A retrospective analysis of the incidence of sports injuries presenting to a primary healthcare clinic in Cape Town.

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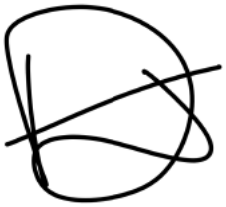
Research Report – STHS 7014A
November 2022

A research report submitted to the Faculty of Therapeutic Sciences, University of the Witwatersrand, in partial fulfilment of the requirements for the degree of Master of Science in Medicine.

Declaration

I *Daniel Isaac Tadmor* declare that his research report is my own, unaided work. It is being submitted for the Degree of Master of Science in Medicine in the branch of Sports Medicine at the University of the Witwatersrand, Johannesburg. It has not been submitted before for any degree or examination at any other University.



(Signature of candidate)

7th day of November 2022.

Dedication

This report is dedicated to my wife Micaela Tadmor who has supported me throughout the whole degree and for her continued inspiration over the years.

List of Nomenclature and abbreviations:

Wits: University of the Witwatersrand
DESSM: Department of Exercise Science and Sports Medicine
SEM: Sport and Exercise Medicine
NCD: Non-communicable disease
CHC: Community Healthcare Centre
HIV: Human Immuno deficiency Virus
AIDS: Acquired Immuno Deficiency Syndrome
TB: Tuberculosis
PHC: Primary Health Care
WHO: World Health Organisation
ACSM: American College of Sports Medicine
AMA: American Medical Association
PI: Principal Investigator
OPD: Outpatients department
MOU: Midwife and Obstetric Unit
ID: Infectious disease
HREC: Health Research and Ethics Committee
SPSS: Statistical software program
MSK: Musculo-skeletal

Acknowledgements:

1. Dr Mamosilo Lichaba – project supervisor, course coordinator.
2. Prof. Demetri Constantinou – Head of Department at the University of the Witwatersrand (Wits) DESSM.
3. Dr Nyiko Chauke – Orthopaedic surgeon/Sports injury clinic at Chris Hani Baragwanath Hospital.
4. Prof. Philippe Gradidge – Professor at Wits DESSM.
5. Mr Eugene Leonard – Orthopaedic nurse at Vanguard CHC.
6. Sr Daina February – Head of trauma unit at Vanguard CHC.
7. Mr Yasser Morgan – Senior admin clerk Vanguard CHC.
8. Dr Mosedi Namane – Family Medicine specialist at Vanguard CHC.
9. Mr Luntu Mbanga – Facility Manager of Vanguard CHC – in memory.
10. Dr Nikita Fensham – Sport and Exercise Medicine PhD student (Australia).

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Abstract

Background: There is a lack of South African specific data related to Sport and Exercise Medicine in the public primary healthcare sector. Primary healthcare affords the majority of the population access to essential healthcare services via clinics and trauma units. Orthopaedic and sports-related injury visits are common and should form part of the basic care provided at this level of health care.

Aims and Objectives: The study set out to retrospectively investigate the incidence proportion of sports-related orthopaedic injuries presenting to a primary level government clinic and trauma unit in Cape Town. Furthermore, it aimed to highlight the need for epidemiological sports injury data collection in the public primary healthcare sector in South Africa.

Methodology: The data were retrospectively collected using clinical records from 1 July 2017 to 30 June 2019. Sports-related injuries were identified from orthopaedic injury presentations and classified according to demographics and injury patterns.

Results: A total of 1346 orthopaedic injuries were identified, resulting in 206 sports-related injuries - an incidence proportion of 15.3%. The most common type of sport causing injury was soccer. Most of the injuries occurred acutely, were male, between the ages of 10-19 years, and were soft tissue injuries. There were more upper limb injuries than lower limb injuries and wrist/forearm injuries were the most common type.

Conclusion: This study identified the incidence proportion of sport-related injuries in a South African primary healthcare trauma unit. In order to advocate for care at a primary care level, the sports-related injury load needs to be identified. The findings can assist in assessing the need for the South African healthcare system and policy makers to recognise and acknowledge sports injuries and have appropriate facilities that will allow for proper consultation, surveillance, and management of sports related injuries.

