERSAL system and provided in Microsoft Excel format, with each year of employment as its own separate file. Each annual employment record file contained details of all contract and permanent employees. Information contained within these records included employee information (date-of-birth, age, gender, ethnicity and language) and details of employment (core occupation description and job title, appointment date, resignation date and salary).

All injury-on-duty data was sourced from the staff files within the IOD office, TBH. When a TBH staff member sustains an IOD their forms are kept in a file within the IOD office. Any future reported occupational injuries or diseases are captured in the same file. Thus, a single staff member's file could contain details of multiple incidents occurring throughout the course of employment. On leaving employment these files are removed from the IOD office and taken to the records department. For each occupational injury event a copy of the following forms are kept in the staff member's file

1. Form W.CL. 2- Employer's Report of Accident
2. Form W.CL. 4- First Medical Report in Respect of an Accident
3. Form W.CL. 5- Final or Progress Medical Report in Respect of an Accident
4. Sick Certificates Issued
5. Correspondence from the Compensation Commissioner, Department of Labour

Not all the files contained a copy of each of the forms listed above. For some minor events, these documents are not kept on file, such as Needlestick Injury (NSI) events. Only complicated NSI events had completed W.CL. forms. A complicated NSI event can be

described as one where a staff member experiences severe side-effects to post exposure prophylaxis requiring further intervention or sick leave. All other NSI information is stored at the Occupational Health Clinic. Consequently, only complicated NSI were included in the analysis.

Using the information contained within the staff members' files the details of all IOD events sustained by each staff member were manually captured into a Microsoft Access database. The required variables (see following section for a discussion of the variables captured) were extracted from the data base and combined with the employment records in Microsoft Excel. Employees not meeting the inclusion criteria, meeting the exclusion criteria and all injury events occurring outside the study period were not extracted from the database for data analysis.

3.6. Variables

3.6.1. Independent Variables

The following employee related independent variables were captured:

1. Date of Birth
2. Occupational group (Refer to Appendix 1 for details of the occupational groups)
3. Date of appointment
4. Date of resignation (if it occurred during the study period)
5. Ethnicity

   Captured as African, Indian, Mixed race or White
6. Sex

   Captured as Male or Female
7. Date of appointment
8. Registered first language
9. Total annual salary in South African Rand

3.6.2. Dependant Variables

The dependant variable was the occurrence of an occupational injury. The following variables were captured in relation to all occupational injury events:

1. Date of each injury
2. Work process (Refer to Appendix 2 for work process details)
3. Place of injury (Refer to Appendix 2 for details of the Place of Injury)

4. Mechanism of injury (Refer to Appendix 2 for mechanism of injury details)
5. Type of injury (Refer to Appendix 2 for type of injury details)
6. Body region affected (Refer to Appendix 2 for details of the body regions affected)
7. Number of sick leave days

3.7. Addressing Potential Bias

There was a possibility of misclassification of injury variables during the data capturing. To limit this there was cross referencing across W.CL. forms and databases during data capturing and analysis. However, misclassification may have occurred, but this is thought to be minimal.

It should be noted that the groups were not very well delineated within PERSAL, as some job titles were captured in more than one Core Description category. There are over 300 different job titles listed within the 16 Core Description categories. To allow for greater accuracy the relevant Support Services occupations were grouped independently (refer to Appendix 1).

The study describes and analyses reported injury on duty (IOD) incidents in the defined cohort. This may not be a true reflection of all IOD incidents within the employee population as a proportion of workers may not report incidents occurring or choose to receive management outside the COIDA system. This may lead to an under-estimation of the true effect of occupational injuries. A second factor leading to underestimation is the removal of files from the IOD office once an employee ends employment. Once an employee leaves employment all files from the HR department are collated and taken to the pension office at TBH. The IOD file is incorporated with all other HR files related to the staff member. No records are kept in the IOD office of files removed for the years 2008-2014.[*] As a result, it is difficult to quantify the number of files excluded. The number of files could not be directly extrapolated from employees leaving the workforce as not all employees leaving the service sustained an occupational injury. To control for this all the old files were requested during data collection and some were obtained from the IOD officer prior to removal. However, files that had been sent to the pension office would have been left out.

[*] Information obtained from Injury on Duty administrative officer

3.8. Statistical Methods

Statistical procedures were performed using the Microsoft Excel, PhStat add-in (version 4.05) for Microsoft Excel and version 13 of STATA (Statacorp).

3.8.1. Descriptive Analysis

The data is first described, using tables, graphs and descriptive statistics. Numerical data is presented with medians (with interquartile ranges) as the data was skewed. Categorical data is presented as proportions (or percentages).

3.8.2. Analytical Analysis

For the analytical component, a significance level of 0.05 is used for all hypothesis tests throughout. Population data is analysed using appropriate statistical inferential techniques and displayed with 95% confidence intervals.

The first part of the analytical component involved calculating the incidence density, measured as injuries per 1000 person-years. The Z Test for Differences in Proportions is used to compare incidence rates.

Crude relative risk and odds ratio calculations were performed. Relative risks were calculated as part of the cohort analysis for all of the independent variables measured and their association with sustaining an injury-on-duty. Odds ratios were calculated as part of the descriptive cross-sectional analysis of the injury events. Whenever a comparison was made for the relative risk or odds ratio calculations the group assessed was compared to the rest of the workforce. Associations for both the relative risk and odds ratio calculations were identified with the Chi-squared test when categorical variables were analysed Associations were identified with the Chi-squared test when categorical variables were analysed (and the Fisher's Exact test when individual cell frequency assumptions were violated). No continuous variables were analysed.

4. RESULTS

4.1 Descriptive Analysis: Study Population (Cohort) Sample Description

The study population consisted of a total of 6971 employees who were retrospectively followed-up over a period from 2008-2014. Staff members included in the analysis ranged from 18-years up to the age of retirement which occurs at the age of 65-years (Refer to 3.3.1. Exclusion Criteria). The cohort contributed a total of 21206.99 person-years. A total of 574 staff members comprising 715 injury events were extracted from the Microsoft Access database for analysis.

4.1.1. Population (Cohort) Workforce Composition

The nursing staff forms much of the workforce at 40.58% (N= 2829). Nursing staff comprise Professional Nurses, Nursing Assistants, Staff Nurses and Nursing Non-Specific. Nursing is followed by the Medical Sciences professionals who encompass 20.93% (N=1459) of the workforce. The Support Staff comprises 16.6% (N= 1157) of the workforce cohort. This group include those professions providing non-clinical, non-administrative support services to the hospital. They are also not involved with engineering and maintenance. These include food service workers, cleaners, general workers, security personnel and porters.

The proportion of the workforce engaged in direct clinical care or health sciences component is 67.98% (N=4739). The remaining 32.02 (N=2232) provide engineering, administrative and support services. Refer to Figure 1

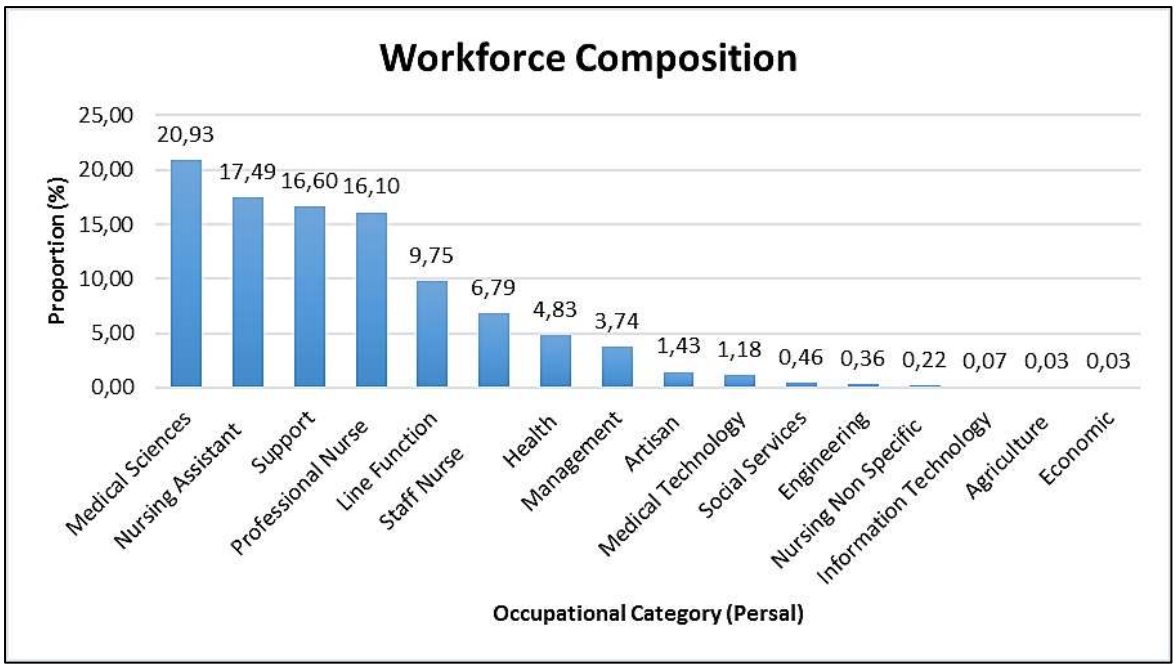

Figure 1: Bar Chart of Workforce Composition 2008-2014

4.1.2. Population Sex Distribution

The population comprised 74.91% (N=5222) females and 25.09% (N=22.13) males.

Refer to Figure 2

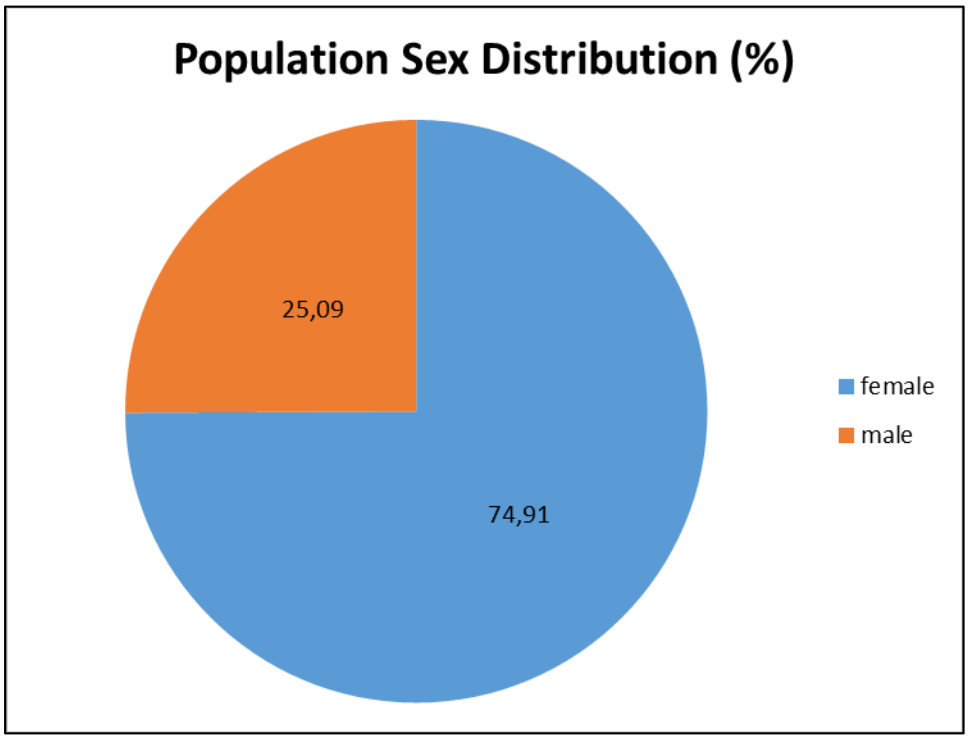

Figure 2: Pie Chart of Population Sex Distribution 2008-2014

4.1.3. Population Age Distribution

Among the workforce cohort the largest proportion, 34.96% (N=2130), of employees were between the ages of 25-34 years.

The minimum and maximum participant age was 18 and 65 years as outlined in the inclusion and exclusion criteria. The median participant age was 37 years with a 25th percentile of 29 years and 75th percentile of 45 years. Refer to Figure 3, 4 and 5

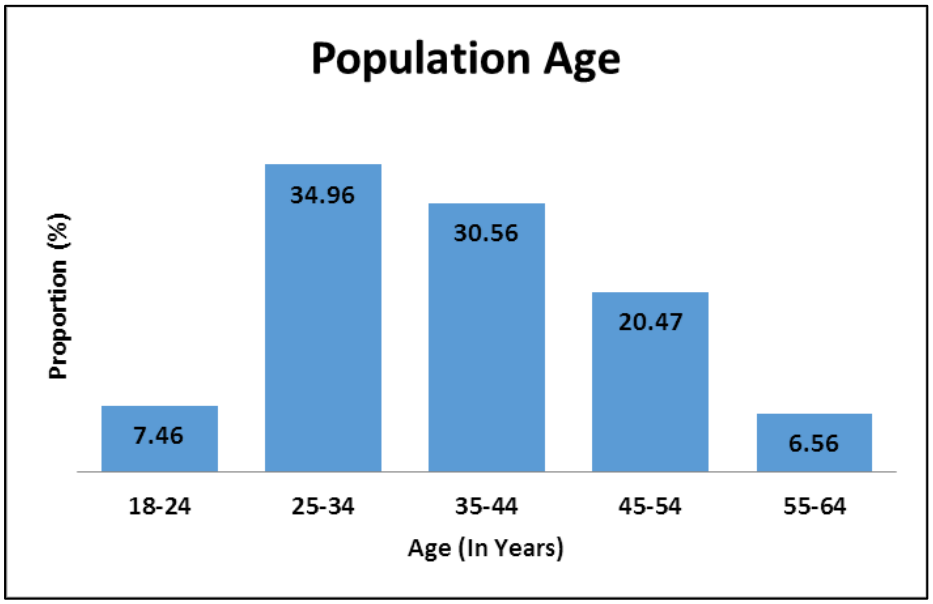

Figure 3: Bar Chart of Population Age Grouped Distribution 2008-2014

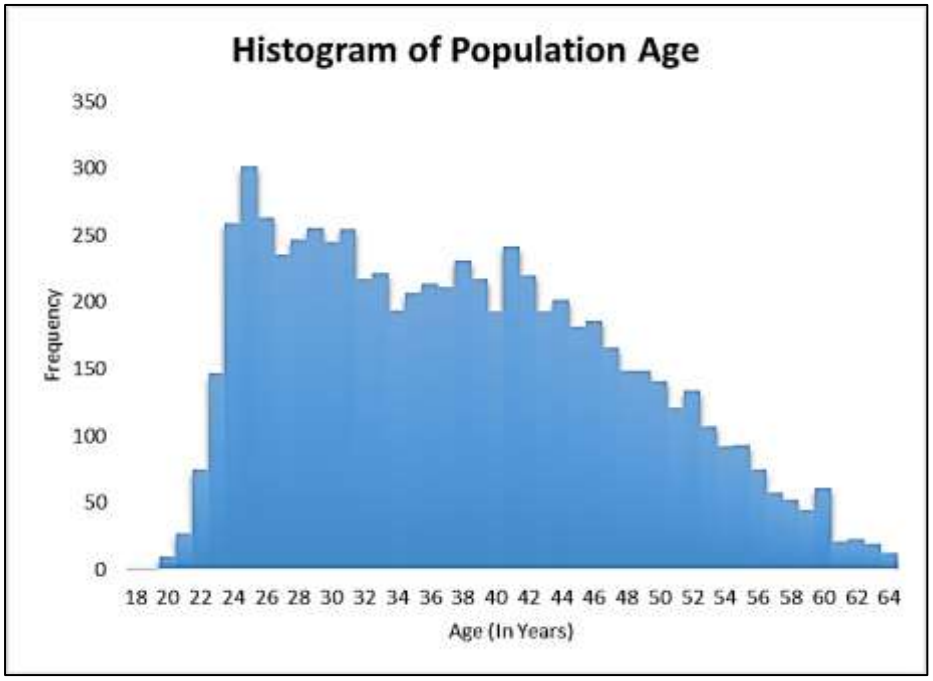

Figure 4: Histogram of Population Age Distribution 2008-2014

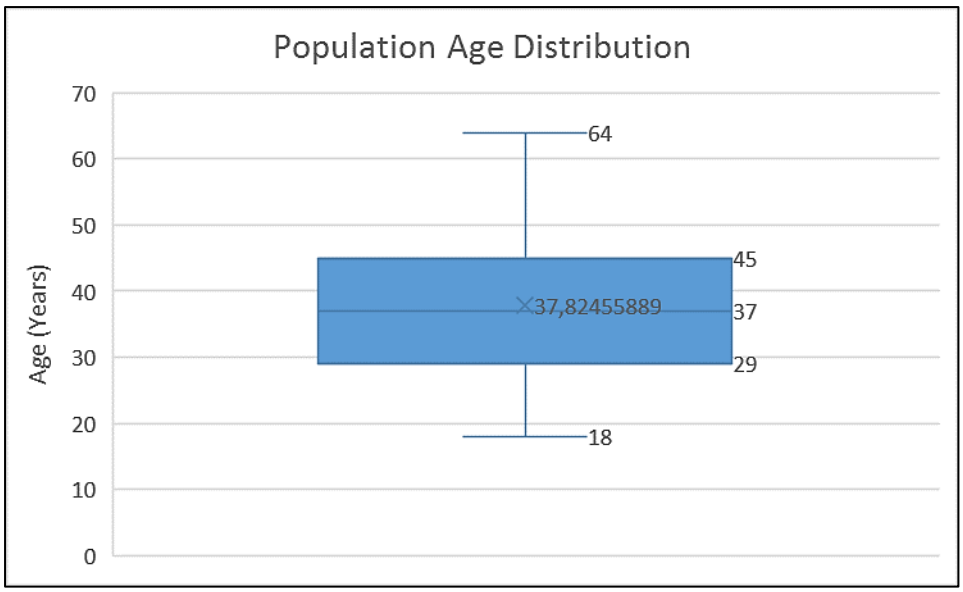

Figure 5: Box and Whisker Plot of Population Age Distribution 2008-2014

4.1.4. Population Language Distribution

Almost half, 49.33% (N=3439), of the population were registered with Afrikaans as their first language, followed by 34.46% (N=2402) English and 13.25% (N=924) Xhosa registered first language speakers. The remaining 2.96% (N=206) had registered either one of the remaining 8 eight South African official languages, other African languages or a European language as their first language. A total of 22 different first languages were registered by the cohort over the follow-up period. Refer to Figure 6

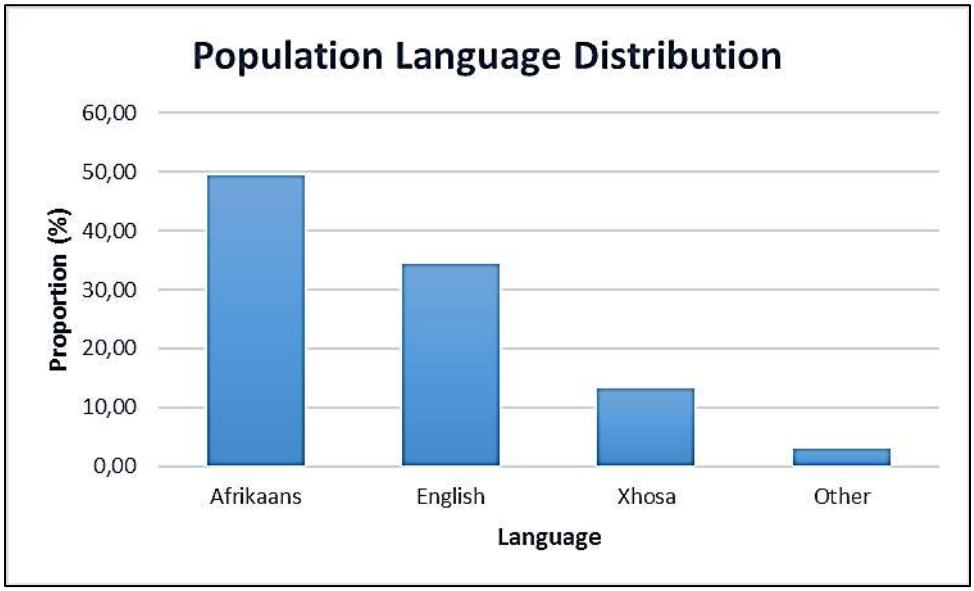

Figure 6: Bar Chart of Population Language Distribution 2008-2014

4.1.5. Population Income Distribution

59.53% (N=4150) employees fell within the lowest income tax bracket as defined by SARS for the 2013-2014 tax year.[118] Refer to Figure 7