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CHAPTER 1 - TITLE AND PROJECT FRAMEWORK

1. Title and project framework:

Title: *A retrospective analysis of the incidence of sports injuries presenting to a primary healthcare clinic in Cape Town.*

This research project was a retrospective analysis of the incidence proportion of sports injuries presenting to a primary healthcare clinic in Cape Town. The motivation for the project was to identify the sports-related orthopaedic injury presentations at a standard community clinic, as it had not been evaluated before. Prior to the commencement of the study, it was important to evaluate the need for Sport and Exercise Medicine research at a primary care level. It was also important to acknowledge the role of exercise, its role in injury and disease prevention, the importance of injury surveillance and the current sport-related orthopaedic injury load in primary care. The research project then followed the standard process of report writing (Figure 1).

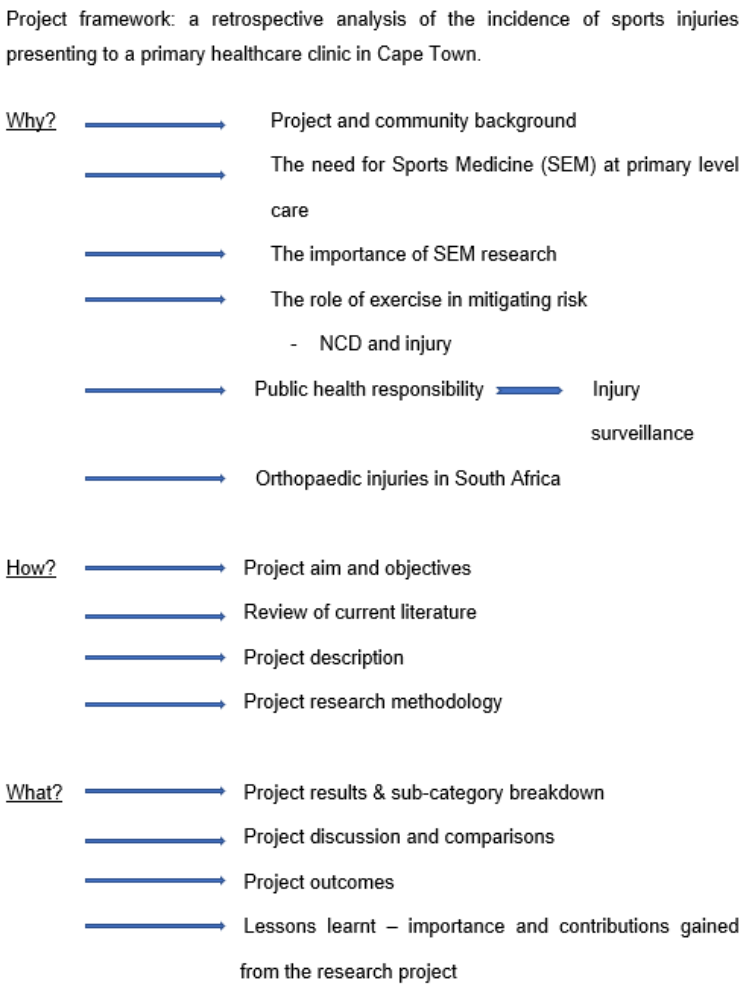

Figure 1: Project framework.

CHAPTER 2 - INTRODUCTION

2. Introduction:

2.1. Background and study rationale:

This study was retrospective and conducted at Vanguard Community Healthcare Centre (CHC) in Cape Town, South Africa. Vanguard CHC is a primary level 1 government clinic. A primary level 1 clinic in South Africa provides essential services to the surrounding community, including but not limited to ante-natal care, immunisations, contraception, treatment of common and chronic diseases, orthopaedic and musculoskeletal conditions, basic emergency and trauma care, HIV/AIDS management, and TB care (1). The study reviewed data from 1 July 2017 until 30 June 2019. The study looked at the incidence proportion of sports injuries presenting to the orthopaedic emergency department. It was conducted in accordance with the regulations of the University of Witwatersrand and the Western Cape Department of Health.

2.2. Motivation for the study:

2.2.1. The need for and importance of Sport and Exercise Medicine at primary care level:

There is a lack of South African specific data related to Sport and Exercise Medicine in the public primary healthcare sector when compared to international bodies of research (2). In general, Sport and Exercise Medicine research in the public primary health sector is limited in South Africa and requires further efforts. As evident in day-to-day life in South Africa, sports activities are appealing to many people and therefore specialised sports medical care should not only be restricted to the private health care sector.

Primary healthcare affords the majority of the population access to essential healthcare services and orthopaedic visits are very common and form part of the basic care provided at this level (2,3). Therefore, orthopaedic and Sport and Exercise Medicine services should be available. However, to provide a specialised service, the sports injury load needs to be evident. Sports-related injuries do occur often globally

(2–5), however, there is limited data specifically available at the primary care level to support this in South Africa (6). The study aimed to identify the incidence of sports-related injuries at a primary healthcare clinic in South Africa. The study draws motivation from the need to provide meaningful data in this regard.
Sport and Exercise Medicine is a growing field in medicine and needs consistent, rigorous, and good research to be performed (7). Sports injuries are one aspect of Sport and Exercise Medicine. There is a need for the South African healthcare system to recognise and acknowledge the sports injury load and have appropriate facilities that will allow for proper consultation, surveillance, and management of sports related injuries. Further research needs to be done to identify the load of sports-related injuries/diseases in the public primary sector in South Africa and understand the nature of injuries in different communities to inform prevention and treatment guidelines.

2.2.2. The role of exercise:

Exercise plays a role in mitigating against NCD disease risk and in injury prevention and management. Non-communicable diseases (NCD's) are the leading cause of death globally and contribute extensively to morbidity and mortality in low-income settings (8–10). Cardiovascular disease is the leading cause of death worldwide and its incidence is increasing every year (10). In South Africa, NCD's are responsible for around 37% of the total deaths (6). The NCD burden is expanding exponentially in low-income communities and unfortunately, the healthcare systems and facilities in these areas are the least equipped (9). Policies for NCD prevention, such as alcohol reduction, nutritional support, tobacco restriction and physical activity programs, have been implemented previously but lack the political commitment and resources to be carried through effectively (9).

The American College of Sports Medicine (ACSM) in their most recent consensus statement reaffirms the important health benefits of moderate levels of physical activity in adolescents, young adults, and the general population (8). Middle-aged people with a background of exercise and greater cardiorespiratory fitness, have a lower all-cause mortality and morbidity risk, compared to sedentary people of the same age cohort (8). Adolescents and young adults participate regularly in physical activity (11), and contribute to a large proportion of exercise-related injuries (12). Provisions need to be

made to include and target adolescents and young adults in prevention strategies. The current epidemic of a sedentary behaviour and lifestyle directly links to increased incidence and younger diagnosis of cardiovascular disease, increased incidence of type-2 diabetes, increased risk of certain cancers and increased mortality (8). Using exercise as a form of affordable, evidence-based non-communicable disease prevention and treatment should be advocated for and initiated at all healthcare facilities (8). These programs have been highly effective in first world countries but require further efforts and initiation in lower income communities (9). Unfortunately, the most common and important side effect (like all medical interventions) is increased risk of injuries (13). In this regard, if we acknowledge the need to widely promote exercise for the maintenance of good health, it is equally important to provide meaningful facilities and resources to mitigate and manage this side effect and optimise the exploitation of sport and exercise for good health and quality of life

2.2.3. Public health responsibility – injury surveillance:

Injury surveillance is the extremely important first step to developing an injury prevention strategy (14,15). The Van Mechelen model of injury prevention is a recognised framework for sports injury prevention programs (15). The model proposes four steps: establishing the extent of the injury, identifying the factors and mechanisms of injury, introducing preventive measures, and evaluating their effectiveness (15). Each injury surveillance system needs to be specific for that setting (14). The study population, research question and suitable injury definitions need to be decided and be appropriate for that study setting (14). Definitions may differ from study to study, but as long as the ones decided on are appropriate, then it will lead to meaningful outcomes (14). In order to develop specific preventative interventions, it is important to identify the modifiable risk factors for injury, the injury incidence and have access to continuous good quality longitudinal injury data (14).

Sports and exercise are very popular in South Africa and exercise is known to have physical, psychological, and social benefits on society and its importance is becoming more apparent (4). Exercise supersedes some of the best drugs available and may have superior physiological benefits, but it is not given the attention it deserves due to current traditional medical practices (16). Therefore, exercise must play a pivotal role in disease prevention and be used as a form of treatment in a multi-modal approach

to healthcare. In this regard, mitigation against sport and exercise related challenges should be allowed meaningful resources and facilities to enable the long-term survival of exercise and sport as a public health strategy.