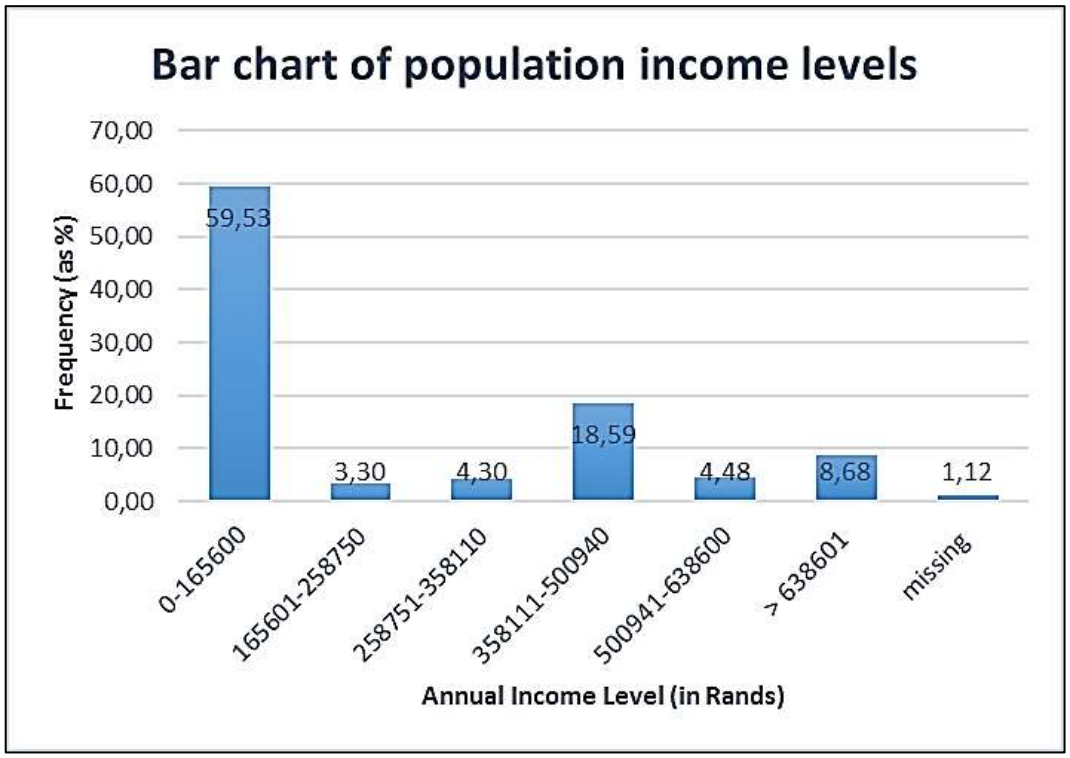

Figure 7: Bar Chart of Population Income Distribution 2008-2014

4.1.6. Population Income and Occupation

Among workers employed at TBH over the period, the engineers had the highest average annual wage (R540 710.69). They contributed 0.3% (N=25) to the overall population size. Nursing was the largest occupation contributing 40.58% (N=2829) of employees. Nurses had the third largest average income (R308 306.07). Medical Sciences was the second largest occupation with the second largest average income [20.93% (N=1459) and R413 620.27]. Support Services was the third largest occupation comprising 17.11% (N=1193) of employees. This group comprised the tenth largest average annual income of (R185 616.62). The inclusion of clerks, security, drivers and other non-managerial occupations in the Management group contributed to this groups low average salary (Refer to Appendix 1 for description of the Occupational groups). Refer to Figure 8

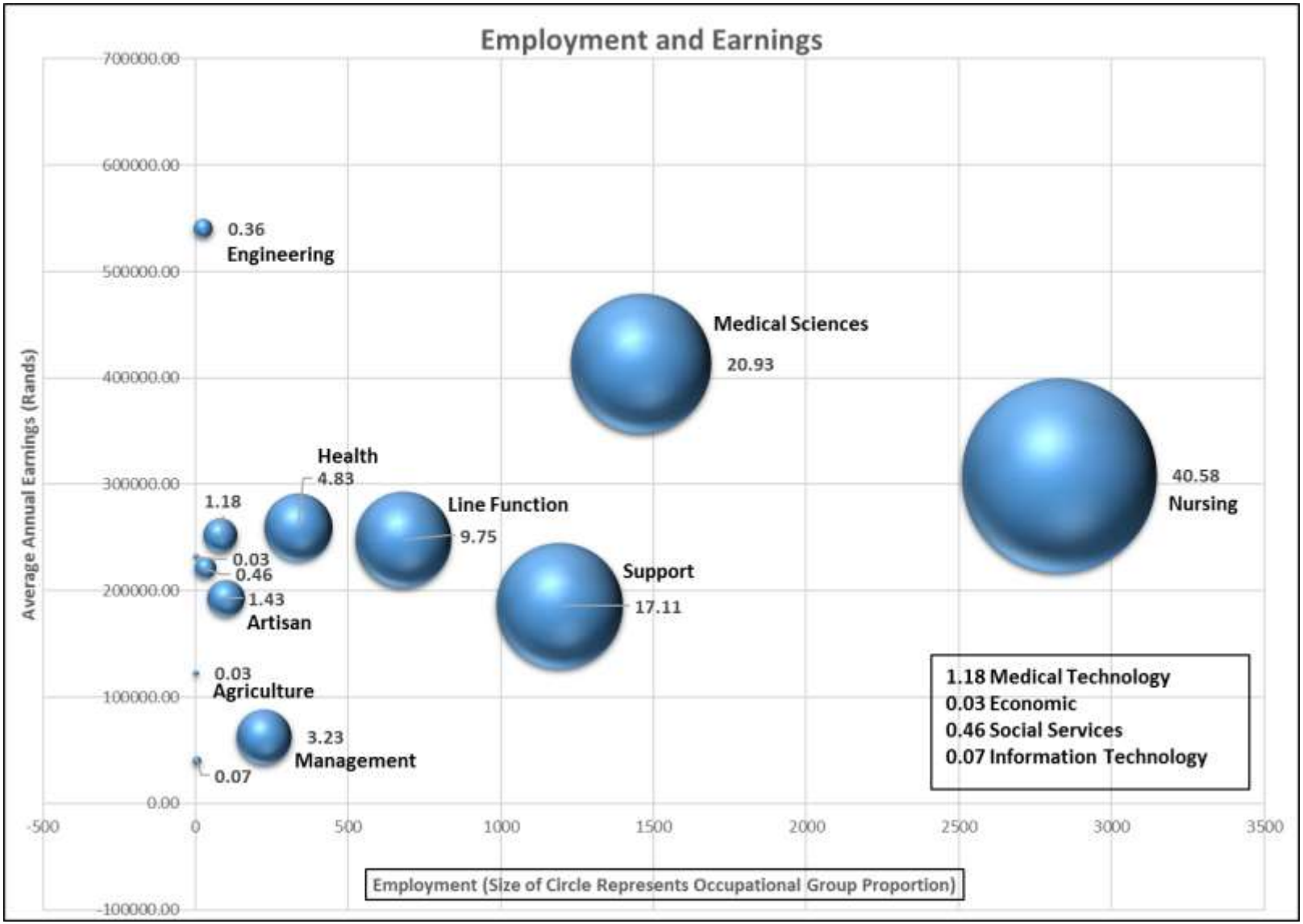

Figure 8: Scatter Plot of Occupation Group Size and Average Annual Income 2008-2014

4.1.7. Population Job Tenure

In terms of job tenure, 47.22% (N=3292) were employed for 1 full year or less. These employees were newly appointed immediately prior or during the study period. The median length of employment was 2 years. Both the minimum and 1st quartile tenure was less than 1 year (0 years) and the maximum tenure 43 years.

The largest proportion, 77.49% (N=2551), of those employed 1 full year or less were clinical staff. Among the total cohort followed up over the study period 53.83% of clinical staff were employed for 1 full year or less as compared to 33.2% of non-clinical staff.

Of these clinical staff employed for 1 full year or less, 52.49% (N=1339) were in the nursing profession and 38.14% (N=973) classified as medical sciences. Of the nurses 42.94% (N=575) were Professional Nurses and 45.33% (N=607) Nursing Assistants. Most of the medical sciences category consisted of new registrars, interns and medical officers who have a naturally short tenure due to the nature of the training contracts. Refer to Figure 9

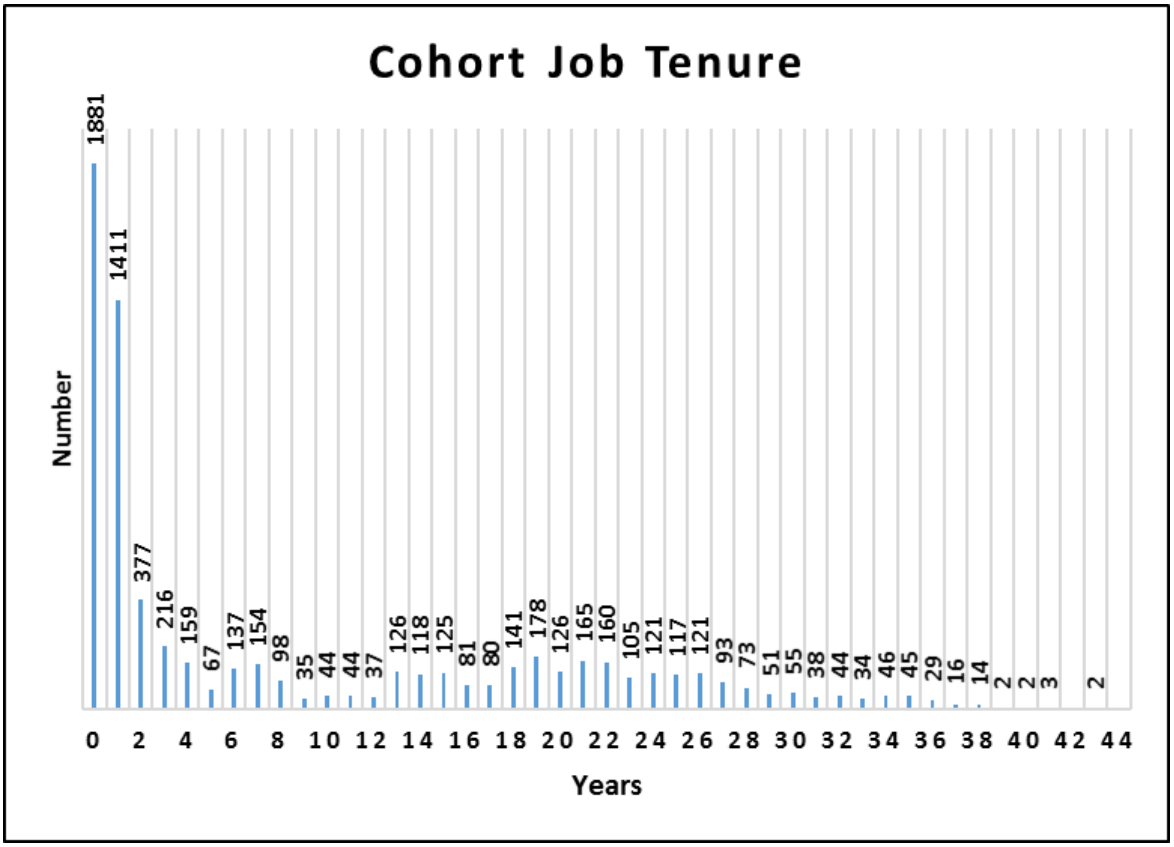

Figure 9: Bar Chart of Cohort Duration of Employment 2008-2014

4.1.8. Population Ethnicity

Mixed race formed the largest proportion with 55.01% (N=3835) followed by 21.29% (N=1484) reported as White, 20.64% (N=1439) as African and 3.06% (N=213) as Indian. Within the Mixed Race category 68.68% (N=2634) were Afrikaans speaking. Refer to Figure 10

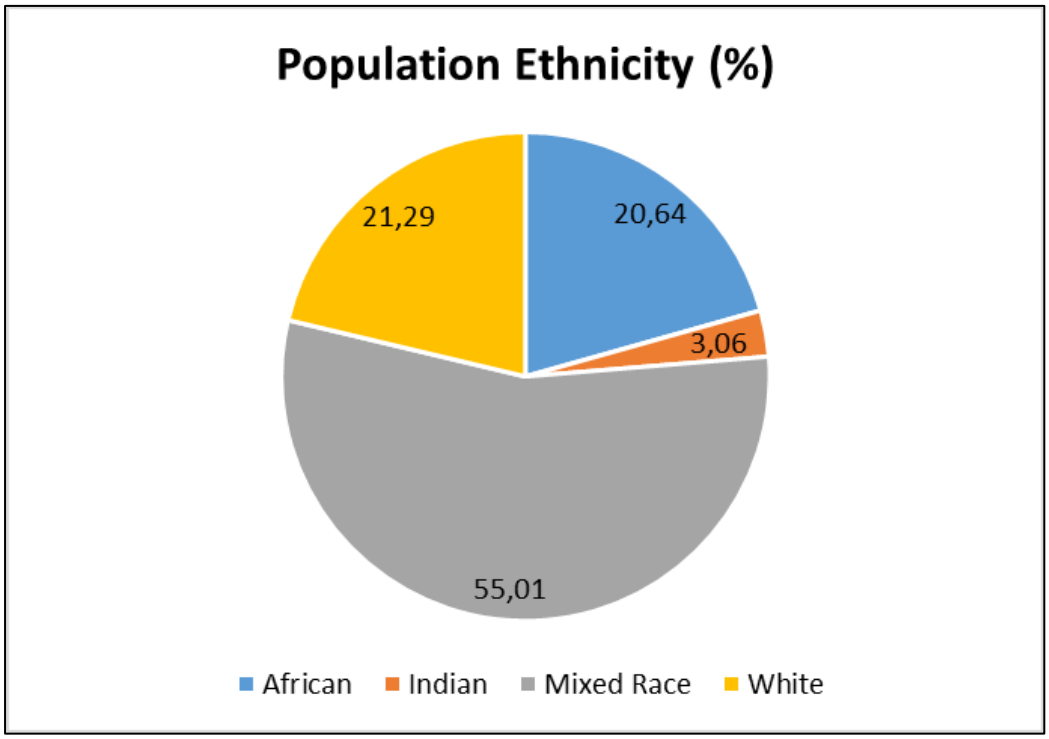

Figure 10: Pie Chart of Population Ethnicity 2008-2014

4.2. Analytical Component

4.2.1. Incidence Density of Reported Injuries sustained from 2008 to 2014

A total of 715 injury events were reported between 2008 and 2014. The cohort contributed a total of 21206.99 person-years. This section reports injury rates with 95% Confidence Intervals for the various independent variables.

4.2.1.1. General Injury Rates

The overall injury rate was 33.72 per 1,000 person-years. A statistically significant difference in injury rates was present between clinical and non-clinical staff. Refer to Table 1

Table 1: Injury Rates of Total Injuries 2008-2014

	No. Injuries	Rate /1,000 PY's	95% CI /1,000 PY's	P Value
Total Injuries	715	33.72	31.31-36.25	
Clinical	363	27.18	24.49-30.09	P<0.001
Non-Clinical	352	44.82	40.32-49.7	

4.2.1.2. Injury Rates: Sex

No statistically significant difference was found between male and female employee injury rates. However, for both sexes a statistically significant difference existed between Clinical and Non-Clinical groups. That is, among both female and male employees, rates in Non-Clinical employees were statistically significantly higher than for Clinical employees. Refer to Table 2

Table 2: Injury Rates by Sex 2008-2014

	No. Injuries	Rate /1,000 PY's	95% CI /1,000 PY's	p Value	
Male	159	31.33	26.74-36.49		p=0.281
Clinical	25	11.18	7.39-16.26	p<0.001	
Non-Clinical	134	47.21	39.71-55.73		
Female	556	34.47	31.69-37.42		
Clinical	338	30.40	27.29-33.78	p<0.001	
Non-Clinical	218	43.47	37.98-49.54		

4.2.1.3. Injury Rates: Employment Categories

Within occupations the highest injury rates were found among the Support staff, Artisan, Health and Staff Nurse groups. These were all higher than the overall injury rate. All nursing groups had injury rates higher than the overall injury rate for clinical staff. Refer to Table 3

Table 3: Injury Rates in Different Workforce Employment Categories 2008-2014

	No. Injuries	Rate /1,000 PY's	95% CI /1,000 PY's
All Clinical	363	27.18	24.49-30.09
All Nursing	295	32.79	29.21-36.7
Professional Nurse	115	32.92	27.3-39.36
Staff Nurse	61	34.76	26.82-44.36
Nursing Assistant	119	31.94	26.58-38.08
Medical Sciences	20	6.49	4.08- 9.85
Medical Technology	1	4.22	0.21- 20.81
Health	45	48.09	35.5-63.77
Social Services	2	19.21	3.22-63.48
All Non-Clinical	352	44.82	40.32-49.7
Line Function	42	16.42	11.99-21.99
Management	23	32.33	20.99-47.74
Artisan	30	92.69	63.68-130.6
Engineering	2	25.00	4.19-82.6
Support	255	61.53	54.32-69.44
Security	12	90.06	48.8-153.1
Food Services	68	111.53	87.28-140.5
Porters	38	61.92	44.44-84.11
Cleaners, General Workers and Household Aids (HHH)	107	52.81	43.49-63.56

4.2.1.4. Injury Rates: Language

Employees registered with Afrikaans as their first language had the highest injury rates. Their rates were higher than the overall injury rate. A statistically significant difference existed in rates across all language groups ($p<0.001$). Within all language groups Non-Clinical employees had statistically significantly higher rates than Clinical employees. Refer to Table 4

Table 4: Injury Rates in Different Language Groups 2008-2014

	No. Injuries	Rate /1,000 PY's	95% CI /1,000 PY's	p value
English	190	28.08	24.29- 32.29	
Clinical	116	24.43	20.28- 29.19	p<0.001
Non-Clinical	74	36.66	28.99- 45.76	
Afrikaans	455	38.27	34.87- 41.91	
Clinical	220	30.55	26.71- 34.79	p<0.001
Non-Clinical	235	50.12	44.01- 56.84	
Xhosa	59	27.63	21.22- 35.39	
Clinical	18	17.83	10.9- 27.64	p=0.010
Non-Clinical	41	36.40	26.47- 48.91	
Other	11	26.55	13.96- 46.15	
Clinical	9	22.79	11.11- 41.82	p=0.034
Non-Clinical	2	103.50	17.35- 341.9	

4.2.1.5. Injury Rates: Job Tenure

Employee's with a job tenure >10 years had the highest injury rates. A statistically significant difference existed across Job Tenure groups (p<0.001). Within all groups Non-Clinical employees had a statistically significantly higher rate than Clinical employees. Refer to Table 5

Table 5: Injury Rates by Duration of Current Employment 2008-2014

	No. Injuries	Rate /1,000 PY's	95% CI /1,000 PY's	p value
0-1 Years	119	33.90	28.21-40.42	
Clinical	70	25.07	19.69-31.49	p<0.001
Non-Clinical	49	68.21	51.02-89.44	
2-10 Years	216	30.23	26.39-34.47	
Clinical	111	23.33	19.28-27.98	p<0.001
Non-Clinical	105	43.99	36.16-53.04	
>10 Years	380	36.01	32.53-39.78	
Clinical	182	31.36	27.05-36.17	p=0.005
Non-Clinical	198	41.70	36.19-47.82	

4.2.1.6. Injury Rates: Age

The highest injury rate was in staff members aged 45-54 years. A statistically significant difference existed in injury rates across all age groups (p<0.001). Non-Clinical employees had significantly higher rates than clinical employees for all age groups except 18-24 years. Refer to Table 6

Table 6: Injury Rates in Different Age Groups (In Years) 2008-2014

	No. Injuries	Rate /1,000 PY's	95% CI /1,000 PY's	p value
Age 18-24	13	25.16	14.01- 42	
Clinical	7	19.19	8.41- 38.04	p=0.186
Non-Clinical	6	39.46	16- 82.1	
Age 25-34	139	27.29	23.03- 32.12	
Clinical	85	22.77	18.31- 28.02	p=0.001
Non-Clinical	54	39.67	30.1- 51.38	
Age 35-44	224	33.62	29.43- 38.24	
Clinical	128	28.64	23.99- 33.94	p=0.002
Non-Clinical	96	43.75	35.64- 53.19	
Age 45-54	265	40.60	35.93- 45.72	
Clinical	118	32.71	27.2- 39.03	P<0.001
Non-Clinical	147	50.35	42.7- 59.01	
Age 55-64	74	30.76	24.33- 38.41	
Clinical	25	21.19	14.01- 30.81	p=0.009
Non-Clinical	49	39.98	29.92- 52.45	

4.2.1.7. Injury Rates: Income Bracket

A statistically significant difference existed in injury rates across all income groups (p<0.001). The highest rates were in employees in the lowest income group. A statistically significant difference between Clinical and Non-clinical employees was found only in this group (p<0.001). Refer to Table 7

4.2.1.8. Injury Rates: Ethnicity

A statistically significant difference existed in injury rates across all ethnicity groups (p<0.001). The highest injury rates were observed in the Mixed Race and African groups. A significant difference between Non-clinical and Clinical employees was found for these groups. Refer to Table 8

Table 7: Injury Rates in Different Income Groups 2008-2014

	No. Injuries	Rate /1,000 PY's	95% CI /1,000 PY's	p value
R 0-165,600	468	42.58	38.85- 46.57	
Clinical	155	32.87	27.99- 38.36	p<0.001
Non-Clinical	313	49.87	44.57- 55.63	
R 165,601 – 258,750	152	32.31	27.48- 37.77	
Clinical	117	35.06	29.12- 41.86	p=0.102
Non-Clinical	35	25.61	18.12- 35.23	
R 258,751 – 358,110	57	32.74	25.03- 42.11	
Clinical	53	33.36	25.24-43.29	p=0.644
Non-Clinical	4	26.27	8.35- 63.36	
R 358,111 – 500,940	22	13.80	8.87-20.55	
Clinical	22	14.11	9.07- 21.01	p=0.482
Non-Clinical	0	0.00	0.0	
R 500,941 – 638,600	7	11.32	4.95- 22.4	
Clinical	7	11.44	5.00- 22.62	p=0.792
Non-Clinical	0	0.00	0.0	
>R 701,300	9	6.77	3.30- 12.42	
Clinical	9	6.83	3.33- 12.54	p=0.773
Non-Clinical	0	0.00	0.0	
Missing	0	0.00	0.0	

Table 8: Injury Rates in Different Race Groups 2008-2014

	No. Injuries	Rate /1,000 PY's	95% CI /1,000 PY's	p value
African	90	26.51	21.44- 32.43	
Clinical	37	20.01	14.3- 27.29	p=0.011
Non-Clinical	53	34.28	25.94-44.49	
Mixed	562	41.77	38.43- 45.34	
Clinical	287	35.64	31.7- 39.95	p<0.001
Non-Clinical	275	50.92	45.16- 57.21	
Indian	2	4.80	0.80-15.85	
Clinical	2	4.97	0.83- 16.41	p=0.790
Non-Clinical	0	0.00	0.0	
White	61	15.48	11.94-19.75	
Clinical	37	12.13	8.67-16.55	p=0.002
Non-Clinical	24	26.92	17.65-39.44	

4.2.2. Risk Factors (Relative Risk) for Sustaining an Injury among Cohort from 2008 to 2014

A total of 574 employees sustained one or more injuries between 2008 and 2014. This section explores risk factors among these 574 staff members for sustaining an injury by the various independent variables.