2.2.4. Orthopaedic injuries – South Africa:

In recent times, inter-personal violence, gang warfare and the trade of illegal firearms have contributed to orthopaedic injuries in Cape Town specifically and it is known as one of the most violent cities in the world (17). This causes an increased patient load to the local healthcare system (17). Furthermore, musculoskeletal injuries constitute a large proportion of the disease burden in low to middle income countries but often go untreated or are neglected (18). It is estimated that more than 90% of injury-related deaths worldwide occur in these low to middle income countries (18). Orthopaedic trauma injuries contribute a large cost to an already struggling healthcare system (7). There is substantial research into orthopaedic injuries and trauma, however sports injuries specifically do not receive the same attention (7). When faced with a high burden of life/limb threatening trauma, the resources are strained. Sports injuries are not usually life threatening so they lose priority to violent trauma in orthopaedics. There is no formal sports injury surveillance system in the state health system, and many injuries are shunted to the private sector (7). Adding to this, the state healthcare system is overwhelmed with orthopaedic trauma and elective procedures occurring very infrequently (7). There needs to be collaborative and transparent research between the private and public health sectors, along with orthopaedic and Sport and Exercise Medicine, in order to address these problems (7).

The American Medical Association (AMA) stated that “Physicians must advocate for the social, economic, educational, and political changes that ameliorate suffering and contribute to human well-being” (7). For policies to be implemented on a large scale, the disease rates need to be established in the community in which it is most needed. The NCD and trauma burden is very well established in South African primary care, however sport specific injuries are not (7,19).

This study will focus on the basic idea of forming a foundation of disease rates in a community in Cape Town, and act as a springboard for further work in the field of Sport

and Exercise Medicine and the community. Disease burden can be formally assessed in research projects in the future.

2.3. Aim:

The primary aim of this study was to retrospectively analyse the incidence proportion of sports-related injuries presenting to a primary level government clinic in Cape Town, South Africa from July 2017 to June 2019.

The secondary aim was to highlight the need for meaningful epidemiological sports injury data collection in the public primary healthcare sector in South Africa.

2.4. Objectives:

1. To determine the incidence proportion of sports-related injuries presenting to the orthopaedic emergency department at Vanguard CHC, using a retrospective clinical record review and identification of the causes of these sports-related cases.
2. To classify the injuries according to demographics and injury patterns - age, gender, time of onset, type of sport, tissue type, anatomical region, and location.
3. To motivate for the need for proper sports-related research, resources, and facilities at a PHC level.

2.5. Research Question:

The primary research question was: “What is the incidence proportion of sports-related injuries presenting to the orthopaedic department at Vanguard CHC from 1 July 2017 to 30 June 2019?”

The secondary research question was: “How do these injuries classify according to demographics and injury patterns?”.

CHAPTER 3 – REVIEW OF THE LITERATURE

3. Review of the literature:

3.1. Definitions

Injury – “damage to the body resulting from the transfer of environmental energy to a person at levels that exceed the threshold for tissue damage” (20,21).

Sports-related injury – “sports injuries result from acute trauma or repetitive stress associated with athletic activities” (22) and “the loss of bodily function or structure that is the object of observation in clinical examinations” (23).

Orthopaedic injury – “an injury affecting the body’s musculoskeletal system, and includes injuries to bones, joints, ligaments, tendons, muscles and nerves” (20).

Sports-related orthopaedic injury – an orthopaedic injury as a result of a sports-related injury.

Exercise – “physical activity that is planned, structured, repetitive and purposeful, usually aimed at improving or maintaining fitness” (22).

Physical activity – “any body movement produced by skeletal muscle that results in energy expenditure beyond rest” (22).

Sport – “a subset of exercises undertaken individually or as a part of a team, where participants have a defined goal” (24).

Illness – “a complaint or disorder experienced, not related to injury – including physical (e.g., influenza), mental (e.g., depression) or social well-being, or removal or loss of vital elements (air, water, warmth)” (25).

3.2. SEM epidemiology in PHC

Sports-related injuries globally represent 18-30% of all acute injuries and presentations to emergency units (26–28). Most of these injuries can be attributed to large contact team sports, such as soccer, and rugby (5,29). Sporting activities play an important role in society; therefore, the number of sports-related injuries are increasing (11,30). Most developing countries do not have national sporting injury surveillance systems and as a result, most injury data are collected from emergency departments, academic institutions, insurance companies and medical records (5).

Sporting activity is important as it is associated with a 20-40% reduction in overall mortality compared to non-participation and is associated with specific health benefits (31). Participating in sport has shown benefits in physical, physiological, social, and

psychological aspects of daily life (11). Even though the benefits of sport participation outweigh the risks, with increased participation, comes increased risk and occurrence of injuries (11). Little is known about sports injury epidemiology in general practice and in primary healthcare (5,30). Data relating to sports injury incidence, incidence proportions, severity, and burden at a primary healthcare level in South Africa is scarce (2–4). It is a common practice to rely on case reporting to indicate injury patterns and incidence, however it is not always scientifically sound (5,32). It is challenging to compare injury incidence data across multiple sports as there are numerous factors contributing to their difference in reporting (14,25,32); namely: type of sport, level of play, number of players involved, training protocols, matches, time played, season played, gender and variable definitions for injury (14,25,32). Sport injury incidence is usually reported as injuries per 1000 hours played (14,25,32), but that is difficult when comparing different sports and especially when recording incidence at a primary healthcare level. Primary healthcare facilities focus on providing basic healthcare to a population and lack specialist services. A sporting injury will occur when an athlete is exposed to or preparing for the given sport, under specific conditions and at an organised time and place (14,23,25,32). When assessing incidence, the fundamental unit of measurement should be rate (14,23,25,32). Therefore, a valid injury rate must be linked to exposure time in order to correctly assess the risk of injury (14,25,32). The most basic measurement of risk is incidence and injury incidence rate are defined as “the number of new injuries that occur in the at-risk population over a specific time period” (14,23,25,32). An initial approach in primary healthcare can be to investigate the injury incidence proportion, prior to formal incidence rates and disease burden (5,33,34).

To understand the true injury burden in team sports, it is necessary to know the injury incidence and the injury mean severity. (28). Colin Fuller notes that: “the timeframe over which injury burden affects a team depends on the incidence and severity values of the injuries sustained” (28). The injury burden assists to understand which injuries cause the most significant playing time lost (28). Therefore, the combination of both factors is necessary to fully grasp the injury burden (28). These factors are key as the results can be conveyed to the relevant stakeholders and policy makers in order to prioritise the most appropriate injury prevention strategies for specific communities (28). Unfortunately, not all information and resources are available in a primary

healthcare setting, therefore using what is available is the first approach (33). The ideal study for sports epidemiology research would consist of a cohort design (injured versus non-injured and athletes versus the general population), a longitudinal prospective study, to have a protocol on injury recognition, definitions, diagnosis, classification, injury severity and documentation; and to use exposure hours and expressed as incidence rates (32). The recording of type of injury is heavily dependent on the medical professional assessing it initially, therefore applying a standard is a challenge in retrospective studies if an established protocol was not in place (34). Furthermore, a potential prospective injury surveillance study at a community level could include the following 11 steps for robust injury data collection (34): date and time of injury, date of return to partial/full participation, playing position at time of injury, injured side and body part (e.g., head/face, low back, foot/toe, etc), type of injury (e.g. concussion, sprain/ligament injury, tendon injury, etc), diagnosis of injury (text or code), has the player had a previous injury of the same type at the same site (i.e. is this injury a recurrence?), was the injury caused by overuse or trauma?, did the injury occur during match or training?, was the injury caused by contact? (If yes, specify activity), and did the reference indicate that the action leading to the injury was a violation of the Laws or dangerous play? (34). Injury severity is important to define and classify in the study (14). A basic approach can be applied by classifying in to three categories; 1 – all injuries reported requiring medical attention, 2 – injuries leading to time loss from play, and 3 – injuries requiring hospital treatment and management (14). An alternate way to monitor severity in the community could be to evaluate the standard playing time loss or the academic/occupational time lost due to the injury and may be more appropriate (34).