4.2.2.1. Relative Risk: Employment Categories

Statistically significant results: All Non-Clinical, Artisan and Support employees had an increased risk of injury relative to all other employees. The highest risk was found among Artisans, Food Service Workers and Security. Refer to Table 9

Table 9: Relative Risk of Different Employment Categories 2008-2014

Employment category	% (N) Injured	RR (95%CI)	p value*
All Clinical	6.37 (302)	0.52 (0.45 - 0.61)	p<0.001
All Nursing	8.73 (247)	1.11 (0.94 - 1.30)	p=0.212
Professional Nurse	8.29 (93)	1.01 (0.81 - 1.25)	p=0.942
Staff Nurse	10.36 (49)	1.28 (0.97 - 1.69)	p=0.082
Nursing Assistant	8.61 (105)	1.06 (0.86 - 1.29)	p=0.596
Medical Sciences	1.23 (18)	0.12 (0.08 - 0.19)	p<0.001
Medical Technology	1.22 (1)	0.15 (0.02 - 1.03)	p=0.020
Health	10.09 (34)	1.24 (0.89 - 1.72)	p=0.204
Social Services	6.25 (2)	0.76 (0.20 - 2.91)	p=1.000
All Non-Clinical	12.19 (272)	1.91 (1.64 - 2.23)	p<0.001
Line Function	5.15 (35)	0.60 (0.43 - 0.84)	p=0.002
Management	6.51 (17)	0.78 (0.49 - 1.25)	p=0.303
Artisan	26.00 (26)	3.26 (2.32 - 4.58)	p<0.001
Engineering	8.00 (2)	0.97 (0.26 - 3.68)	p=1.000
Support	16.59 (192)	2.53 (2.15 - 2.97)	p<0.001
Security	22.22 (8)	2.72 (1.47 - 5.04)	p=0.008
Food Services	24.43 (43)	3.13 (2.38 - 4.11)	p<0.001
Porters	16.38 (29)	2.04 (1.45 - 2.88)	p<0.001
Cleaner /HHH	14.68 (85)	1.92 (1.55 - 2.38)	p<0.001

* For all relative risk calculations, the relative risk and it's corresponding p-value pertain to the particular employee group assessed compared to all other employees grouped together.

4.2.2.2. Relative Risk: Gender

Statistically significant results: There was no increased risk for either sex (p=0.087). However, for both sexes Non-Clinical employees had an increased risk relative to clinical employees. Refer to Table 10

Table 10: Relative Risk by Sex 2008-2014

	% (N) Injured	RR (95%CI)	p value
Female	8.56 (447)	1.18 (0.98 - 1.42)	p=0.087
Non-Clinical	11.78 (165)	1.60 (1.33 - 1.91)	p<0.001
Clinical	7.38 (282)		
Male	7.26 (127)	0.85 (0.70 - 1.03)	p=0.087
Non-Clinical	12.88 (107)	5.91 (3.70 - 9.44)	p<0.001
Clinical	2.18 (20)		

4.2.2.3. Relative Risk: Language

Statistically significant results: Employees registered with Afrikaans as their first language had an increased risk of injury relative to other language groups. Within Afrikaans, English and Xhosa groups Non-clinical employees had an increased risk of injury relative to Clinical employees. Refer to Table 11

Table 11: Relative Risk of Different Language Groups 2008-2014

	% (N) Injured	RR (95%CI)	p value
English	6.62 (159)	0.73 (0.61 - 0.87)	p<0.001
Non-Clinical	10.90 (62)	2.06 (1.52 - 2.79)	p<0.001
Clinical	5.29 (97)		
Afrikaans	10.41 (358)	1.70 (1.45 – 2.00)	p<0.001
Non-Clinical	14.21 (176)	1.72 (1.41 - 2.09)	p<0.001
Clinical	8.27 (182)		
Xhosa	5.09 (47)	0.58 (0.44 - 0.78)	p<0.001
Non-Clinical	7.75 (32)	2.64 (1.45 - 4.81)	p=0.001
Clinical	2.94 (15)		
Other	4.85 (10)	0.58 (0.32 - 1.07)	p=0.073
Non-Clinical	18.18 (2)	4.43 (1.07 - 18.44)	p=0.092
Clinical	4.10 (8)		

4.2.2.4. Relative Risk: Job Tenure

Statistically significant results: All employees with a job tenure of 2 years of longer had an increased risk of injury. For everyone employed for 10 years or less, Non-clinical employees had an increased risk of injury relative to Clinical employees. Refer to Table 12

Table 12: Relative Risk of Duration of Employment 2008-2014

	% (N) Injured	RR (95%CI)	p value
Years 0-1	3.34 (110)	0.26 (0.22 - 0.32)	p<0.001
Non-Clinical	6.07 (45)	2.38 (1.64 – 3.45)	p<0.001
Clinical	2.55 (65)		
Years 2-10	12.74 (164)	1.77 (1.49 - 2.10)	p<0.001
Non-Clinical	20 (76)	2.06 (1.55 – 2.73)	p<0.001
Clinical	9.7 (88)		
Years >10	12.54 (300)	2.10 (1.79 - 2.45)	p<0.001
Non-Clinical	13.59 (151)	1.17 (0.95 – 1.44)	p=0.149
Clinical	11.63(149)		

4.2.2.5. Relative Risk: Age (Years)

Statistically significant results: Employees aged 45 years and above had an increased risk of injury relative to other age groups. Among employees aged 25-54 years, Non-clinical employees had an increased risk for injury relative to Clinical employees. Refer to Table 13

Table 13: Relative Risk of Age (In Years) 2008-2014

	% (N) Injured	RR (95%CI)	p value
Age 18-24	2.50 (13)	0.29 (0.17 - 0.49)	p<0.001
Non-Clinical	4.51 (6)	2.49 (0.85 - 7.29)	p=0.106
Clinical	1.81 (7)		
Age 25-34	5.13 (125)	0.52 (0.43 - 0.63)	p<0.001
Non-Clinical	9.24 (51)	2.35 (1.67 - 3.32)	p<0.001
Clinical	3.93 (74)		
Age 35-44	8.45 (180)	1.04 (0.88 - 1.23)	p=0.663
Non-Clinical	10.77 (71)	1.45 (1.09 - 1.93)	p=0.010
Clinical	7.41 (109)		
Age 45-54	14.30 (204)	2.14 (1.82 - 2.52)	p<0.001
Non-Clinical	17.26 (111)	1.46 (1.13 - 1.88)	p=0.004
Clinical	11.86 (93)		
Age 55-64	11.38 (52)	1.42 (1.09 - 1.86)	p=0.011
Non-Clinical	13.47 (33)	1.50 (0.88 - 2.56)	p=0.130
Clinical	8.96 (19)		

4.2.2.6. Relative Risk: Ethnicity

Statistically significant results: Mixed race employees had an increased risk relative to other employees. Of these employees 71.84% (N=324) were registered with Afrikaans as their first language. Within all ethnic groups except for Indians, Non-Clinical employees had an increased risk relative to clinical employees. Refer to Table 14

4.2.2.7. Relative Risk: Income Group

Statistically significant results: Employees within the two lowest income categories had an increased risk of injury relative to other employees. Within these categories Non-clinical employees had an increased risk relative to Clinical employees. Refer to Table 15

Table 14: Relative Risk of Different Ethnic Categories 2008-2014

	% (N) Injured	RR (95%CI)	p Value
African	5.28 (76)	0.59 (0.46 - 0.74)	p<0.001
Non-Clinical	7.96 (43)	2.17 (1.40 - 3.37)	p<0.001
Clinical	3.67 (33)		
Indian	0.94 (2)	0.11 (0.03 - 0.44)	p<0.001
Non-Clinical	0 (0)	‡*	‡
Clinical	0.97 (2)		
Mixed	11.76 (451)	3.00 (2.47 - 3.64)	p<0.001
Non-Clinical	14.53 (211)	1.44 (1.21 - 1.72)	p<0.001
Clinical	10.07 (240)		
White	3.03 (45)	0.31 (0.23 - 0.42)	p<0.001
Non-Clinical	7.69 (18)	3.56 (1.99 - 6.36)	p<0.001
Clinical	2.16 (27)		

Table 15: Relative Risk Income (South African Rand) 2008-2014

	% (N) Injured	RR (95%CI)	p value
R 0-165,600	9.13 (379)	1.32 (1.12 - 1.56)	p=0.001
Non-Clinical	11.64 (242)	1.76 (1.44 - 2.15)	p<0.001
Clinical	6.62 (137)		
R 165,601 – 258,750	9.10 (118)	1.13 (0.93 - 1.37)	p=0.206
Non-Clinical	21.09 (27)	2.71 (1.84 - 3.99)	p<0.001
Clinical	7.79 (91)		
R 258,751 – 358,110	14.74 (46)	1.86 (1.41 - 2.46)	p<0.001
Non-Clinical	21.43 (3)	1.49 (0.52 - 4.20)	p=0.443
Clinical	14.43 (43)		
R 358,111 – 500,940	2.98 (18)	0.34 (0.21 - 0.54)	p<0.001
Non-Clinical	0 (0)	‡	‡
Clinical	2.99 (18)		
R 500,941-638,600	1.74 (4)	0.21 (0.08 - 0.55)	p<0.001
Non-Clinical	0 (0)	‡	‡
Clinical	1.75 (4)		
R 638,601 and above	3.00 (9)	0.35 (0.19 - 0.68)	p=0.001
Non-Clinical	0 (0)	‡	‡
Clinical	3.04 (9)		

* ‡ = Relative risk and p-value calculation is not possible

4.2.3. Detailed Analysis for Groups with a Significant Increased Risk of Injuries 2008-2014

This section takes a more focused look at risk factors within those groups in the previous section highlighted as having an increased risk relative to all other employees. Refer to Appendix 3 for more details.

4.2.3.1. Non-Clinical Workforce

Within the Non-Clinical workforce employees aged 45-54 years had an increased risk relative to other age groups. Afrikaans speaking had an increased risk relative to other language groups. Employees with a job tenure longer than two years had an increased risk relative to those working for one full year or less.

4.2.3.2. Artisans

There were no statistically significant risk factors present for any of the independent variables assessed within the Artisan workforce.

4.2.3.3. All Support Services

Employees aged 45-54 years were at an increased risk relative to other age groups. Employees registered with Afrikaans as their first language were at an increased risk relative to other language groups. Employees with a job tenure of between 2-10 years had an increased risk relative to other tenures.

4.2.3.4. Support Services- Security

There were no statistically significant risk factors present for any of the independent variables assessed within the Security workforce.

4.2.3.5. Support Services-Food Services

Employees aged 45-54 years had an increased risk relative to other age groups. Employees with a job tenure of more than ten years had an increased risk relative to other job tenures.

4.2.3.6. Support Services- General Workers/Cleaners/Household Aids (HHH)

Employees with Afrikaans registered as their first language had an increased risk relative to other language groups. Employees with a job tenure of between 2-10 years had an increased risk relative to other lengths of employments.

4.2.3.7. Support Services- Porters

There were no statistically significant risk factors present for any of the independent variables assessed within the Porter workforce.

4.2.4. Cross-Sectional Analysis of Injuries Sustained 2008-2014

This section explores the 715 injury events in more detail.

4.2.4.1. Injuries by Occupational Category

A total of 715 injury events were reported by the 574 staff members injured between 2008 and 2014. Clinical staff had the highest proportion of injury events, with 50.77% (N=363) events occurring in this professional group. However, 6.37% (N=302) of all Clinical staff employed during this period sustained injuries as compared to 12.19% (N=272) of Non-Clinical staff. Nursing Professionals had the highest proportion of injury events, with 41.26% (N=295) events occurring in this professional group. However, 8.73% (N=247) of all Nurses employed during the period sustained injuries. Artisans had the highest proportion of injuries relative to their occupational group, 26% (N=26), however a low proportion of overall injury events, 4.2% (N=30). Refer to Figure 11

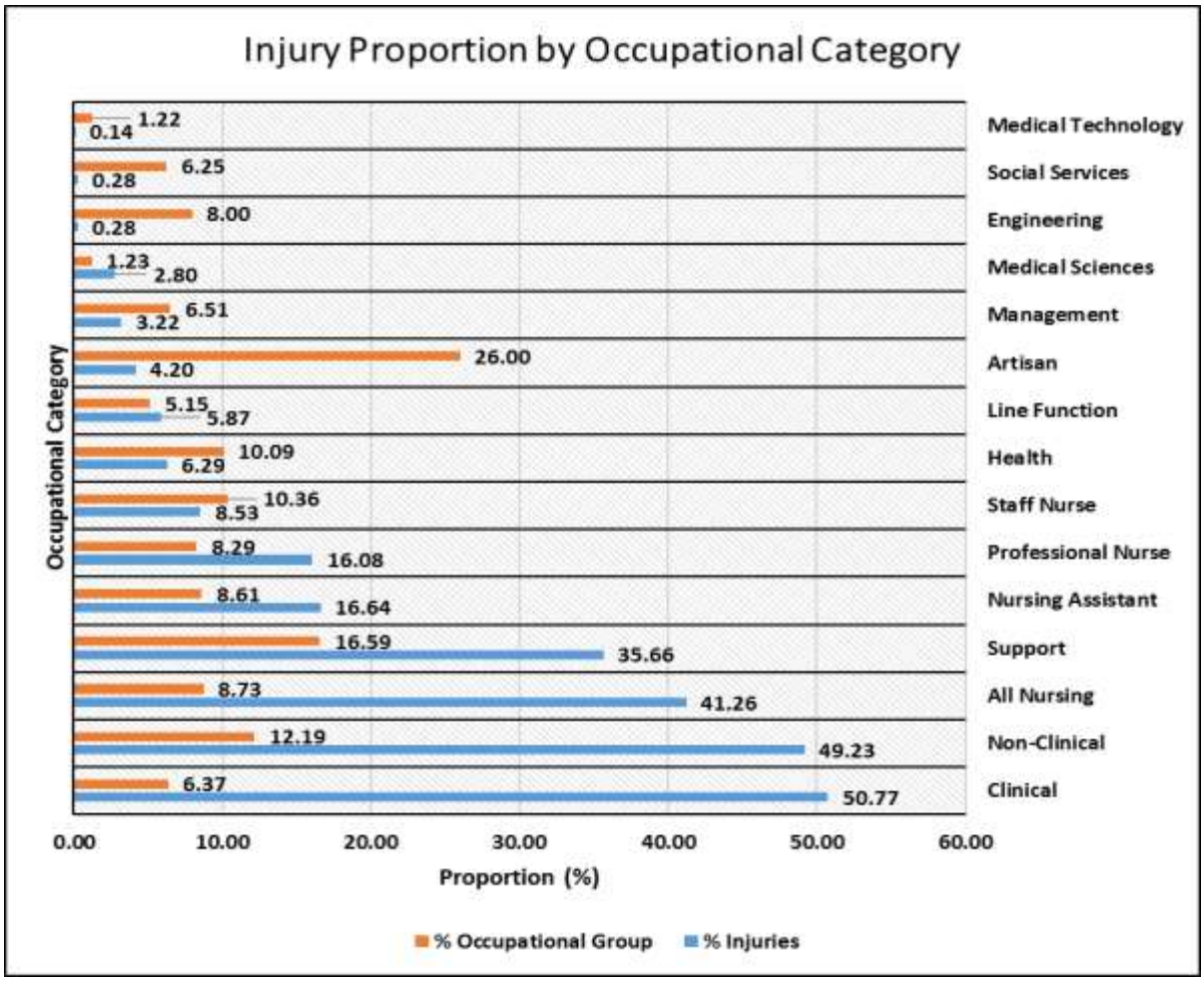

Figure 11: Clustered Bar Chart of Injury Proportions by Occupational Category

4.2.4.2. Location of Injury

Most [53.57% (N=383)] injuries occurred in clinical areas. A majority of the injuries occurring in clinical areas involved Clinical staff [75.72% (N=290)]. Of the Clinical staff, 80.07% (N=238) were Nursing professionals. The next highest proportion of injuries [18.18% (N=130)] occurred while in passageways or similar areas, in the lift and on the stairs. Non-clinical staff mostly sustained injuries while in these areas [57.7% (N=75)]. The third highest proportion of injuries [12.32% (N=88)] occurred in the kitchen and only affected Non-Clinical staff. Refer to Appendix 4, Figure 12

Statistically significant results: The following occupational groups had statistically increased odds of sustaining injuries in the accompanying areas. Refer to Appendix 5: Table 23&24 for details

1. All Nursing and Health: clinical areas
2. Support services: CSSD, kitchen, lift and NOS areas.*
    a. Food Services: kitchen.
    b. Cleaners/General Workers/HHH: lift/stairs/passageway and NOS areas.
    c. Porters: lift/stairs/passageway
3. Line function: administrative/office and in the lift/stairs/passageway.
4. Artisans: outside TBH, in the workshop and NOS areas.

4.2.4.3. Work Process

Of the injuries, 34.55% (N=247) occurred while interacting with patients. Clinical staff mostly sustained injuries during patient interaction-84.21% (N=208). Of the Clinical staff, 81.73% (N=170) were Nursing professionals. The remaining 25.79% (N=39) of Non-clinical staff consisted mostly of porters and security personnel who sustained injuries when moving or restraining patients.

Working with equipment led to 20.7% (N=148) injuries. Mostly Non-clinical staff were injured while working with equipment- 64.87% (N=96). A similar proportion of injuries, 20.14% (N=144), occurred while the employee is moving from one place to another (transit). There was a slight difference in the proportion of Clinical and Non-Clinical staff injured during transit- 51.39% (74) versus 48.61% (N=70).

* NOS are events where the location was not specified anywhere in the WCL documents.

Cleaning resulted in 10.35% (N=74) of injuries. Mostly Support staff were injured while cleaning- 86.49% (N=64). Refer to Appendix 4, Figure 13

Statistically significant results: The following occupational groups had statistically increased odds of sustaining injuries in the accompanying work processes. Refer to Appendix 5: Table 25&26 for details

1. All Nursing, Medical Sciences and Health: patient interaction
2. Social Services: transit
3. Line Function: administration
4. Support Services: cleaning, working with equipment and meal preparation
    a. Food Services: cleaning and meal preparation
    b. Clean/Gen Workers and HHH: cleaning, working with equipment and daycare
    c. Porters: patient interaction
5. Artisans and Engineering: maintenance and fixing

4.2.4.4. Mechanism of Injury (MOI)

The most common MOI was Slips, Trips and Falls (STF) contributing to 29.65% (N=212) events. Non-Clinical staff sustained 55.19% (N=117) of STF injuries compared to 44.81% (N=95) Clinical employees. The most common place for STF to occur was clinical areas comprising 36.79% (N=78) of STF. This was followed by lifts/stairs/passages comprising 32.08% (N=68) and the kitchen, comprising 16.04% (N=34). Of all STF 49.06% (N=104) occurred while moving from one place to another (transit). The next most common work process was cleaning contributing to 14.15 (N=30) STF followed by patient interaction and working with equipment. These contributed 11.79% (N=25) and 10.85% (N=23) respectively.

Manual handling was the second most common MOI contributing to 21.96% (N=157) events. Clinical staff sustained 66.88% (N=105) of manual handling events compared to 33.12% (N=52) Non-Clinical staff. The most common place for manual handling injuries was in clinical areas contributing 77.07% (N=121). The most common work process leading to manual handling injuries was patient interaction contributing 63.69% (N=100). This was followed by working with equipment and cleaning. These contributed 22.29% (N=35) and 7.01% (N=11) respectively. Refer to Appendix 4, Figure 14

Statistically significant results: The following occupational groups had statistically increased odds of sustaining injuries through the accompanying mechanisms. Refer to Appendix 5: Table 27&28 for details

1. All Nursing: assault, manual handling
2. Health: manual handling
3. Medical Sciences: bumps/knocks NOS
4. Social Services: STF
5. Support: burns and bumps/knocks NOS
    a. Food Services: burns and STF
    b. Security: assault
6. Artisans: Foreign Body in eyes
7. Engineering: Manual handling
8. Line Function: STF and NOS
9. Management: assault

4.2.4.5. Type of Injury

Using the ILO classification, 57.62% (N=412) injuries were classified as sprain/strain type injuries. Clinical staff sustained 54.37% (N=224) of sprain/strain injuries. The majority [56.31% (N232)] of sprain/strain injuries occurred in clinical areas. This was followed by the lift/stairs/passage [20.15% (N=83)] and kitchen [10.19% (N=42)]. Refer to Appendix 4, Figure 15

The most common work processes leading to sprain/strain injuries were patient care, moving from one place to another (transit), working with equipment and cleaning. These contributed 37.86% (N=156), 22.33% (N=92), 19.17% (N=79) and 9.22% (N=38) respectively.