3.3. Contributing factors

There are very few Sport and Exercise Medicine studies being done at a primary healthcare level globally. A study conducted in the Netherlands found that the incidence of sports injuries presenting at a primary healthcare level was 23.7 per 1000 patients seen (30). The study noted that 3.5 million sports injuries occur in Netherlands per year, with 20% of them first consulting a general practitioner (30). Soccer injuries were found to be the most common with lower extremity injuries occurring three times more than upper extremity (30). Only 6.6% of patients on average were referred to hospital and patients consulted 1-2 times per week for a sporting injury (30). Overall,

in a predominantly soccer playing cohort, lower limb soft tissue injuries were found to be the most common (11,30,35).

Sports and soccer injury research previously would focus on fatal or catastrophic injuries (36). Now, the research routinely involves analysing individual factors that contribute to injury incidence (36). In Africa, the research has been challenging due to the difficulty in quantifying injuries and the limited data (36). However, in South Africa, Uganda, Nigeria and Kenya, injury incidence research is being conducted more regularly and focusing on multiple sporting codes (36). Soccer is known as the most popular sport worldwide, and expectedly, soccer-related injuries are high (37). Soccer-related injuries place financial and health pressures on players and their families (37). Furthermore, the healthcare system and socioeconomic systems are strained (37). In 2006, it was estimated that 270 million people worldwide are involved with soccer (37). The health and cardiovascular benefits of soccer are well documented, however with that many people playing, injuries, and health consequences (e.g., soft tissue injuries, fractures, weight gain post injury and osteoarthritis) are expected (37).

A study done amongst universities in South Africa identified the most popular sporting codes played at youth level and compared them to each other (38) and sporting participation was found to be 65% males and 35% females (38). Therefore, the load of injuries can be weighted in a similar distribution (38). The study found rugby to be the most popular sport followed by hockey, cricket, soccer, netball and then athletics (38). Traditionally, rugby, cricket and soccer have been dominated by male participation whereas hockey, basketball and athletics have been found to be more neutral (38). The popularity of a sport does not necessarily imply that there will be more injuries, but it can be used as a way to categorise and then monitor for injuries (38). However, it is important to note that popular sports will result in increased exposure and potentially result in an increased injury risk. Public health prioritises the greater population, therefore it is of utmost importance to know which sports are being played by the most people (30,38). A university cohort versus a primary care community is different, although there is very limited academic data describing a primary care community yet. Primary care government clinics in South Africa do not have dedicated sports injury clinics on site and therefore fall under general orthopaedics. In Cape Town, only the quaternary hospitals (Groote Schuur Hospital

and Tygerberg Hospital), have bespoke Sport and Exercise Medicine clinics which patients need to be referred to. Resources to mitigate and manage sports-related injuries at primary care health facilities should be investigated.

A recent study in Spain looked at sports-related injuries amongst adolescents and found soccer to have the highest rate of injuries (11). The most common injuries identified in soccer were lumbar muscle strains (12%), ankle sprains (11%) and lower limb fractures (9%) (11). In the total adolescent cohort, ankle injuries were the most common (36%), followed by knees (19%) and shoulders (6%) (11).

The majority of the available published surveillance studies on athletes/sports participants in general, are conducted on elite athletes, despite most of the world's playing population being amateurs and community level players (34). A major challenge to community-based sports is the limited availability and access to qualified medical support staff and structured facilities which would enable the above-mentioned processes (34). Therefore, it is difficult to truly understand the burden of injury due the limited injury recording protocols and available measures and data to do so (34).

3.4. Diagnosis, treatment, and prevention

The primary approach to Sport and Exercise Medicine care includes prevention, optimisation, and treatment (39). Each of these areas are equally important and crucial in the holistic management of athletes and patients (39). The Sport and Exercise Medicine physician should be trained to identify and have critical insight into disease incidence, disease pathology, mental health issues, demographic factors, cultural factors, and environmental obstacles that could be a barrier to patient care and impact the optimisation and future treatment of medical conditions (39). Furthermore, they should be trained thoroughly through primary care disciplines and further Sport and Exercise Medicine specialisation programs to provide comprehensive healthcare to their athlete patients (39). The team physician or primary Sport and Exercise Medicine physician is generally responsible for taking care of the athlete's general well-being, including physical and mental health, prescribing appropriate medication and treatments, and linking with allied professionals for the best outcome (39). A cohesive multi-disciplinary team is crucial to good management of the athlete patient (39). Sport

and Exercise Medicine advocates for the use of up-to-date and evidence-based research as the foundation to care (39). Sport and Exercise Medicine physicians should also be aware of the multiple factors that can influence the patient, including psychological, cultural, and social factors (39).