The most common MOI for sprain/strain type injuries were manual handling and STF. These contributed 37.62% (N=155) and 35.19% (N=145) respectively. The most common body region affected by sprain/strain injuries was the back/neck [36.65% (N=151)] followed by the lower limb [31.07% (N=128)] then the upper limb [29.61% (N=122)]. Sprain/strain type injuries resulted in 62.64% (N=3111 of 4943) of sick days taken over the study period. Nurses took 41.63% (N=1295) and Support Services 34.23% (N=1065) of the occupational sick days

taken due to sprain/strain type injuries. A nurse was medically boarded, the only such case following an occupational injury for the duration of the study period.

Statistically significant results: The following occupational groups had statistically increased odds of sustaining the accompanying types of injuries. Refer to Appendix 5: Table 29&30 for details

1. All Nursing: sprain/strain
2. Support Services: burns and a reported injury with no objective clinical findings
    a. Food Service Workers: burns
3. Artisans: foreign body in eye

4.2.4.6. Body Regions Affected

Using a modified version of the ILO classification the upper limb was the most affected with 34.83% (N=249) of injuries occurring in this region. This was followed by the lower limb [28.67% (N=205)] and back/neck [23.22% (N=166)]. Refer to Appendix 4, Figure 16

Non-Clinical staff sustained 50.2% (N=125) of upper limb (UL) injuries. Almost half of UL injuries were sprain/strain in nature [49% (N=122)]. Superficial injuries accounted for 38.55% (N=96) of UL injuries. Crush injury/laceration of the hands was the MOI in 43.37% (N=108) UL injuries. Manual handling and STF was the MOI in 16.87% (N=42) and 14.46% (N=36) UL injury events. A third of UL injuries [33.73% (N=84)] occurred during patient care. Working with equipment contributed to 26.51% UL injuries and transit 12.85% (N=32). Half of UL injuries occurred in clinical areas [53.41% (N=133)] followed by the kitchen [16.87% (n=42)]. Upper limb injuries resulted in a total of 2127 sick days taken by injured employees.

Non-Clinical staff sustained 51.22% (N=205) lower limb (LL) injuries. More than half of the LL injuries were sprain/strain in nature [62.44% (N=128)]. Superficial injuries comprised 23.9% (N=49) of LL injuries and fractures 10.24% (N=21). The MOI was STF for 54.15% (N=111) of LL injuries and crush injuries/bumps NOS for 35.61% (N=73). Transit resulted in 36.59% (N=75) of LL injuries, patient care 24.88% (N=51) and working with equipment 19.51% (N=40). Slightly less than half [42.93% (N=88)] of LL injuries occurred in clinical areas followed by lift/stairs/passageways with 30.73% (N=63). LL injuries resulted in a total of 1864 sick leave days taken by injured employees.

Clinical staff sustained 59.05% (N=98) of back/neck injuries. Most of the back/neck injuries were sprain/strain in nature [90.91% (N=151)]. Manual handling was the MOI for 63.86%

(N=106) of back/neck injuries while STF was the MOI for 27.71% (N=46). The most common work process leading to back/neck injuries was patient interaction [48.19% N=80)] followed by working with equipment [18.07% (N=30)]. Over half [64.46% (N=107)] of back/neck injuries occurred in clinical areas. Back/neck injuries resulted in a total of 740 sick leave days taken by injured employees. As mentioned in the previous section, a nurse was medically boarded following an injury incident.

Statistically significant results: The following occupational groups had statistically increased odds of sustaining an injury in the accompanying Body Region. Refer to Appendix 5: Table 31&32 for details

1. Professional Nurses and Health: back/neck injuries
2. Nursing assistants: injuries NOS. Non-specific injuries comprised post-traumatic stress, emotional trauma and generalised injuries with no specific body parts specified.
3. Artisans: head/eye injuries
4. Cleaners/general workers/HHH: lower limb injuries

5. DISCUSSION AND RECOMMENDATIONS

The pictures on the ceiling of the Sistine Chapel in Rome, Italy depict various stories. Each picture is its own individual entity and can be dissected and analysed as such. However, to fully understand the artists message, the pictures must be viewed within the construct of the complete painting and the relation of each picture to the others.[119] Likewise, injuries among staff members at TBH need to be appraised from a comprehensive perspective before interrogating injuries and injury risk within individual groups.

A few common themes emerge across the results from section 4.2.1. and 4.2.2. Within the study population five independent variables were associated with an increased relative risk of injury applicable to all occupations. These are discussed below.

The highest injury rates were observed within the age group 45-54 years (refer to Table 6). Employees 45 years and above had an increased risk of injury relative to those in other age groups (refer to Table 13). This is contrary to the literature which indicates that younger employees are at an increased risk for sustaining occupational injuries.[93]

New employees, irrespective of age are considered an increased risk for sustaining occupational injuries.[96–98] In contrast, within this study the highest injury rates were among employees with a job tenure of longer than ten years (refer to Table 5). Employees with a tenure of two years or longer had an increased risk relative to those employed for one full year or less (refer to Table 12).

This study's findings could be explained by the most common type of injury sustained by employees, that is, musculoskeletal injuries (refer to Figure 15). Repeated and asymmetrical loading of the musculoskeletal system as may occur with manual handling would result in increased tissue stress and may eventually lead to musculoskeletal injuries.[65] The acute injury event would present after a longer period although the musculoskeletal system has been under pressure since commencing employment.

Age related musculoskeletal physiological changes include decreased muscular strength, joint mobility and manual dexterity as well as a slowing of reaction and movement times.[120] These

changes could make older employees more susceptible to the most common mechanisms for sprain/strain injuries- STF and manual handling (refer to Section 4.2.4.5.).

The highest injury rates were observed among employees who had registered Afrikaans as their first language and were of Mixed Race ethnicity (refer to Table 4 and 8). These employees had an increased risk of injury relative to other language and ethnic groups (refer to Table 11 and 14). Of the 574 individuals who reported injuries, 78.57% (N=451) were of Mixed Race ethnicity of which 71.84% were Afrikaans (refer to Table 14). As can be seen a close relationship exists between the registered Afrikaans language and ethnicity. Thus, these two variables are discussed concurrently.

A 2017 US study investigating ethnic differences in the frequency of occupational injuries found that inequalities in economic opportunities lead to minority group exposure to more hazardous working environments.[121] While these results cannot be directly extrapolated to this study population it is worth contemplating the influence of historical inequality within the South African context on the current TBH workforce composition. The higher risk among the Mixed Race ethnicity (who are majority Afrikaans speaking within this cohort) may be because of historical disadvantage leading to job opportunities within environments with a greater risk of sustaining occupational injuries. Thus, the increased risk within these groups may not be due to the employee characteristics (language and ethnicity) but instead due to work characteristics. Due to previous inequity, most of the manual, hazardous work comprises a workforce of previously disadvantaged individuals [within this population 68.8% (N=796) of Support Services-an occupational with an increased risk of injury- are of Mixed Race and 28% (N=324) of African ethnicity].

This is a working hypothesis to explain the results found in this study. It is not one without methodological flaws. These are complex interactions and need further investigation in future studies.

Pertaining to income, the highest injury rates was found in the lowest income group (refer to Table 7). This group had an increased risk of injury relative to other income groups (refer to Table 15). Previous studies finding a similar relationship between income and occupational injury rates have attributed these findings to differences in job tenure, organisational and

psychosocial factors and workplace demands. Workplace factors as opposed to the income levels explained the increased risk among lower earning employees.[102–104] Within this study population lower income groups include Support Services and Artisans who comprise 18.54% (N=1293) of the cohort (refer to Figure 8). These two groups have increased rates and risk of injuries (refer to Table 3 and 9). Thus, as hypothesised in previous studies the increased risk in lower income groups could be explained by workforce differences. However, this association needs further rigorous exploration using multivariate analysis within this study population.

The high turnover of nursing professionals may have influenced the rates within this occupational group (refer to Figure 9 description). Nurses may have left employment before presenting with an occupational injury (highest rates and risk among those employed for longer than 2 years). This may not be a true healthy worker effect as a high turnover among Nurses occurs for various reasons, not only as a result of severe illness or permanent disability.[122–125] The reasons for a rapid turnover among Nursing professionals at TBH and its relationship to injury rates require further investigation.

Within the population cohort Non-Clinical employees had significantly higher rates than Clinical employees (refer to Table 1). They had a 1.9 times greater risk for sustaining an injury event compared to Clinical staff (refer to Table 9). Statistically significantly higher injury rates and increased relative risks was observed in the Non-Clinical staff within most of the variables measured (refer to Section 4.2.1. and 4.2.2.).

There is a paucity of literature exploring the risk among Non-Clinical staff compared to Clinical staff. Studies have found increased musculoskeletal, manual handling and STF injury rates among hospital Cleaners compared to other hospital employees.[77,78] However, the full Non-Clinical population compared to the Clinical population has hardly been explored. What is known is that the Non-Clinical hospital employees comprises occupations recognized as hazardous within other industries including cleaners.[72–74] The results from this study indicate that this risk is not mitigated by the hospital environment and these occupational groups have an increased risk relative to the Clinical occupations.

A detailed analysis of risk factors within the Non-Clinical and all the Support workforce were inconclusive due to the small numbers within these groups. Further interrogation and analysis of these groups with an increased risk is required.

Nurses sustained the most injuries overall. However, as a percentage of the individual occupational groups Artisans and Support Services had the highest proportion of injuries (refer to Figure 11). Most of the injuries occurred in clinical areas and during patient interaction (refer to figure 12 and 13). The most common mechanism of injury was STF followed by manual handling (refer to figure 14). These were the most common MOI for the most common type of injury which was sprain/strains. Sprain/strain injuries mostly affected the back/neck and resulted in 62.64% of occupational sick days taken. Nurses took more sick days as a result of these injuries and one case resulted in medical boarding (refer to Section 4.2.4.5.). Of the occupational groups, Nurses had a statistically significant increased odds of sprain/strain injuries.

The importance of appraising the information as a whole prior to interrogating the component parts was highlighted in the beginning of the discussion section. In looking at a single aspect of the analysis individually, the relationships between the different aspects are overlooked and erroneous conclusions may be drawn. These conclusions have important implications for the steps taken and resources allocated to address occupational injuries among staff members at TBH, which is a resource scarce setting.

To elaborate, the analysis of incidence rates and relative risks clearly indicate an increased risk among Non-Clinical staff relative to Clinical staff for injuries overall. That is, for all injuries, the rates and risks are higher for Non-Clinical staff (Refer to section 4.2.1. and 4.2.2.). This information could be used to guide interventions specifically targeting Non-Clinical employees. However, it is not only the rates and risk of sustaining any injury, but also the severity of the effects of the injuries that require consideration. Namely, what are the most severe injuries and who is at risk of sustaining injuries with worse outcomes.

Using sick leave days as a proxy measure of severity, sprain/strains (MSI) resulted in two-thirds of occupational sick leave days recorded over the study period and the only case of medical boarding (refer to Section 4.2.4.5.). This evidence points toward worse outcomes after

sustaining a MSI than compared to other injuries. The deleterious effects of occupational MSI have been highlighted in the literature.[126–132] Nursing staff have significantly increased odds of sustaining MSI compared to other populations (refer to Appendix 3 Table 30, Section 4.2.4.5.). This is in keeping with the literature which recognises Nursing staff as being at an increased risk for MSI.(83,84) A higher proportion of sick days following MSI were taken among Nurses compared to Support Services (refer to Section 4.2.4.5.). This poses a greater cost to the employer given the higher average salary among Nursing Professionals (refer to Figure 8). Other implications include the effect on patient care and patient outcomes when nurses are booked off sick or are incapacitated at work due to MSI.[114] Thus, for sprain/strain injuries which have a more serious outcome, nursing staff are at an increased risk with consequences for both the employer and patient care. This relationship requires further detailed exploration, within the TBH study population, in future studies.

Therefore, from the study findings it is evident that the Non-Clinical workforce has higher rates and an increased risk for any injury. However, additional interrogation of the data reveal that Nursing Professional have increased odds for sustaining MSI injuries (which have a more severe outcome). As discussed, these findings are supported by evidence from the literature. Accordingly, taking into account not only rates and risk, but also the severity of the effects of the injuries, and the available literature, recommendations for injury prevention and further research within TBH should address both Nursing professionals and the Non-Clinical workforce. These recommendations are outlined below.

5.1. Recommendations

5.1.1. Recommendations: All Employees

5.1.1.1. Conditioning Training for Employees 45 Years and Above

Strength training and the maintenance of a normal age-related level of fitness can mitigate the risk of MSI in the ageing workforce.[120,133]

5.1.1.2. Adjust Physical Workload to Expected for Age

After the age of 45-years there is an expected 20-25% decline in physical capacity. This should be adjusted for within the work environment.[133]

5.1.1.3. Focused Pre-Employment Assessments for High Risk Occupations

There is inconsistent evidence that focused pre-employment clinical examinations will reduce the risk of MSI. Therefore, focused pre-employment examinations specifically for MSI are not recommended. Pre-employment examinations for other injury risks may be of benefit and these need to be implemented based on a Hazard Identification and Risk Assessment (HIRA).[134]

5.1.1.4. Medical Surveillance

Medical surveillance should be based on the outcomes of a HIRA. For ergonomic hazards, a questionnaire as opposed to a clinical examination may be appropriate to pick up signs of cumulative loading or differential fatigue before it presents as an acute MSI or work-related musculoskeletal disorder. [135,136]

5.1.1.5. Further Research

Further research is needed-

- To clearly explain the relationship between each of the employee characteristics- age, language, ethnicity and income level- and injuries within this cohort.
- To explore injury variables in more depth
- Regression analysis for identified risk factors- to confirm risk factors identified and to adjust for any confounding
- To evaluate costs (direct and indirect) of occupational injuries

5.1.2. Recommendations: Non-Clinical Workforce

5.1.2.1. Perform Hazard Identification and Risk Assessments (HIRA) of Workstations/Jobs and Tasks.

Due to the different work environments and job characteristics among Non-Clinical staff, no single intervention can be applied to all occupational groups. Each occupational group requires a detailed HIRA and medical surveillance plan. Special attention should be given to injury variables and occupational groups identified as having a significant association, as outlined in Section 4.2.4. and Appendix 3.

5.1.2.2. Further Research

Further research is needed to identify risk factors for injuries among Non-Clinical Occupations identified as high risk

5.1.3. Recommendations: Nursing Profession

5.1.3.1. Perform HIRAs of Workstations/Jobs and Tasks.

Nurses work in a variety of areas with different job requirements. HIRAs will allow identification and stratification of workplaces requiring intervention to enable efficient and effective allocation of interventions.

5.1.3.2. Intervention Implementation: Administrative Controls-Training and Policies

No lift policies and systems have shown to decrease MSI injuries among nurses.[137,138] These programmes use a multi-faceted approach, combining zero-lift policies, training and mechanical lifts or other assistive devices (discussed below). Zero lift policies are not always possible and lifting teams are a different policy approach that has been effective in other settings.[139–141] There is no evidence that the use of back-belts prevent MSI injuries in Nurses.[142,143] Training in body mechanics and manual patient handling and lifting techniques alone has not shown a reduction in MSI injuries among nurses.[144–147]

5.1.3.3. Intervention Implementation: Engineering Controls-Lifts and Assistive Devices

Engineering controls incorporate mechanical lifting devices such as ceiling lifts, repositioning devices, lateral transfer devices such as friction reducing slide sheets and mechanized beds such as utilising air inflation to turn patients.[147] These control measures markedly reduce the biomechanical load placed on nurses during patient handling activities. This has been proved in laboratory studies.[38] Although lifting devices and safe patient handling programmes have cost implications to the employer, a number of studies have shown a proven return on investment with initial cost outlays recovered through post-intervention savings in workers compensation costs.[138,148–154]

5.1.3.4. Further Research

Further investigation is required in:

- The high turnover rate among nursing professionals
- Economic evaluation of measures available to reduce patient handling ergonomic hazards within Southern African context

5.2. Study Limitations

This study only captures injury data within TBH. Studies across other health facilities are required to confirm any patterns identified. The generalisability of these results beyond this

study population may be limited. However, as reflected in the discussion, this study identified patterns confirmed in other settings. This indicates that it may be a true reflection of risk both within this population and the general population beyond TBH. More research within Western Cape Government: Health and other South African healthcare institutions is required to confirm whether the local population follow international healthcare industry non-fatal occupational injury trends.

Sources of bias include misclassification due to the large number of job categories in PERSAL or due to the error of the principal investigator. In addition, the true number of reported injury events may have been underestimated as files removed from the IOD office are difficult to trace. Through only assessing reported injuries the true burden of occupational injuries may be underestimated. Actual injury rates may be higher than those reflected in this study's findings. Because the study interrogated a large amount of data, in depth analysis of identified risk factors was not done. This should be performed in future studies.

A major limitation was that only crude relative risks and odds ratios were calculated. A regression analysis using a reference group would have presented more meaningful results. The results of this study therefore need to be interpreted cautiously. Further editing prior to publication of these findings will include building robust multivariate regression models. These models would also adjust for potential confounding within the study results.

A second major limitation is the potential for confounding when using a cohort study design. As highlighted in the discussion, variables identified as risk factors may have been influenced by a third variable, or confounder. As a result, any associations identified should be interpret with caution. This potential for confounding was further aggravated by the fact that multivariate analysis was not performed in this paper. These limitations should be addressed prior to writing up and submitting these results for publication.

6. CONCLUSION

The beginning of this paper highlighted the global burden of occupational injuries and the cost implications of these incidents. A closer look at the healthcare industry in other settings revealed higher rates and numbers compared to industries outside healthcare. It also revealed a common theme across regions. Namely, a workforce at risk of musculoskeletal injuries mainly as a result of manual handling and slip, trip and fall events. Due to a paucity of up-to-date aggregate South African data it could not be said with certainty whether this trend was true or not for the local workforce.

The findings of this study highlight that the effect of occupational injuries on the South African (SA) healthcare industry workforce requires attention. This is particularly true regarding musculoskeletal injuries and their outcomes in nurses. As this project investigated injuries among the TBH workforce from a comprehensive perspective, more in depth research is needed to explore the findings from this project in more detail. In addition, more research is needed in both the private and public sector to further clarify trends in the SA setting and compare these to those found internationally. In addition, evidence based, cost effective interventions should be implemented to protect the SA healthcare workforce. Given the cost and patient safety implications of occupational injuries within the healthcare sector, the health and safety of its employees is simply too important to ignore.

7. APPENDICES

7.1. Appendix 1: Occupational Grouping Details

Occupations were grouped as found in the TBH PERSAL data. Within PERSAL 15 categories were listed under the heading "Core Description" comprising different occupational groupings. One of the 15 combined Support Services and Health employees. This category was split adding an additional category to make 16 occupational groupings. This grouping allows a broad delineation of work-related groups and in doing so functions. The 16 Core Description groups and key associated job titles are outlined below as listed in PERSAL:

1. Agriculture- animal house employees and groundsman
2. Artisans- artisans, handyman, tradesman, foreman
3. Economic- finance department staff, including administrative staff
4. Engineering- engineers and industrial technicians
5. Health- radiographers, allied health professionals (physiotherapists, occupational therapists, dietetics, speech therapists, audiologists and pharmacists)
6. Human Resources- labour relations and human resources staff
7. Information Technology- administrative officers, information management
8. Line Function- administrative clerks, auxiliary officers, case managers, quality assurance, secretaries and typists
9. Management- security, administrative clerks, drivers, messengers, CEO, Telkom operators, typists and bed managers
10. Medical Sciences- clinical psychologists, doctors, heads of clinical departments, medical managers, clinical pharmacologists, pharmacists, physiotherapists and speech and language audiologists
11. Medical Technology- Clinical technologists and medical technologists
12. Nursing and Support- director nursing services, staff nurses, nursing assistant, nurse professionals and professional nurses
13. Nursing assistant- nursing assistants and staff nurses
14. Professional Nurse- professional nurses, staff nurses, nursing managers and nursing lecturers
15. Social services- social workers
16. Staff nurse- nursing assistants, staff nurses, professional nurses

17. Support Services- auxiliary service officers, food service aids, cleaners, general workers, household aids, porters and sterilization operators.

To allow further analysis the PERSAL Core Description groups were combined as follows:

1. All Nursing- all nursing occupational groups were combined to form a single Nursing group. This comprised groups no. 12-14 and 16 in the list above.
2. Clinical- All health sciences and related occupations involved in delivering any aspect of medical care to a patient. This comprised groups no. 5 and 10-16 in the list above
3. Non-Clinical- all non-health sciences occupations employed at the hospital that are not inherently linked to the delivery of patient care. This comprised groups no. 1-4, 6-9 and 17.
4. Cleaners, General Workers and Household Aids (HHH) were combined into a single group as they had similar functions.
5. The following Support Services job titles were grouped individually to allow for accurate analysis of these groups- Porters, Security, Food Service Workers and Cleaners/General Workers/HHH. All of these job titles except food service workers were listed in more than one Core Description group

7.2. Appendix 2: Injury Variables- Details and Definitions

7.2.1. Work Processes

These groups describe the employee's activities at the time of the injury event. Due to the breadth of occupations and job descriptions included a broad classification system was used. This is outlined below.

1. Patient interaction

   This work process includes any direct interaction with the patient to facilitate the delivery of health care. It includes transporting patients as those involved in transporting patients become responsible for the safety and wellbeing of the patient during passage.
2. Working with equipment

   This involves the use of any tools or other physical resources to fulfil a specific function or purpose
3. Transit

   This involves moving from one area to another (walking or running)
4. Cleaning

   Removing dirt from inanimate objects (excludes cleaning patients) by various means such as washing, wiping, brushing or polishing.
5. Administrative work (admin)

   Administration for the purposes of this paper encompasses routine work involving written documents, electronic work (on a computer), clerical work, attending meetings and record keeping
6. Preparing meals

   Any activity in the process of preparing food items for consumption. For the purposes of this paper this definition includes dishing up of food.
7. Tea/lunch

   Time taken for a tea, lunch or comfort break
8. Maintenance/fixing
9. This involves maintaining or repairing any equipment or building items
10. NOS

    The work process could not be obtained anywhere in the W.CL. documents.
11. Daycare

    Watching over and looking after young children

7.2.2. Place of Injury

Due to the incorporation of all occupational groups employed at TBH the place of injury was broadly categorised. All common areas were grouped together. For example, theatre, wards and clinics would be grouped under "clinical areas" and offices would be grouped under administrative/office. The groups are outline below.

1. Clinical areas

   These encompass all areas within the hospital where the main function is the delivery of patient care.
2. Kitchen

   The main kitchen areas within the hospital used for food preparation mainly for patients.
3. Passages and similar

   These encompass the corridors and other common areas with no specific purpose (and not defined elsewhere).
4. Administrative/office

   All areas used for administrative purposes. It includes the administrative building, medical records and stores. Administration for the purposes of this paper encompasses routine work involving written documents, electronic work (on a computer), clerical work, attending meetings and record keeping.
5. Lift

   All lifts within the hospital
6. Stairs

   All staircases within TBH
7. Outside TBH

   Any area outside the TBH building
8. CSSD

   Central sterile services/supply department where equipment is cleaned and sterilized.
9. Rec area

   Recreational areas including staff tea rooms and bathroom facilities
10. NOS- not otherwise specified.

    The location was not specified anywhere in the W.CL. documents
11. Workshop

    Workshop areas used mainly by artisans and engineers.

7.2.3. Mechanism of Injury

Mechanism of injury in this study refers to the process by which the reported injury occurred. The injuries were grouped according to the following mechanisms which are listed and defined below.

1. Slip, trip and falls

   Regarding falls on the same level, slipping occurs when there is insufficient friction between the shoe sole/foot and the floor surface. This results in an imbalance in the forward and rear forces acting on the individual and may lead to a loss of posture control. A trip may occur when the foot comes into unexpected forcible contact with an object or person. Both “slips” and “trips” act as triggers and may result in falls (a complete loss of balance and posture).[47]
2. Manual handling

   Bending down, lifting, carrying, pushing, pulling, twisting the leg or ankle, twisting or turning related to patients or inanimate objects.[18]
3. Crush injury/laceration of the hand

   A crush injury refers to force or pressure on the hand, particularly where the hand is squeezed between 2 heavy objects.(155)

   A laceration refers to a cut or break in the skin caused by a physical object.(156) For the purpose of this study lacerations included all puncture wounds of the skin such as that caused by a needle or other sharp object.
4. Bump/knock NOS

   A bump or knock refers to a light blow or collision with a person or inanimate object resulting in an injury event.(157)
5. Assault

   Violent acts, including physical assault and threats of assault, directed toward persons at work or on duty.[57]
6. Crush injury of the foot/ankle

   A crush injury refers to force or pressure on the foot or ankle, particularly where the foot or ankle is squeezed between 2 heavy objects.(155)
7. Burn

   Damage to the skin and surrounding tissue caused by heat, chemicals, electricity, sunlight, or radiation.(158)
8. Foreign body (FB)

A foreign body is physical matter present in the eyes, skin, body orifice or anywhere else in the body that does not form part of normal anatomical structures.(159)

9. NOS- not otherwise specified

   The mechanism of injury was not specified anywhere in the W.CL. documents.

7.2.4. Type of Injury

The type of injury classification was based on the ILO Resolution Concerning Statistics of Occupational Injuries, Annexure E.(160) The classification system was modified to the current version listed below as 3 designations (traumatic amputations, concussion and internal injuries and acute poisonings and infections) did not occur in this study population and were not applicable and removed.

As foreign body injuries occurred frequently it was added as a group as opposed to adding it to NOS injuries. Some employees reported injuries but no abnormality was found by the examining medical doctor and this was noted on the W.CL. 4- First Medical Report in Respect of an Accident form. Thus, the group "none", reflecting no clinical evidence of injuries was added. The ILO classifications used are defined below.

1. Sprain/strain

   Classified as a stretched or torn ligament or a stretched or torn muscle or tendon. Symptoms include pain, muscle spasms, swelling, and trouble moving the muscle.(161)

2. Superficial

   This group included all cuts, lacerations, puncture wounds, abrasions and contusions.

3. Fracture

   A break in a bone. (162)

4. Burn

   Damage to the skin and surrounding tissue caused by heat, chemicals, electricity, sunlight, or radiation.(158)

5. None

   An injury reported by the employee but no abnormal clinical findings are found by the medical practitioner.

6. Foreign body

   A foreign body is physical matter present in the eyes, skin, body orifice or anywhere else in the body that does not form part of normal anatomical structures.(159)

7. NOS-not otherwise specified

This group encompassed a case of emotional trauma, a case of post-traumatic stress disorder and cases where the type of injury was not specified anywhere in the W.CL. documents

7.2.5. Body Region Affected

The body region classification was based on the ILO Resolution Concerning Statistics of Occupational Injuries, Annexure F.(160) The ILO classifications used are defined below.

Injuries NOS (not otherwise specified) included a reported genital prolapse, 2 cases of emotional trauma, 1 case of post-traumatic stress disorder and 3 cases of generalised/non-specific soft-tissue injuries.

7.3. Appendix 3: Detailed Analysis for Groups with a Significant Increased Risk of Injuries

This section takes a more focused look at risk factors within those groups highlighted in section 4.2.2. as having an increased risk relative to all other employees.

7.3.1. Non-Clinical Workforce

Statistically significant results: Within the Non-Clinical workforce employees aged 45-54 years had an increased risk relative to other age groups. Afrikaans speaking had an increased risk relative to other language groups. Employees with a job tenure longer than two years had an increased risk relative to those working for one full year or less. Refer to Table 16: Detailed Analysis of the Non-Clinical Workforce

Table 16: Detailed Analysis of the Non-Clinical Workforce

Non-Clinical	% (N) Injured	RR (95%CI)	p Value
Age (Years)			
18-24	4.51 (6)	0.36 (0.16 - 0.78)	p=0.005
25-34	9.24 (51)	0.70 (0.53 - 0.94)	p=0.015
35-44	10.77 (71)	0.84 (0.65 - 1.09)	p=0.187
45-54	17.26 (111)	1.70 (1.36 - 2.13)	p<0.001
55-64	13.47 (33)	1.12 (0.80 - 1.57)	p=0.515
Language			
English	10.90 (62)	0.86 (0.66 - 1.13)	p=0.276
Afrikaans	14.21 (176)	1.47 (1.16 - 1.86)	p=0.001
Xhosa	7.75 (32)	0.59 (0.41 - 0.84)	p=0.002
Other	18.18 (2)	1.50 (0.42 - 5.27)	p=0.634
Duration Current Employment (Years)			
0-1	6.07 (45)	0.40 (0.29 – 0.54)	p<0.001
2-10	20 (76)	1.89 (1.49 – 2.40)	p<0.001
>10	13.59 (151)	1.26 (1.01 – 1.58)	p=0.043
Gender			
Female	11.78 (165)	0.91 (0.73 - 1.15)	p=0.443
Male	12.88 (107)	1.09 (0.87 - 1.37)	p=0.443

7.3.2. Artisans

Statistically significant results: There were no statistically significant risk factors present for any of the independent variables assessed within the Artisan workforce. Refer to Table 17: Detailed Analysis for Artisans

Table 17: Detailed Analysis for Artisans

Artisans	% (N) Injured	RR (95%CI)	p Value
Age (Years)			
25-34	25.00 (5)	0.95 (0.41 - 2.21)	p=0.909
35-44	35.48 (11)	1.63 (0.85 - 3.13)	p=0.147
45-54	20.69 (6)	0.73 (0.33 - 1.64)	p=0.439
55-64	22.22 (4)	0.83 (0.33 - 2.11)	p=0.687
Language			
English	18.18 (6)	0.61 (0.27 - 1.37)	p=0.211
Afrikaans	28.33 (17)	1.26 (0.62 - 2.54)	p=0.515
Xhosa	33.33 (2)	1.31 (0.40 - 4.26)	p=0.649
Other	100.00 (1)	3.96 (2.82 - 5.56)	p=0.260
Duration Current Employment (Years)			
0-1	19.51 (8)	0.64 (0.31 – 1.33)	p=0.218
2-10	38.89 (7)	1.68 (0.83 – 3.38)	p=0.169
>10	26.83 (11)	1.06 (0.54 – 2.06)	p=0.875

7.3.3. All Support Services

Statistically significant results: Employees aged 45-54 years were at an increased risk relative to other age groups. Employees registered with Afrikaans as their first language were at an increased risk relative to other language groups. Employees with a job tenure of between 2-10 years had an increased risk relative to other tenures. Refer to Table 18: Detailed Analysis for Support Services- All

Table 18: Detailed Analysis for Support Services- All

Support	% (N) Injured	RR (95%CI)	p Value
Age (Years)			
18-24	10.91 (6)	0.65 (0.3 - 1.39)	p=0.246
25-34	14.72 (34)	0.86 (0.61 - 1.21)	p=0.392
35-44	13.01 (45)	0.72 (0.53 - 0.98)	p=0.032
45-54	21.90 (83)	1.56 (1.21 - 2.02)	p=0.001
55-64	16.44 (24)	0.99 (0.67 - 1.46)	p=0.957
Language			
English	15.33 (42)	0.9 (0.66 - 1.24)	p=0.519
Afrikaans	19.74 (121)	1.51 (1.16 - 1.98)	p=0.002
Xhosa	10.53 (28)	0.57 (0.39 - 0.83)	p=0.002
Other	25.00 (1)	1.51 (0.28 - 8.28)	p=0.517
Duration of Current Employment (Years)			
0-1	7.73 (30)	0.37 (0.25 - 0.53)	p<0.001
2-10	34.81 (55)	2.54 (1.95 - 3.31)	p<0.001
>10	17.51 (107)	1.12 (0.87 - 1.46)	p=0.375
Gender			
Female	16.48 (134)	0.98 (0.74 - 1.29)	p=0.874
Male	16.86 (58)	1.02 (0.77 - 1.35)	p=0.874

7.3.4. Support Services- Security

Statistically significant results: There were no statistically significant risk factors present for any of the independent variables assessed within the Security workforce. Refer to Table 19: Detailed Analysis for Support Services- Security

Table 19: Detailed Analysis for Support Services- Security

Security	% (N) Injured	RR (95%CI)	p Value
Age (Years)			
35-44	27.27 (3)	1.36 (0.39 - 4.73)	p=0.678
45-54	30.77 (4)	1.77 (0.53 - 5.92)	p=0.422
55-64	20.00 (1)	0.89 (0.14 - 5.75)	p=1.000
Language			
English	14.29 (1)	0.59 (0.09 - 4.06)	p=1.000
Afrikaans	30.43 (7)	3.96 (0.55 - 28.71)	p=0.213
Duration of Current Employment (Years)			
0-1	9.09 (1)	0.32 (0.05 – 2.33)	p=0.209
>10	35 (7)	5.60 (0.77 – 40.95)	p=0.053

7.3.5. Support Services-Food Services

Statistically Significant Results: Employees aged 45-54 years had an increased risk relative to other age groups. Employees with a job tenure of more than ten years had an increased risk relative to other job tenures. Refer to Table 20: Detailed Analysis for Support Services- Food Services

Table 20: Detailed Analysis for Support Services: Food Services

Food Services	% (N) Injured	RR (95%CI)	p Value
Age (Years)			
18-24	28.57 (2)	1.18 (0.35 - 3.91)	p=0.680
25-34	12.20 (5)	0.43 (0.18 - 1.03)	p=0.037
35-44	14.89 (7)	0.53 (0.26 - 1.12)	p=0.075
45-54	38.46 (25)	2.37 (1.41 – 4.00)	p=0.001
55-64	25.00 (4)	1.03 (0.42 - 2.50)	p=1.000
Language			
English	31.82 (7)	1.36 (0.69 - 2.67)	p=0.389
Afrikaans	27.96 (26)	1.36 (0.80 - 2.33)	p=0.249
Xhosa	16.67 (10)	0.59 (0.31 - 1.11)	p=0.085
Duration of Current Employment (Years)			
0-1	6.15 (4)	0.18 (0.07 - 0.47)	p<0.001
2-10	37.14 (13)	1.75 (1.02 - 2.98)	p=0.051
>10	34.21 (26)	2.01 (1.18 - 3.43)	p=0.008
Gender			
Female	24.60 (31)	1.03 (0.57 - 1.83)	p=0.933
Male	24.00 (12)	0.98 (0.55 - 1.74)	p=0.933

7.3.6. Support Services- General Workers/Cleaners/Household Aids (HHH)

Statistically Significant Results: Employees with Afrikaans registered as their first language had an increased risk relative to other language groups. Employees with a job tenure of between 2-10 years had an increased risk relative to other lengths of employments. Refer to Table 21: Detailed Analysis for Support Services- General Workers/Cleaners/HHH

Table 21: Detailed Analysis for Support Services- General Workers/Cleaners/HHH

Gen Workers/ Cleaners/HHH	% (N) Injured	RR (95%CI)	p Value
Age (Years)			
18-24	12.50 (2)	0.85 (0.23 - 3.15)	p=1.000
25-34	12.61 (14)	0.83 (0.49 - 1.42)	p=0.494
35-44	12.35 (20)	0.79 (0.50 - 1.26)	p=0.322
45-54	16.75 (35)	1.24 (0.83 - 1.84)	p=0.291
55-64	17.28 (14)	1.21 (0.72 - 2.04)	p=0.475
Language			
English	13.37 (23)	0.88 (0.56 - 1.37)	p=0.563
Afrikaans	18.58 (47)	1.59 (1.07 - 2.37)	p=0.020
Xhosa	9.74 (15)	0.59 (0.35 – 1.00)	p=0.043
Duration of Current Employment (Years)			
0-1	9.41 (19)	0.54 (0.33 - 0.87)	p=0.009
2-10	45.45 (15)	3.55 (2.30 – 5.47)	p<0.001
>10	14.83 (51)	1.02 (0.69 - 1.53)	p=0.905
Gender			
Female	14.85 (71)	1.07 (0.63 - 1.82)	p=0.798
Male	13.86 (14)	0.93 (0.55 - 1.59)	p=0.798

7.3.7. Support Services- Porters

Statistically Significant Results: There were no statistically significant risk factors present for any of the independent variables assessed within the Porter workforce. Refer to Table 22: Detailed Analysis for Support Services- Porters

Table 22: Detailed Analysis for Support Services- Porters

Porters	% (N) Injured	RR (95%CI)	p Value
Age (Years)			
25-34	22.50 (9)	1.54 (0.76 - 3.11)	p=0.235
35-44	13.85 (9)	0.78 (0.38 - 1.60)	p=0.487
45-54	20.00 (9)	1.32 (0.65 - 2.69)	p=0.448
55-64	25.00 (2)	1.56 (0.45 - 5.46)	p=0.619
Language			
English	17.24 (5)	1.06 (0.44 - 2.56)	p=0.892
Afrikaans	18.64 (22)	1.57 (0.71 - 3.47)	p=0.251
Xhosa	6.90 (2)	0.38 (0.10 - 1.50)	p=0.131
Duration of Current Employment (Years)			
0-1	8.96 (6)	0.43 (0.18 – 0.998)	p=0.037
2-10	26.32 (10)	1.93 (0.98 – 3.79)	p=0.062
>10	18.06 (13)	1.18 (0.61 – 2.31)	p=0.619
Gender			
Female	12.73 (7)	0.71 (0.32 - 1.55)	p=0.377
Male	18.03 (22)	1.42 (0.64 - 3.12)	p=0.377

7.4. Appendix 4: Cross-Sectional Injury Analysis- Graphs

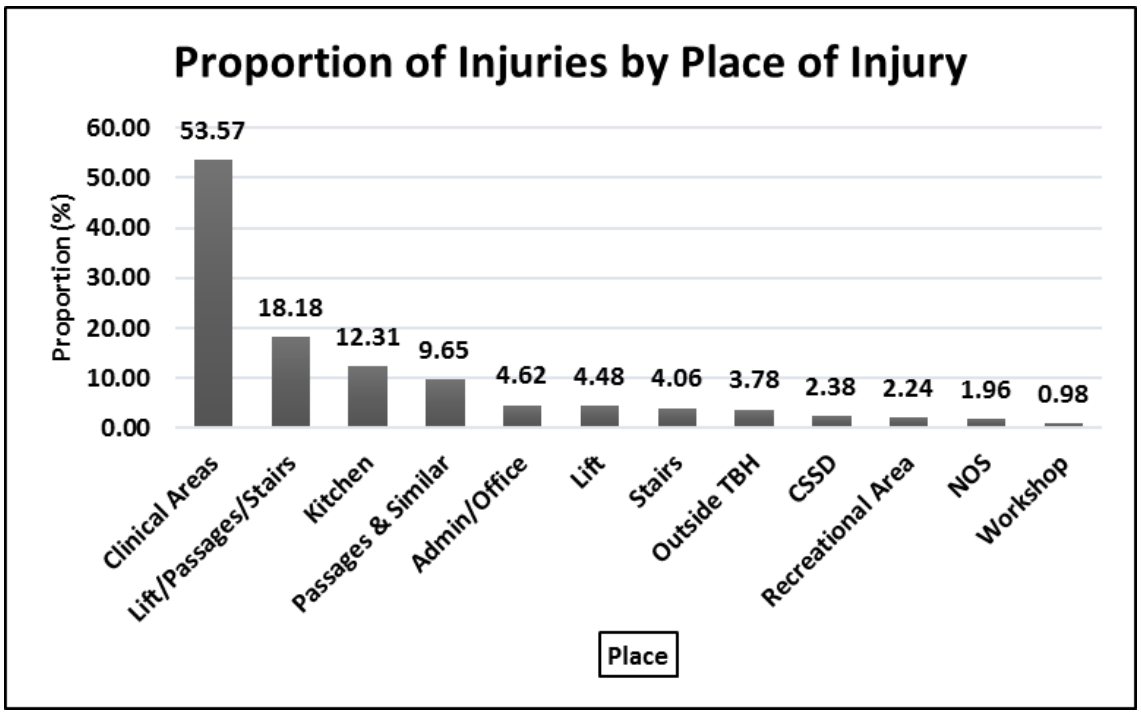

Figure 12: Bar Chart of Proportion of Injuries by Place of Injury 2008-2014

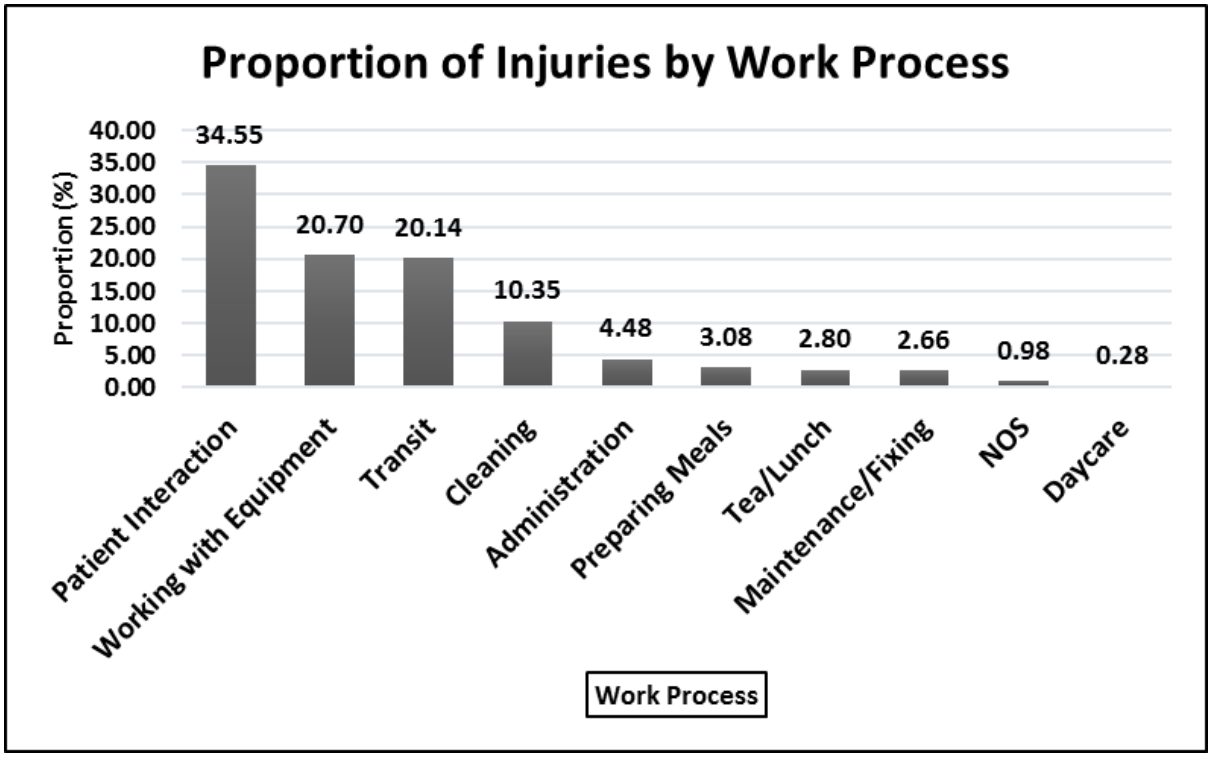

Figure 13: Bar Chart of Proportion of Injuries by Work Process 2008-2014

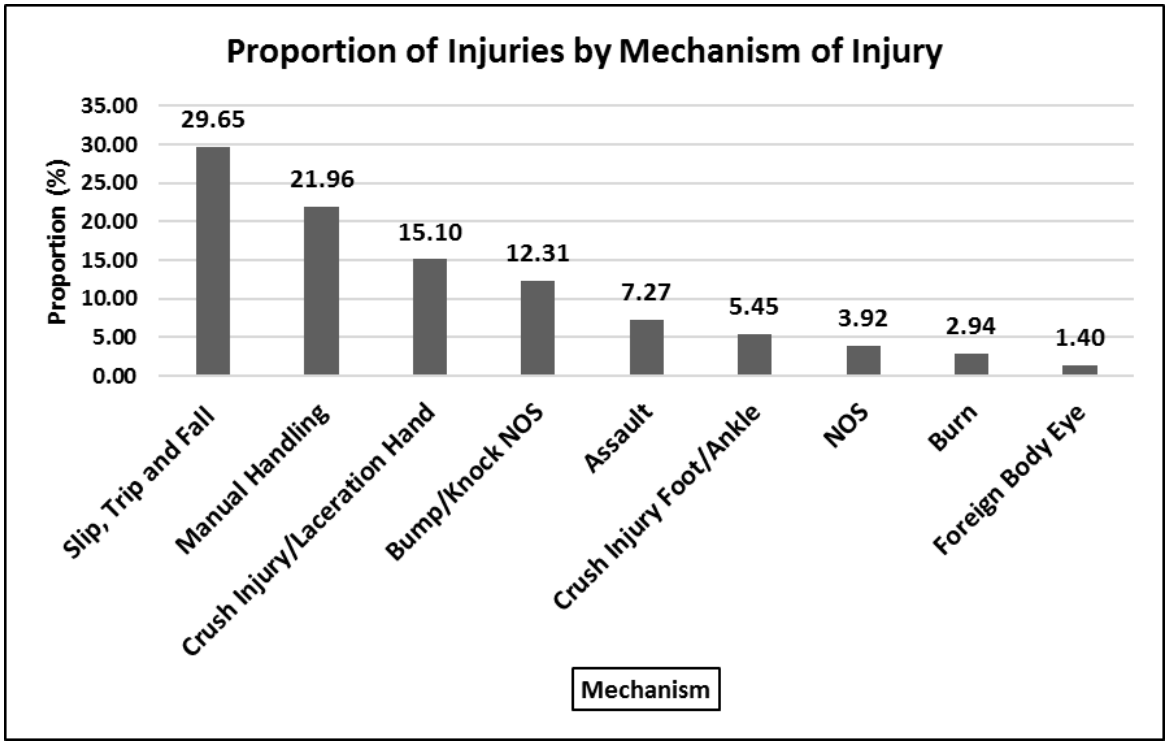

Figure 14: Bar Chart of Proportion of Injuries by Mechanism of Injury 2008-2014

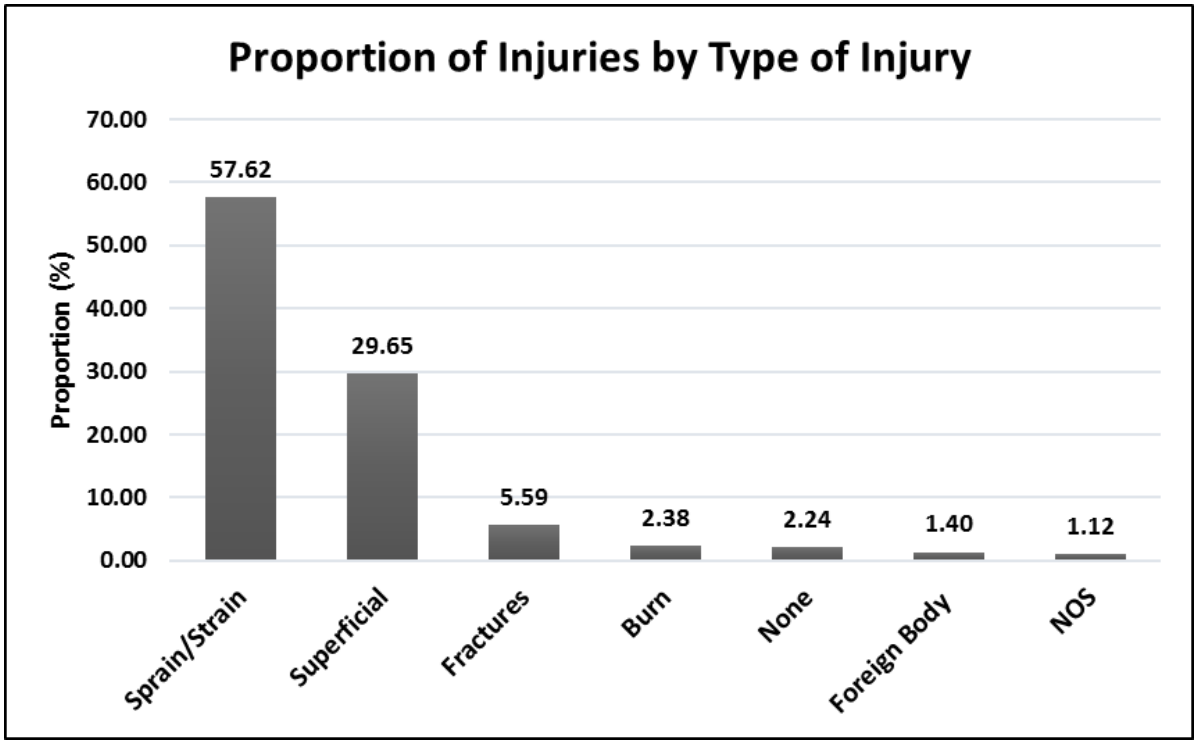

Figure 15: Bar Chart of Proportion of Injuries by Type of Injury 2008-2014

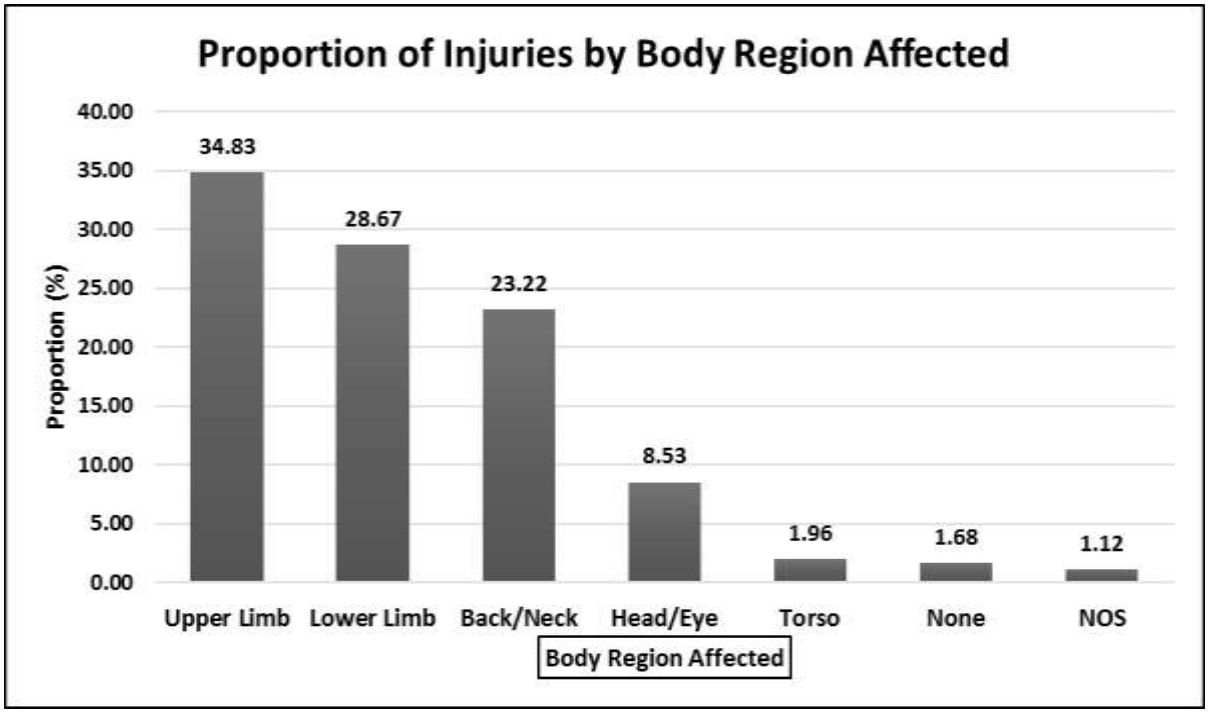

Figure 16: Bar Chart of Proportion of Injuries by Body Region Affected 2008-2014

7.5. Appendix 5: Cross-Sectional Injury Analysis- Odds Ratio Tables

The tables in this appendix outline the odd ratios for an association between occupational groups and various variables related to injury events.

Key:

	A statistically significant association exists
	Due to small numbers for these variables a meaningful conclusion could not be drawn. The complete odds ratio and 95% confidence interval could not be calculated
	Due to small numbers for these variables a discordance between the p-value and confidence interval was present with one indicating statistical significance and the other no significance in the result. Due to this discordance, an inference of statistical significance is not possible for these results.
‡	No Injury Occurred for this Variable and Occupational Group

Table 23: Odds Ratio by Location of Injury Part A

Location of Injury		Artisan (30)	Engineering2)	Health (45)	Support (255)	Line Function (42)	Management (23)	Medical Sciences (20)	Medical Technology (1)	Nursing Assistant (119)	Professional Nurse (115)	Social Services (2)	Staff Nurse (61)
		N (%); OR (95%CI); p-value	N (%); OR (95%CI); p-value	N (%); OR (95%CI); p-value	N (%); OR (95%CI); p-value	N (%); OR (95%CI); p-value	N (%); OR (95%CI); p-value	N (%); OR (95%CI); p-value	N (%); OR (95%CI); p-value	N (%); OR (95%CI); p-value	N (%); OR (95%CI); p-value	N (%); OR (95%CI); p-value	N (%); OR (95%CI); p-value
Clinical Areas	383	2 (6.7); OR=0.06 (0 - 0.22); p<0.001	1 (50); OR=0.9 (0 - .); p=1	37 (82.2); OR=4.3 (2 - 9.4); p<0.001	71 (27.8); OR=0.2 (0.1 - 0.3); p<0.001	9 (21.4); OR=0.2 (0.1 - 0.5); p<0.001	10 (43.5); OR=0.7 (0.3 - 1.5); p=0.324	15 (75); OR=2.7 (0.96 - 7.4); p=0.051	‡	99 (83.2); OR=5.4 (3.3 - 9); p<0.001	94 (81.7); OR=4.8 (2.9 - 7.9); p<0.001	‡	45 (73.8); OR=2.6 (1.5 - 4.7); p=0.001
CSSD	17	1 (3.3); OR=1.4 (0 - 8.88); p=0.522	‡	‡	16 (6.3); OR=30.7 (4.1 - 233.1); p<0.001	‡	‡	‡	‡	‡	‡	‡	‡
Kitchen	88	1 (3.3); OR=0.24 (0 - 1.39); p=0.16	‡	‡	87 (34.1); OR=237.7 (32.8 - 1720.1); p<0.001	‡	‡	‡	‡	‡	‡	‡	‡
Outside TBH	27	9 (30); OR=15.9 (6.52 - 38.88); p<0.001	‡	1 (2.2); OR=0.56 (0 - 3.36); p=1	6 (2.4); OR=0.5 (0.2 - 1.3); p=0.137	1 (2.4); OR=0.61 (0 - 3.63); p=1	2 (8.7); OR=2.54 (0 - 10.35); p=0.214	2 (10); OR=2.98 (0 - 12.25); p=0.172	‡	2 (1.7); OR=0.39 (0 - 1.51); p=0.189	2 (1.7); OR=0.4 (0 - 1.58); p=0.211	‡	2 (3.3); OR=0.85 (0 - 3.34); p=1
Lift	32	‡	‡	‡	23 (9); OR=5 (2.3 - 10.9); p<0.001	1 (2.4); OR=0.51 (0 - 3); p=1	3 (13); OR=3.43 (1.03 - 11.49); p=0.078	‡	‡	2 (1.7); OR=0.3 (0.1 - 1.4); p=0.106	3 (2.6); OR=0.5 (0.2 - 1.8); p=0.291	‡	‡
NOS	14	3 (10); OR=6.81 (1.94 - 24.2); p=0.018	1 (50); OR=53.85 (0- .); p=0.039	‡	9 (3.5); OR=3.33 (1.16 - 9.57); p=0.024	‡	‡	‡	‡	1 (0.8); OR=0.38 (0 - 2.3); p=0.485	‡	‡	‡

Location of Injury		Artisan (30)	Engineering2)	Health (45)	Support (255)	Line Function (42)	Management (23)	Medical Sciences (20)	Medical Technology (1)	Nursing Assistant (119)	Professional Nurse (115)	Social Services (2)	Staff Nurse (61)
Rec Area	16	‡	‡	2 (4.4); OR=2.17 (0 - 8.92); p=0.267	6 (2.4); OR=1.1 (0.4 - 3); p=0.877	2 (4.8); OR=2.35 (0 - 9.65); p=0.241	‡	‡	1 (100); OR=.(0-.); p=0.022	2 (1.7); OR=0.71 (0 - 2.85); p=1	1 (0.9); OR=0.34 (0 - 2.05); p=0.49	‡	2 (3.3); OR=1.55 (0 - 6.28); p=0.639
Stairs	29	3 (10); OR=2.82 (0.86 - 9.32); p=0.117	‡	3 (6.7); OR=1.77 (0.55 - 5.73); p=0.419	4 (1.6); OR=0.3 (0.1 - 0.8); p=0.012	5 (11.9); OR=3.65 (1.37 - 9.82); p=0.023	3 (13); OR=3.8 (1.15 - 12.96); p=0.062	1 (5); OR=1.25 (0 - 7.67); p=0.568	‡	2 (1.7); OR=0.36 (0 - 1.39); p=0.15	5 (4.3); OR=1.1 (0.4 - 2.8); p=0.863	1 (50); OR=24.46 (0 - .); p=0.08	2 (3.3); OR=0.79 (0 - 3.07); p=1
Workshop	7	7 (23.3); OR= . (52.16- .); p<0.001	‡	‡	‡	‡	‡	‡	‡	‡	‡	‡	‡
Admin/ Office	33	2 (6.7); OR=1.5 (0.3 - 6.6); p=0.584	‡	‡	8 (3.1); OR=0.6 (0.3 - 1.3); p=0.161	20 (47.6); OR=46.15 (20.58 - 103.58); p<0.001	3 (13); OR=3.31 (0.9994 - 11.07); p=0.084	‡	‡	‡	‡	‡	‡
151	69	2 (6.7); OR=0.66 (0 - 2.56); p=0.759	‡	2 (4.4); OR=0.42 (0 - 1.6); p=0.222	25 (9.8); OR=1 (0.6 - 1.7); p=0.918	4 (9.5); OR=0.98 (0.36 - 2.73); p=0.977	2 (8.7); OR=0.89 (0 - 3.5); p=1	2 (10); OR=1.04 (0 - 4.14); p=1	‡	11 (9.2); OR=0.9 (0.5 - 1.9); p=0.869	10 (8.7); OR=0.9 (0.4 - 1.8); p=0.705	1 (50); OR=9.49 (0- .); p=0.184	10 (16.4); OR=2 (1 - 4.1); p=0.062
Lift/Stairs/ Passageway	130	5 (16.7); OR=0.9 (0.3 - 2.4); p=0.826	‡	5 (11.1); OR=0.5 (0.2 - 1.4); p=0.204	52 (20.4); OR=1.3 (0.8 - 1.9); p=0.254	10 (23.8); OR=1.4 (0.7 - 3); p=0.33	8 (34.8); OR=2.49 (1.06 - 5.87); p=0.036	3 (15); OR=0.79 (0.24 - 2.56); p=1	‡	15 (12.6); OR=0.6 (0.3 - 1.1); p=0.084	18 (15.7); OR=0.8 (0.5 - 1.4); p=0.443	2 (100); OR= . (2.36- .); p=0.033	12 (19.7); OR=1.1 (0.6 - 2.2); p=0.752

Table 24: Odds Ratio by Location of Injury Part B

Location of Injury		All Nursing (295)	All Non-Clinical (352)	All Clinical (363)	Food Services (68)	Clean/Gen/HHH (107)	Porters (38)	Security (12)
		N (%); OR (95%CI); p-value	N (%); OR (95%CI); p-value	N (%); OR (95%CI); p-value	N (%); OR (95%CI); p-value	N (%); OR (95%CI); p-value	N (%); OR (95%CI); p-value	N (%); OR (95%CI); p-value
Clinical Areas	383	238 (80.7); OR=7.9 (5.6 - 11.3); p<0.001	93 (26.4); OR=0.1 (0.1 - 0.1); p<0.001	290 (79.9); OR=11.1 (7.8 - 15.7); p<0.001	‡	44 (41.1); OR=0.6 (0.4 - 0.8); p=0.005	20 (52.6); OR=1 (0.5 - 1.8); p=0.905	7 (58.3); OR=1.2 (0.4 - 3.9); p=0.738
CSSD	17	‡	17 (4.8); OR= . (4.78- .); P<0.001	‡	‡	3 (2.8); OR=1.2 (0.37 - 4.05); p=0.73	‡	‡
Kitchen	88	‡	88 (25); OR= . (31.46- .); p=<0.001	‡	68 (100); OR= . (540.77- .); P=<0.001	15 (14); OR=1.2 (0.7 - 2.2); p=0.559	1 (2.6); OR=0.18 (0 - 1.07); p=0.062	‡
Outside TBH	27	6 (2); OR=0.4 (0.2 - 0.99); p=0.041	18 (5.1); OR=2.1 (0.9 - 4.8); p=0.065	9 (2.5); OR=0.5 (0.2 - 1.1); p=0.065	‡	4 (3.7); OR=0.99 (0.35 - 2.79); p=0.982	‡	1 (8.3); OR=2.37 (0 - 14.96); p=0.372
Lift	32	5 (1.7); OR=0.3 (0.1 - 0.7); p=0.003	27 (7.7); OR=5.9 (2.3 - 15.6); p<0.001	5 (1.4); OR=0.2 (0.1 - 0.4); p<0.001	‡	14 (13.1); OR=4.9 (2.4 - 10.14); p<0.001	4 (10.5); OR=2.73 (0.95 - 7.89); p=0.083	1 (8.3); OR=1.97 (0 - 12.37); p=0.425
NOS	14	1 (0.3); OR=0.1 (0 - 0.8); p=0.009	13 (3.7); OR=13.9 (1.8 - 106.7); p=0.001	1 (0.3); OR=0.1 (0 - 0.6); p=0.001	‡	7 (6.5); OR=6.01 (2.15 - 16.8); p=0.002	‡	‡

Location of Injury		All Nursing (295)	All Non-Clinical (352)	All Clinical (363)	Food Services (68)	Clean/Gen/HHH (107)	Porters (38)	Security (12)
		N (%); OR (95%CI); p-value	N (%); OR (95%CI); p-value	N (%); OR (95%CI); p-value	N (%); OR (95%CI); p-value	N (%); OR (95%CI); p-value	N (%); OR (95%CI); p-value	N (%); OR (95%CI); p-value
Rec Area	16	5 (1.7); OR=0.6 (0.2 - 1.9); p=0.411	8 (2.3); OR=1 (0.4 - 2.8); p=0.95	8 (2.2); OR=1 (0.4 - 2.6); p=0.95	‡	1 (0.9); OR=0.37 (0 - 2.24); p=0.489	2 (5.3); OR=2.63 (0 - 10.83); p=0.207	‡
Stairs	29	9 (3.1); OR=0.6 (0.3 - 1.4); p=0.254	15 (4.3); OR=1.1 (0.5 - 2.3); p=0.784	14 (3.9); OR=0.9 (0.4 - 1.9); p=0.784	‡	4 (3.7); OR=0.91 (0.32 - 2.55); p=0.857	‡	‡
Workshop	7	‡	7 (100); OR= . (1.91- .); p=0.007	‡	‡	‡	‡	‡
Admin/Office	33	‡	33 (9.4); OR=. (9.76- .); p=<0.001	‡	‡	2 (1.9); OR=0.25 (0 - 1.36); p=0.142	2 (5.3); OR=1.16 (0 - 4.56); p=0.693	1 (8.3); OR=1.91 (0 - 11.95); p=0.435
Passageway and Similar Areas	69	31 (10.5); OR=1.2 (0.7 - 1.9); p=0.515	33 (9.4); OR=0.9 (0.6 - 1.5); p=0.806	36 (9.9); OR=1.1 (0.6 - 1.7); p=0.806	‡	13 (12.1); OR=1.4 (0.7 - 2.6); p=0.342	9 (23.7); OR=3.19 (1.47 - 6.96); p=0.007	2 (16.7); OR=1.9 (0 - 7.9); p=0.325
Lift/Stairs/Passageway	130	45 (15.3); OR=0.7 (0.5 - 1.1); p=0.089	75 (21.3); OR=1.5 (1.03 - 2.2); p=0.033	55 (15.2); OR=0.7 (0.44 - 0.97); p=0.033	‡	31 (29); OR=2.1 (1.3 - 3.4); p=0.002	13 (34.2); OR=2.5 (1.2 - 5); p=0.008	3 (25); OR=1.51 (0.44 - 5.25); p=0.465

Table 25: Odds Ratio by Work Process Part A

Work Process		Artisan (30)	Engineering2)	Health (45)	Support (255)	Line Function (42)	Management (23)	Medical Sciences (20)	Medical Technology (1)	Nursing Assistant (119)	Professional Nurse (115)	Social Services (2)	Staff Nurse (61)
		N (%); OR (95%CI) ; p-value	N (%); OR (95%CI) ; p-value	N (%); OR (95%CI) ; p-value	N (%); OR (95%CI) ; p-value	N (%); OR (95%CI) ; p-value	N (%); OR (95%CI) ; p-value	N (%); OR (95%CI) ; p-value	N (%); OR (95%CI) ; p-value	N (%); OR (95%CI) ; p-value	N (%); OR (95%CI) ; p-value	N (%); OR (95%CI) ; p-value	N (%); OR (95%CI) ; p-value
Admin	32	‡	‡	1 (2.2); OR=0.47 (0 - 2.78); p=0.714	2 (0.8); OR=0.1 (0 - 0.5); p<0.001	22 (52.4); OR=72.93 (30.91 - 172.03); p<0.001	‡	‡	‡	1 (0.8); OR=0.2 (0 - 1.1); p=0.036	6 (5.2); OR=1.2 (0.5 - 3); p=0.674	‡	‡
Cleaning	74	2 (6.7); OR=0.61 (0 - 2.36); p=0.76	‡	1 (2.2); OR=0.19 (0 - 1.09); p=0.065	64 (25.1); OR=15.1 (7.6 - 30); p<0.001	‡	1 (4.3); OR=0.39 (0 - 2.29); p=0.499	‡	‡	2 (1.7); OR=0.1 (0 - 0.5); p=0.001	2 (1.7); OR=0.1 (0 - 0.5); p=0.001	‡	2 (3.3); OR=0.3 (0.1 - 1.1); p=0.058
Daycare	2	‡	‡	‡	2 (0.8); OR= . (0.94- .); p=0.127	‡	‡	‡	‡	‡	‡	‡	‡
Maintenance / Fixing	19	15 (50); OR=170.25 (52.39 - 547.6); p<0.001	2 (100); OR= . (20.27- .) p<0.001	1 (2.2); OR=0.82 (0 - 4.98); p=1	1 (0.4); OR=0.1 (0 - 0.7); p=0.005	‡	‡	‡	‡	‡	‡	‡	‡
Patient Care	247	‡	‡	26 (57.8); OR=2.8 (1.5 -	29 (11.4); OR=0.1 (0.1 -	1 (2.4); OR=0 (0 - 0.3); p<0.001	9 (39.1); OR=1.2 (0.5 - 2.9); p=0.638	12 (60); OR=2.9 (1.2 - 7.3); p=0.015	‡	71 (59.7); OR=3.5 (2.4 -	64 (55.7); OR=2.9 (1.9 -	‡	35 (57.4); OR=2.8 (1.6 -

Work Process		Artisan (30)	Engineering2)	Health (45)	Support (255)	Line Function (42)	Management (23)	Medical Sciences (20)	Medical Technology (1)	Nursing Assistant (119)	Professional Nurse (115)	Social Services (2)	Staff Nurse (61)
				5.1); p=0.001	0.2); p<0.001					5.3); p<0.001	4.3); p<0.001		4.8); p<0.001
Prep Meals	22	‡	‡	‡	22 (8.6); OR= . (11.27- .) p<0.001	‡	‡	‡	‡	‡	‡	‡	‡
Tea/Lunch	20	‡	‡	2 (4.4); OR=1.68 (0 - 6.77); p=0.363	6 (2.4); OR=0.8 (0.3 - 2); p=0.592	2 (4.8); OR=1.82 (0 - 7.33); p=0.331	1 (4.3); OR=1.61 (0- 9.94); p=0.485	‡	1 (100); OR= . (0- .); p=0.028	4 (3.4); OR=1.3 (0.4 - 3.8); p=0.683	2 (1.7); OR=0.57 (0 - 2.25); p=0.756	‡	2 (3.3); OR=1.2 (0 - 4.77); p=0.685
Transit	144	4 (13.3); OR=0.6 (0.2 - 1.7); p=0.342	‡	10 (22.2); OR=1.1 (0.6 - 2.4); p=0.719	47 (18.4); OR=0.8 (0.6 - 1.2); p=0.396	12 (28.6); OR=1.6 (0.8 - 3.3); p=0.16	7 (30.4); OR=1.77 (0.73 - 4.28); p=0.211	6 (30); OR=1.73 (0.67 - 4.44); p=0.265	‡	23 (19.3); OR=0.9 (0.6 - 1.5); p=0.809	20 (17.4); OR=0.8 (0.5 - 1.4); p=0.422	2 (100); OR= . (2.08- .); p=0.04	13 (21.3); OR=1.1 (0.6 - 2.1); p=0.811
Working with Equipment	148	8 (26.7); OR=1.4 (0.6 - 3.2); p=0.41	‡	4 (8.9); OR=0.36 (0.13 - 0.97); p=0.043	79 (31); OR=2.5 (1.8 - 3.7); p<0.001	5 (11.9); OR=0.5 (0.2 - 1.3); p=0.147	4 (17.4); OR=0.8 (0.28 - 2.29); p=0.691	2 (10); OR=0.42 (0 - 1.64); p=0.231	‡	17 (14.3); OR=0.6 (0.3 - 1); p=0.059	20 (17.4); OR=0.8 (0.5 - 1.3); p=0.339	‡	9 (14.8); OR=0.6 (0.3 - 1.3); p=0.231
NOS	7	1 (3.3); OR=3.9 (0 - 25.85); p=0.26	‡	‡	3 (1.2); OR=1.36 (0.34 - 5.46); p=0.705	‡	1 (4.3); OR=5.2 (0 - 34.89); p=0.205	‡	‡	1 (0.8); OR=0.83 (0 - 5.34); p=1	1 (0.9); OR=0.87 (0 - 5.57); p=1	‡	‡

Table 26: Odds Ratio by Work Process Part B

Work Process		All Nursing (295)	All Non-Clinical (352)	All Clinical (363)	Food Services (68)	Clean/Gen/HHH (107)	Porters (38)	Security (12)
		N (%); OR (95%CI); p-value	N (%); OR (95%CI); p-value	N (%); OR (95%CI); p-value	N (%); OR (95%CI); p-value	N (%); OR (95%CI); p-value	N (%); OR (95%CI); p-value	N (%); OR (95%CI); p-value
Admin	32	7 (2.4); OR=0.4 (0.2 - 0.9); p=0.023	24 (6.8); OR=3.2 (1.4 - 7.3); p=0.003	8 (2.2); OR=0.3 (0.1 - 0.7); p=0.003	‡	1 (0.9); OR=0.17 (0 - 1.03); p=0.055	‡	‡
Cleaning	74	6 (2); OR=0.1 (0 - 0.3); p=0	67 (19); OR=12 (5.4 - 26.4); p<0.001	7 (1.9); OR=0.1 (0 - 0.2); p<0.001	16 (23.5); OR=3.1 (1.7 - 5.8); p<0.001	40 (37.4); OR=10.1 (6 - 17); p<0.001	‡	‡
Daycare	2	‡	2 (0.6); OR= . (0.54- .); p=0.242	‡	‡	2 (1.9); OR= . (2.99- .); p=0.022	‡	‡
Maintenance/Fixing	19	‡	18 (5.1); OR=19.5 (2.6 - 146.9); p<0.001	1 (0.3); OR=0.1 (0 - 0.4); p<0.001	‡	‡	‡	‡
Patient Interaction	247	170 (57.6); OR=6.1 (4.3 - 8.5); p<0.001	39 (11.1); OR=0.1 (0.1 - 0.1); p<0.001	208 (57.3); OR=10.8 (7.3 - 15.9); p<0.001	‡	5 (4.7); OR=0.1 (0 - 0.2); p<0.001	25 (65.8); OR=3.9 (2 - 7.9); p<0.001	7 (58.3); OR=2.7 (0.9 - 8.14); p=0.081
Prep Meals	22	‡	22 (6.3); OR= . (6.28- .); p<0.001	‡	20 (29.4); OR=134.38 (33.7 - .); p<0.001	‡	‡	‡
Tea/Lunch	20	8 (2.7); OR=0.9 (0.4 - 2.3); p=0.908	9 (2.6); OR=0.8 (0.3 - 2.1); p=0.701	11 (3); OR=1.2 (0.5 - 2.9); p=0.701	‡	2 (1.9); OR=0.62 (0 - 2.46); p=0.754	2 (5.3); OR=2 (0 - 8.23); p=0.288	1 (8.3); OR=3.27 (0 - 21.01); p=0.291
Transit	144	56 (19); OR=0.9 (0.6 - 1.3); p=0.518	70 (19.9); OR=1 (0.7 - 1.4); p=0.868	74 (20.4); OR=1 (0.7 - 1.5); p=0.868	12 (17.6); OR=0.8 (0.4 - 1.6); p=0.59	18 (16.8); OR=0.8 (0.4 - 1.3); p=0.353	5 (13.2); OR=0.6 (0.2 - 1.5); p=0.27	1 (8.3); OR=0.35 (0 - 2.17); p=0.476
Working with Equipment	148	46 (15.6); OR=0.6 (0.4 - 0.8); p=0.005	96 (27.3); OR=2.2 (1.5 - 3.3); p<0.001	52 (14.3); OR=0.4 (0.3 - 0.6); p<0.001	20 (29.4); OR=1.7 (1 - 2.9); p=0.062	37 (34.6); OR=2.4 (1.5 - 3.7); p<0.001	6 (15.8); OR=0.7 (0.3 - 1.7); p=0.443	2 (16.7); OR=0.76 (0 - 3.14); p=1
NOS	7	2 (0.7); OR=0.57 (0 - 2.55); p=0.706	5 (1.4); OR=2.6 (0.58 - .); p=0.28	2 (0.6); OR=0.38 (0 - 1.73); p=0.28	‡	2 (1.9); OR=2.3 (0 - 10.43); p=0.282	‡	1 (8.3); OR=10.56 (0 - 74.74); p=0.112

Table 27: Odds Ratio by Mechanism of Injury Part A

Mechanism of Injury		Artisan (30)	Engineering2)	Health (45)	Support (255)	Line Function (42)	Management (23)	Medical Sciences (20)	Medical Technology (1)	Nursing Assistant (119)	Professional Nurse (115)	Social Services (2)	Staff Nurse (61)
		N (%); OR (95%CI) ; p-value	N (%); OR (95%CI) ; p-value	N (%); OR (95%CI) ; p-value	N (%); OR (95%CI) ; p-value	N (%); OR (95%CI) ; p-value	N (%); OR (95%CI) ; p-value	N (%); OR (95%CI) ; p-value	N (%); OR (95%CI) ; p-value	N (%); OR (95%CI) ; p-value	N (%); OR (95%CI) ; p-value	N (%); OR (95%CI) ; p-value	N (%); OR (95%CI) ; p-value
Assault	52	‡	‡	2 (4.4); OR=0.58 (0 - 2.22); p=0.764	5 (2); OR=0.2 (0.1 - 0.4); p<0.001	‡	6 (26.1); OR=4,96 (1.92 - 12,83); p=0.004	‡	‡	12 (10.1); OR=1.6 (0.8 - 3.1); p=0.196	16 (13.9); OR=2.5 (1.4 - 4.7); p=0.003	‡	11 (18); OR=3.29 (1.61 - 6.72); p<0.001
Bump/Knock NOS	88	6 (20); OR=1.84 (0.75 - 4.51); p=0.248	‡	3 (6.7); OR=0.5 (0.1 - 1.6); p=0.234	40 (15.7); OR=1.6 (1.02- 2.5); p=0.041	6 (14.3); OR=1.2 (0.5 - 2.9); p=0.688	3 (13); OR=1.1 (0.33 - 3.46); p=0.755	6 (30); OR=3.2 (1.24 - 8.31); p=0.027	‡	8 (6.7); OR=0.5 (0.2 - 0.99); p=0.042	11 (9.6); OR=0.7 (0.4 - 1.4); p=0.328	‡	5 (8.2); OR=0.6 (0.2 - 1.6); p=0.307
Burn	21	‡	‡	2 (4.4); OR=1.59 (0 - 6,39); p=0.386	15 (5.9); OR=4.7 (1.8 - 12.3); p=0.001	‡	‡	‡	‡	2 (1.7); OR=0.52 (0 - 2.04); p=0.555	1 (0.9); OR=0.25 (0 - 1.51); p=0.228	‡	1 (1.6); OR=0.53 (0 - 3,16); p=1
Crush Injury Foot/Ankle	39	‡	‡	‡	16 (6.3); OR=1.3 (0.7 - 2.5); p=0.472	1 (2.4); OR=0.41 (0 - 2,41); p=0.721	2 (8.7); OR=1.69 (0 - 6,75); p=0.361	1 (5); OR=0.91 (0 - 5,51); p=1	‡	7 (5.9); OR=1.1 (0.5 - 2.6); p=0.822	8 (7); OR=1.4 (0.6 - 3.1); p=0.439	‡	4 (6.6); OR=1.24 (0.45 - 3.47); p=0.566

Mechanism of Injury		Artisan (30)	Engineering2)	Health (45)	Support (255)	Line Function (42)	Management (23)	Medical Sciences (20)	Medical Technology (1)	Nursing Assistant (119)	Professional Nurse (115)	Social Services (2)	Staff Nurse (61)
		N (%); OR (95%CI) ; p-value	N (%); OR (95%CI) ; p-value	N (%); OR (95%CI) ; p-value	N (%); OR (95%CI) ; p-value	N (%); OR (95%CI) ; p-value	N (%); OR (95%CI) ; p-value	N (%); OR (95%CI) ; p-value	N (%); OR (95%CI) ; p-value	N (%); OR (95%CI) ; p-value	N (%); OR (95%CI) ; p-value	N (%); OR (95%CI) ; p-value	N (%); OR (95%CI) ; p-value
Slip, Trip and Fall	212	3 (10); OR=0.3 (0.1 - 0.8); p=0.016	‡	12 (26.7); OR=0.9 (0.4 - 1.7); p=0.651	86 (33.7); OR=1.3 (1 - 1.9); p=0.076	20 (47.6); OR=2.28 (1.23 - 4.23); p=0.009	8 (34.8); OR=1.3 (0.5 - 3.1); p=0.584	4 (20); OR=0.6 (0.2 - 1.8); p=0.338	‡	35 (29.4); OR=1 (0.6 - 1.5); p=0.95	28 (24.3); OR=0.7 (0.5 - 1.2); p=0.174	2 (100); OR= . (1,24- .); p=0.088	14 (23); OR=0.7 (0.4 - 1.3); p=0.231
Foreign Body Eye	10	5 (16.7); OR=27.2 (7.89 - 94,05); p<0.001	‡	‡	2 (0.8); OR=0.45 (0 - 1,88); p=0.508	1 (2.4); OR=1.8 (0 - 11,35); p=0.456	‡	‡	‡	1 (0.8); OR=0.55 (0 - 3,42); p=1	1 (0.9); OR=0.58 (0 - 3,56); p=1	‡	‡
Manual Handling	157	8 (26.7); OR=1.3 (0.6 - 3); p=0.524	2 (100); OR= . (1,86- .); p=0.048	22 (48.9); OR=3.8 (2.1 - 7); p<0.001	35 (13.7); OR=0.4 (0.3 - 0.7); p<0.001	5 (11.9); OR=0.5 (0.2 - 1.2); p=0.105	2 (8.7); OR=0.3 (0.1 - 1.4); p=0.118	3 (15); OR=0.62 (0.19 - 2); p=0.446	‡	33 (27.7); OR=1.5 (0.9 - 2.3); p=0.096	35 (30.4); OR=1.7 (1.1 - 2.7); p=0.017	‡	12 (19.7); OR=0.9 (0.4 - 1.7); p=0.652
NOS	28	‡	‡	‡	13 (5.1); OR=1.6 (0.7 - 3.4); p=0.225	5 (11.9); OR=3.82 (1.43 - 10.29); p=0.02	‡	1 (5); OR=1.3 (0 - 7,97); p=0.555	‡	2 (1.7); OR=0.37 (0 - 1.45); p=0.169	3 (2.6); OR=0.62 (0.2 - 1,95); p=0.43	‡	4 (6.6); OR=1.8 (0.65 - 5.27); p=0.288
Crush Injury/ Laceration Hands	108	8 (26.7); OR=2.13 (0.94 - 4.82); p=0.071	‡	4 (8.9); OR=0.5 (0.2 - 1.5); p=0.229	43 (16.9); OR=1.2 (0.8 -	4 (9.5); OR=0.6 (0.2 - 1.6); p=0.298	2 (8.7); OR=0.53 (0 - 2.06); p=0.557	5 (25); OR=1.92 (0.71 - 5.19); p=0.207	1 (100); OR= . (0 - .); p= 0.151	19 (16); OR=1.1 (0.6 - 1.9); p=0.774	12 (10.4); OR=0.6 (0.3 -	‡	10 (16.4); OR=1.1 (0.5 -

Mechanism of Injury		Artisan (30)	Engineering2)	Health (45)	Support (255)	Line Function (42)	Management (23)	Medical Sciences (20)	Medical Technology (1)	Nursing Assistant (119)	Professional Nurse (115)	Social Services (2)	Staff Nurse (61)
		N (%); OR (95%CI) ; p-value	N (%); OR (95%CI) ; p-value	N (%); OR (95%CI) ; p-value	N (%); OR (95%CI) ; p-value	N (%); OR (95%CI) ; p-value	N (%); OR (95%CI) ; p-value	N (%); OR (95%CI) ; p-value	N (%); OR (95%CI) ; p-value	N (%); OR (95%CI) ; p-value	N (%); OR (95%CI) ; p-value	N (%); OR (95%CI) ; p-value	N (%); OR (95%CI) ; p-value
					1.9); p=0.328						1.2); p=0.127		2.3); p=0.769

Table 28: Odds Ratio by Mechanism of Injury Part B

Mechanism of Injury		All Nursing (295)	All Non-Clinical (352)	All Clinical (363)	Food Services (68)	Clean/Gen/HHH (107)	Porters (38)	Security (12)
		N (%); OR (95%CI); p-value	N (%); OR (95%CI); p-value	N (%); OR (95%CI); p-value	N (%); OR (95%CI); p-value	N (%); OR (95%CI); p-value	N (%); OR (95%CI); p-value	N (%); OR (95%CI); p-value
Assault	52	39 (13.2); OR=4.8 (2.5 - 9.1); p<0.001	11 (3.1); OR=0.3 (0.1 - 0.5); p<0.001	41 (11.3); OR=3.9 (2 - 7.8); p<0.001	‡	3 (2.8); OR=0.3 (0.1 - 1.1); p=0.054	‡	6 (50); OR=14.28 (4.66 - 43,81); p=0.001
Bump/Knock NOS	88	24 (8.1); OR=0.5 (0.3 - 0.8); p=0.004	55 (15.6); OR=1.9 (1.2 - 2.9); p=0.008	33 (9.1); OR=0.5 (0.3 - 0.9); p=0.008	10 (14.7); OR=1.3 (0.6 - 2.6); p=0.527	17 (15.9); OR=1.4 (0.8 - 2.5); p=0.222	6 (15.8); OR=1.36 (0.57 - 3.27); p=0.502	2 (16.7); OR=1.43 (0 - 5,95); p=0.65
Burn	21	4 (1.4); OR=0.3 (0.1 - 0.98); p=0.036	15 (4.3); OR=2.6 (1.02 - 6.9); p=0.039	6 (1.7); OR=0.4 (0.1 - 0.98); p=0.039	7 (10.3); OR=5.19 (2,08 - 13.01); p=0.002	4 (3.7); OR=1.35 (0.47 - 3,91); p=0.539	2 (5.3); OR=1.92 (0 - 7,76); p=0.308	‡
Crush Injury Foot/Ankle	39	19 (6.4); OR=1.4 (0.7 - 2.6); p=0.33	19 (5.4); OR=1 (0.5 - 1.9); p=0.947	20 (5.5); OR=1 (0.5 - 1.9); p=0.947	4 (5.9); OR=1.09 (0.39 - 3.05); p=0.781	8 (7.5); OR=1.5 (0.7 - 3.4); p=0.318	3 (7.9); OR=1.53 (0.48 - 4,9); p=0.456	‡

Mechanism of Injury		All Nursing (295)	All Non-Clinical (352)	All Clinical (363)	Food Services (68)	Clean/Gen/HHH (107)	Porters (38)	Security (12)
		N (%); OR (95%CI); p-value	N (%); OR (95%CI); p-value	N (%); OR (95%CI); p-value	N (%); OR (95%CI); p-value	N (%); OR (95%CI); p-value	N (%); OR (95%CI); p-value	N (%); OR (95%CI); p-value
Slip, Trip and Fall	212	77 (26.1); OR=0.7 (0.5 - 1); p=0.082	117 (33.2); OR=1.4 (1.02 - 1.9); p=0.039	95 (26.2); OR=0.7 (0.5 - 0.98); p=0.039	28 (41.2); OR=1.8 (1.1 - 2.9); p=0.029	39 (36.4); OR=1.4 (0.9 - 2.2); p=0.095	7 (18.4); OR=0.5 (0.2 - 1.2); p=0.119	2 (16.7); OR=0.47 (0 - 1,93); p=0.525
Foreign Body Eye	10	2 (0.7); OR=0.35 (0 - 1.48); p=0.169	8 (2.3); OR=4.2 (1 - .); p=0.05	2 (0.6); OR=0.24 (0 - 1); p=0.05	‡	2 (1.9); OR=1.43 (0 - 6.05); p=0.651	‡	‡
Manual Handling	157	80 (27.1); OR=1.7 (1.2 - 2.4); p=0.005	52 (14.8); OR=0.4 (0.3 - 0.6); p<0.001	105 (28.9); OR=2.3 (1.6 - 3.4); p<0.001	3 (4.4); OR=0.1 (0 - 0.5); p<0.001	17 (15.9); OR=0.6 (0.4 - 1.1); p=0.1	10 (26.3); OR=1.3 (0.6 - 2.7); p=0.505	1 (8.3); OR=0.32 (0 - 1,94); p=0.48
NOS	28	9 (3.1); OR=0.7 (0.3 - 1.5); p=0.318	18 (5.1); OR=1.9 (0.9 - 4.2); p=0.104	10 (2.8); OR=0.5 (0.2 - 1.2); p=0.104	2 (2.9); OR=0.72 (0 - 2,82); p=1	6 (5.6); OR=1.58 (0.64 - 3,9); p=0.328	1 (2.6); OR=0.65 (0 - 3,89); p=1	‡
Crush Injury/ Laceration Hands	108	41 (13.9); OR=0.9 (0.6 - 1.3); p=0.45	57 (16.2); OR=1.2 (0.8 - 1.8); p=0.424	51 (14); OR=0.8 (0.6 - 1.3); p=0.424	14 (20.6); OR=1.5 (0.8 - 2.9); p=0.184	11 (10.3); OR=0.6 (0.3 - 1.2); p=0.131	9 (23.7); OR=1.8 (0.8 - 3.9); p=0.129	1 (8.3); OR=0.51 (0 - 3,09); p=1

Table 29: Odds Ratio by Type of Injury Part A

Type of Injury		Artisan (30)	Engineering2)	Health (45)	Support (255)	Line Function (42)	Management (23)	Medical Sciences (20)	Medical Technology (1)	Nursing Assistant (119)	Professional Nurse (115)	Social Services (2)	Staff Nurse (61)
		N (%); OR (95%CI) ; p-value	N (%); OR (95%CI) ; p-value	N (%); OR (95%CI) ; p-value	N (%); OR (95%CI) ; p-value	N (%); OR (95%CI) ; p-value	N (%); OR (95%CI) ; p-value	N (%); OR (95%CI) ; p-value	N (%); OR (95%CI) ; p-value	N (%); OR (95%CI) ; p-value	N (%); OR (95%CI) ; p-value	N (%); OR (95%CI) ; p-value	N (%); OR (95%CI) ; p-value
Superficial	212	12 (40); OR=1.6 (0.8 - 3.4); p=0.205	‡	11 (24.4); OR=0.8 (0.4 - 1.5); p=0.43	81 (31.8); OR=1.2 (0.8 - 1.6); p=0.357	12 (28.6); OR=0.9 (0.5 - 1.9); p=0.875	7 (30.4); OR=1 (0.4 - 2.6); p=0.933	9 (45); OR=2 (0.8 - 4.9); p=0.127	1 (100); OR= . (0- .); p=0.297	25 (21); OR=0.6 (0.4 - 0.9); p=0.024	31 (27); OR=0.9 (0.5 - 1.3); p=0.49	‡	23 (37.7); OR=1.5 (0.9 - 2.6); p=0.15
Fracture	40	1 (3.3); OR=0.57 (0 - 3.41); p=1	‡	2 (4.4); OR=0.77 (0 - 3); p=1	11 (4.3); OR=0.7 (0.3 - 1.4); p=0.267	3 (7.1); OR=1.32 (0.42 - 4.23); p=0.724	2 (8.7); OR=1.64 (0 - 6.56); p=0.373	3 (15); OR=3.14 (0.95 - 10.52); p=0.095	‡	10 (8.4); OR=1.7 (0.8 - 3.6); p=0.144	6 (5.2); OR=0.9 (0.4 - 2.2); p=0.848	‡	2 (3.3); OR=0.55 (0 - 2.12); p=0.567
Sprain/ Strain	412	12 (40); OR=0.475 (0.23 - 0.987); p=0.046	2 (100); OR= . (0.38- .); p=0.511	29 (64.4); OR=1.4 (0.7 - 2.5); p=0.339	135 (52.9); OR=0.7 (0.5 - 1); p=0.059	26 (61.9); OR=1.2 (0.6 - 2.3); p=0.563	13 (56.5); OR=1 (0.4 - 2.2); p=0.914	8 (40); OR=0.5 (0.2 - 1.2); p=0.106	‡	78 (65.5); OR=1.5 (1 - 2.3); p=0.055	74 (64.3); OR=1.4 (0.9 - 2.1); p=0.111	2 (100); OR= . (0.38- .); p=0.511	33 (54.1); OR=0.9 (0.5 - 1.4); p=0.56
Foreign body	10	5 (16.7); OR=27.2 (7.89 - 94.05); p<0.001	‡	‡	2 (0.8); OR=0.45 (0- 1.88); p=0.508	1 (2.4); OR=1.8 (0 - 11.35); p=0.456	‡	‡	‡	1 (0.8); OR=0.55 (0 - 3.42); p=1	1 (0.9); OR=0.58 (0 - 3.56); p=1	‡	‡

Type of Injury		Artisan (30)	Engineering2)	Health (45)	Support (255)	Line Function (42)	Management (23)	Medical Sciences (20)	Medical Technology (1)	Nursing Assistant (119)	Professional Nurse (115)	Social Services (2)	Staff Nurse (61)
		N (%); OR (95%CI) ; p-value	N (%); OR (95%CI) ; p-value	N (%); OR (95%CI) ; p-value	N (%); OR (95%CI) ; p-value	N (%); OR (95%CI) ; p-value	N (%); OR (95%CI) ; p-value	N (%); OR (95%CI) ; p-value	N (%); OR (95%CI) ; p-value	N (%); OR (95%CI) ; p-value	N (%); OR (95%CI) ; p-value	N (%); OR (95%CI) ; p-value	N (%); OR (95%CI) ; p-value
Burn	17	‡	‡	2 (4.4); OR=2 (0 - 8.27); p=0.291	12 (4.7); OR=4.5 (1.6 - 12.9); p=0.002	‡	‡	‡	‡	2 (1.7); OR=0.66 (0 - 2.64); p=0.752	1 (0.9); OR=0.32 (0 - 1.92); p=0.335	‡	‡
None	16	‡	‡	‡	11 (4.3); OR=4.1 (1.4 - 11.9); p=0.005	‡	‡	‡	‡	2 (1.7); OR=0.71 (0 - 2.85); p=1	‡	‡	3 (4.9); OR=2.55 (0.76 - 8.62); p=0.149
NOS	8	‡	‡	1 (2.2); OR=2.15 (0 - 13.84); p=0.407	3 (1.2); OR=1.08 (0.28 - 4.14); p=1	‡	1 (4.3); OR=4.45 (0 - 29.41); p=0.231	‡	‡	1 (0.8); OR=0.71 (0 - 4.5); p=1	2 (1.7); OR=1.75 (0 - 7.71); p=0.621	‡	‡

Table 30: Odds Ratio by Type of Injury Part B

Type of Injury		All Nursing (295)	All Non-Clinical (352)	All Clinical (363)	Food Services (68)	Clean/Gen/HHH (107)	Porters (38)	Security (12)
		N (%); OR (95%CI); p-value	N (%); OR (95%CI); p-value	N (%); OR (95%CI); p-value	N (%); OR (95%CI); p-value	N (%); OR (95%CI); p-value	N (%); OR (95%CI); p-value	N (%); OR (95%CI); p-value
Superficial	212	79 (26.8); OR=0.8 (0.6 - 1.1); p=0.159	112 (31.8); OR=1.2 (0.9 - 1.7); p=0.211	100 (27.5); OR=0.8 (0.6 - 1.1); p=0.211	24 (35.3); OR=1.3 (0.8 - 2.3); p=0.284	30 (28); OR=0.9 (0.6 - 1.4); p=0.692	12 (31.6); OR=1.1 (0.5 - 2.2); p=0.789	3 (25); OR=0.79 (0.23 - 2.72); p=1
Fracture	40	18 (6.1); OR=1.2 (0.6 - 2.2); p=0.621	17 (4.8); OR=0.8 (0.4 - 1.4); p=0.381	23 (6.3); OR=1.3 (0.7 - 2.5); p=0.381	3 (4.4); OR=0.76 (0.24 - 2.39); p=1	6 (5.6); OR=1 (0.4 - 2.5); p=0.995	2 (5.3); OR=0.93 (0 - 3.65); p=1	1 (8.3); OR=1.55 (0 - 9.64); p=0.502
Sprain/ Strain	412	185 (62.7); OR=1.4 (1.1 - 1.9); p=0.021	188 (53.4); OR=0.71 (0.53 - 0.96); p=0.025	224 (61.7); OR=1.41 (1.04 - 1.89); p=0.025	30 (44.1); OR=0.5 (0.3 - 0.9); p=0.018	61 (57); OR=1 (0.6 - 1.5); p=0.889	21 (55.3); OR=0.9 (0.5 - 1.7); p=0.762	7 (58.3); OR=1 (0.3 - 3.3); p=0.96
Foreign body	10	2 (0.7); OR=0.35 (0 - 1.48); p=0.169	8 (2.3); OR=4.2 (1 - .); p=0.05	2 (0.6); OR=0.24 (0 - 1); p=0.05	‡	2 (1.9); OR=1.43 (0 - 6.05); p=0.651	‡	‡
Burn	17	3 (1); OR=0.3 (0.09 - 0.9776); p=0.045	12 (3.4); OR=2.5 (0.9 - 7.2); p=0.075	5 (1.4); OR=0.4 (0.1 - 1.1); p=0.075	6 (8.8); OR=5.6 (2.08 - 15.13); p=0.003	3 (2.8); OR=1.2 (0.37 - 4.05); p=0.73	2 (5.3); OR=2.45 (0 - 10.04); p=0.227	‡
None	16	5 (1.7); OR=0.6 (0.2 - 1.9); p=0.411	11 (3.1); OR=2.3 (0.8 - 6.7); p=0.114	5 (1.4); OR=0.4 (0.1 - 1.3); p=0.114	4 (5.9); OR=3.31 (1.09 - 10.05); p=0.057	4 (3.7); OR=1.93 (0.64 - 5.8); p=0.28	1 (2.6); OR=1.19 (0 - 7.31); p=0.587	‡
NOS	8	3 (1); OR=0.85 (0.22 - 3.26); p=1	4 (1.1); OR=1.03 (0.28 - 3.8); p=1	4 (1.1); OR=0.97 (0.26 - 3.57); p=1	1 (1.5); OR=1.37 (0 - 8.69); p=0.552	1 (0.9); OR=0.81 (0 - 5.12); p=1	‡	1 (8.3); OR=9.04 (0 - 62.89); p=0.127

Table 31: Odds Ratio by Body Region Affected Part A

Body Region Affected		Artisan (30)	Engineering2)	Health (45)	Support (255)	Line Function (42)	Management (23)	Medical Sciences (20)	Medical Technology (1)	Nursing Assistant (119)	Professional Nurse (115)	Social Services (2)	Staff Nurse (61)
		N (%); OR (95%CI) ; p-value	N (%); OR (95%CI) ; p-value	N (%); OR (95%CI) ; p-value	N (%); OR (95%CI) ; p-value	N (%); OR (95%CI) ; p-value	N (%); OR (95%CI) ; p-value	N (%); OR (95%CI) ; p-value	N (%); OR (95%CI) ; p-value	N (%); OR (95%CI) ; p-value	N (%); OR (95%CI) ; p-value	N (%); OR (95%CI) ; p-value	N (%); OR (95%CI) ; p-value
Upper limb	249	9 (30); OR=0.8 (0.4 - 1.8); p=0.571	‡	16 (35.6); OR=1 (0.6 - 1.9); p=0.915	92 (36.1); OR=1.1 (0.8 - 1.5); p=0.6	16 (38.1); OR=1.2 (0.6 - 2.2); p=0.647	8 (34.8); OR=1 (0.4 - 2.4); p=0.997	8 (40); OR=1.3 (0.5 - 3.1); p=0.622	1 (100); OR= . (0- .); p=0.348	38 (31.9); OR=0.9 (0.6 - 1.3); p=0.468	35 (30.4); OR=0.8 (0.5 - 1.2); p=0.281	‡	26 (42.6); OR=1.4 (0.8 - 2.4); p=0.181
Back/ Neck	166	8 (26.7); OR=1.2 (0.5 - 2.8); p=0.648	2 (100); OR= . (1.73- .); p= 0.054	19 (42.2); OR=2.6 (1.4 - 4.8); p=0.002	42 (16.5); OR=0.5 (0.4 - 0.8); p=0.001	12 (28.6); OR=1.3 (0.7 - 2.7); p=0.397	4 (17.4); OR=0.7 (0.2 - 2.1); p=0.501	2 (10); OR=0.36 (0 - 1.41); p=0.156	‡	27 (22.7); OR=1 (0.6 - 1.5); p=0.881	40 (34.8); OR=2 (1.3 - 3.1); p=0.001	‡	10 (16.4); OR=0.6 (0.3 - 1.3); p=0.187
Lower limb	205	3 (10); OR=0.3 (0.1 - 0.9); p=0.021	‡	6 (13.3); OR=0.4 (0.2 - 0.9); p=0.019	84 (32.9); OR=1.4 (1 - 1.9); p=0.06	9 (21.4); OR=0.7 (0.3 - 1.4); p=0.285	9 (39.1); OR=1.6 (0.7 - 3.8); p=0.26	8 (40); OR=1.7 (0.7 - 4.2); p=0.256	‡	36 (30.3); OR=1.1 (0.7 - 1.7); p=0.676	30 (26.1); OR=0.9 (0.5 - 1.3); p=0.503	2 (100); 0R= . (1.3 - .); p=0.082	18 (29.5); OR=1 (0.6 - 1.9); p=0.88
Head/ eye	61	9 (30); OR=5.22 (2.32 - 11.78); p<0.001	‡	3 (6.7); OR= 0.76 (0.24- 2.37); p=1	19 (7.5); OR=0.8 (0.5 - 1.4); p=0.441	4 (9.5); OR=1.14 (0.41 - 3.17); p=0.775	2 (8.7); OR=1.02 (0 - 4.04); p=1	2 (10); OR=1.2 (0 - 4.77); p=0.685	‡	12 (10.1); OR=1.3 (0.6 - 2.4); p=0.507	7 (6.1); OR=0.7 (0.3 - 1.5); p=0.306	‡	3 (4.9); OR=0.5 (0.2 - 1.7); p=0.291

Body Region Affected		Artisan (30)	Engineering2)	Health (45)	Support (255)	Line Function (42)	Management (23)	Medical Sciences (20)	Medical Technology (1)	Nursing Assistant (119)	Professional Nurse (115)	Social Services (2)	Staff Nurse (61)
		N (%); OR (95%CI) ; p-value	N (%); OR (95%CI) ; p-value	N (%); OR (95%CI) ; p-value	N (%); OR (95%CI) ; p-value	N (%); OR (95%CI) ; p-value	N (%); OR (95%CI) ; p-value	N (%); OR (95%CI) ; p-value	N (%); OR (95%CI) ; p-value	N (%); OR (95%CI) ; p-value	N (%); OR (95%CI) ; p-value	N (%); OR (95%CI) ; p-value	N (%); OR (95%CI) ; p-value
Torso	14	1 (3.3); OR=1.78 (0 - 11.1); p=0.454	‡	1 (2.2); OR=1.15 (0 - 7.06); p=0.601	8 (3.1); OR=2.45 (0.88 - 6.84); p=0.09	1 (2.4); OR=1.21 (0 - 7.63); p=0.575	‡	‡	‡	‡	2 (1.7); OR=0.87 (0 - 3.52); p=1	‡	1 (1.6); OR=0.82 (0 - 5.02); p=1
No injury	12	‡	‡	‡	8 (3.1); OR=3.69 (1.17 - 11.63); p=0.024	‡	‡	‡	‡	2 (1.7); OR=1 (0 - 4.13); p=1	‡	‡	2 (3.3); OR=2.18 (0 - 9.12); p=0.273
NOS	8	‡	‡	‡	2 (0.8); OR=0.6 (0 - 2.61); p=0.718	‡	‡	‡	‡	4 (3.4); OR=5.15 (1.39 - 19.07); p=0.03	1 (0.9); OR=0.74 (0- 4.69); p=1	‡	1 (1.6); OR=1.54 (0 - 9.83); p=0.512

Table 32: Odds Ratio by Body Region Affected Part B

Body Region Affected		All Nursing (295)	All Non-Clinical (352)	All Clinical (363)	Food Services (68)	Clean/Gen/HHH (107)	Porters (38)	Security (12)
		N (%); OR (95%CI); p-value	N (%); OR (95%CI); p-value	N (%); OR (95%CI); p-value	N (%); OR (95%CI); p-value	N (%); OR (95%CI); p-value	N (%); OR (95%CI); p-value	N (%); OR (95%CI); p-value
Upper limb	249	99 (33.6); OR=0.9 (0.7 - 1.2); p=0.552	125 (35.5); OR=1.1 (0.8 - 1.4); p=0.705	124 (34.2); OR=0.9 (0.7 - 1.3); p=0.705	31 (45.6); OR=1.6 (1 - 2.7); p=0.05	30 (28); OR=0.7 (0.4 - 1.1); p=0.11	13 (34.2); OR=1 (0.5 - 1.9); p=0.935	5 (41.7); OR=1.34 (0.45 - 4.05); p=0.616
Back/ Neck	166	77 (26.1); OR=1.3 (0.9 - 1.9); p=0.126	68 (19.3); OR=0.6 (0.5 - 0.9); p=0.015	98 (27); OR=1.5 (1.1 - 2.2); p=0.015	5 (7.4); OR=0.2 (0.1 - 0.6); p=0.001	20 (18.7); OR=0.7 (0.4 - 1.2); p=0.229	8 (21.1); OR=0.9 (0.4 - 1.9); p=0.745	2 (16.7); OR=0.66 (0 - 2.7); p=0.742
Lower limb	205	84 (28.5); OR=1 (0.7 - 1.4); p=0.922	105 (29.8); OR=1.1 (0.8 - 1.5); p=0.5	100 (27.5); OR=0.9 (0.6 - 1.2); p=0.5	22 (32.4); OR=1.2 (0.7 - 2.1); p=0.48	41 (38.3); OR=1.7 (1.1 - 2.6); p=0.017	12 (31.6); OR=1.2 (0.6 - 2.3); p=0.684	3 (25); OR=0.83 (0.24 - 2.86); p=1
Head/ eye	61	22 (7.5); OR=0.8 (0.5 - 1.4); p=0.389	34 (9.7); OR=1.3 (0.8 - 2.3); p=0.288	27 (7.4); OR=0.8 (0.4 - 1.3); p=0.288	5 (7.4); OR=0.8 (0.3 - 2.2); p=0.715	7 (6.5); OR=0.7 (0.3 - 1.6); p=0.424	3 (7.9); OR=0.92 (0.29 - 2.89); p=1	2 (16.7); OR=2.18 (0 - 9.12); p=0.273
Torso	14	3 (1); OR=0.4 (0.1 - 1.4); p=0.128	10 (2.8); OR=2.6 (0.8 - 8.4); p=0.093	4 (1.1); OR=0.4 (0.1 - 1.2); p=0.093	2 (2.9); OR=1.6 (0.4 - 7.3); p=0.538	5 (4.7); OR=3.26 (1.12 - 9.49); p=0.045	1 (2.6); OR=1.38 (0 - 8.53); p=0.538	‡
No injury	12	4 (1.4); OR=0.71 (0.23 - 2.23); p=0.574	8 (2.3); OR=2.1 (0.6 - 7); p=0.223	4 (1.1); OR=0.5 (0.1 - 1.6); p=0.223	3 (4.4); OR=3.27 (0.94 - 11.5); p=0.097	3 (2.8); OR=1.92 (0.55 - 6.69); p=0.403	1 (2.6); OR=1.64 (0 - 10.21); p=0.483	‡
NOS	8	6 (2); OR=4.34 (0.99- .); p=0.071	2 (0.6); OR=0.34 (0 - 1.49); p=0.287	6 (1.7); OR=2.9 (0.67 - .); p=0.168	‡	1 (0.9); OR=0.8 (0.1 - 6.7); p=0.844	‡	‡

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