There is a gap in clinical practice in the delivery, continuation and follow-up of patients who have been prescribed lifestyle changes (6,40). General practitioners should be effective prescribers of dietary advice and exercise but are less likely to be able to prescribe individualised training programs and understand the metabolic and physiological responses to exercise (6,40). Lifestyle intervention training is underemphasised in undergraduate studies and may not be utilised in day-to-day consultations (6,40). Consultations are already time sensitive at primary care level, therefore there may be limited time and expertise to counsel patients on the benefits of physical activity and implement risk factor modifications (6,40). There needs to be a revision of the approach to NCD management as there is overwhelming evidence supporting the benefits of exercise and the health consequences of physical inactivity (6,40). The introduction of specially trained and qualified “exercise prescribers” into primary healthcare has the potential to greatly enhance the primary care service delivery (6,40).

The importance of linking Sport and Exercise Medicine and primary healthcare is necessary as regular physical activity is associated with substantial health benefits and it is cost-effective (31). As there is limited sports epidemiology research, accurate estimation of population health benefits is very difficult (31). Sport participation data are scarce in many low-income countries therefore further research is needed (31). Health care providers are encouraged to engage about sport and physical activity in every consultation as a central part of chronic disease prevention and screening (31). Ways to improve the uptake of these health strategies by the authorities and patients are needed. It is important to prove to the public that physical activity is a major public health preventive approach and potent medical therapy (31). Changes are needed at a community-based level in order to influence national policies to improve health on a global scale (31).

This study was retrospective, therefore only the appropriate variables defined in the study were identifiable, recorded and used – as will be highlighted later in the report.

Common weaknesses in retrospective sports epidemiology research may include bias and lower inter-rater reliability (11,41). A single or part of a season's data may be analysed or only a single team may be analysed; not allowing for generalisability and injuries are recorded but are not adjusted for exposure risk hours of training or playing time (11). Comparisons made to other studies may encounter challenges like different methodological criteria, injury definitions, different sport, or a different population (11,32). A way to mitigate this could be to standardise the data collection protocols and compare sports and non-athletes. An awareness of these potential challenges should be acknowledged when conducting SEM epidemiological research.

This study aimed to assess the incidence proportion of sport-related injuries at a primary level to advocate for further research and understanding between SEM and PHC in South Africa. Unfortunately, due to limited resources retrospectively, assessing true incidence rates, injury severity and SEM injury burden, was not possible. The goal is to have appropriate facilities at primary care level that will allow for effective consultation, surveillance, and treatment of sports related injuries Furthermore, the importance of identifying and understanding the nature of injuries in different communities to inform prevention and treatment will become apparent and streamlined. As illustrated above, data are limited, therefore this study can only act as an initial approach to further research and training and policy influence in this area.

CHAPTER 4 - METHODS

4. Methods:

4.1. Study design:

The study was a retrospective descriptive and observational review of the incidence proportion of sports-related injuries presenting to the orthopaedic emergency department at Vanguard CHC.

4.2. Site of study:

The site of the study was Vanguard CHC which is a primary level public clinic situated in Cape Town, South Africa. The clinic serves two large communities, Bonteheuwel (approximately 48 000 people) and Langa (approximately 51 000 people) (42). Both communities consist of working-class people and are classified as predominantly low-income. Vanguard CHC is a large clinic and provides essential healthcare services including a general adult OPD (outpatient department), paediatric OPD, MOU (midwife and obstetric unit), ID (infectious disease) clinic, dental clinic and an accident and emergency/trauma unit. The orthopaedic injury clinic is within and forms part of the accident and emergency/trauma unit to allow for streamlined orthopaedic and acute trauma care. The patients' first present to the accident and emergency/trauma unit and are triaged into medical and trauma cases. If an orthopaedic case is identified, it is efficiently sent to the orthopaedic side of the trauma unit. These cases are seen to by the medical officer on duty and recorded in a logbook with the patient's details, diagnosis, and follow-up date. This logbook is what was used to identify and retrospectively record the cases in the study.

4.3. Study population:

The study population was all patients presenting to the orthopaedic accident and emergency/trauma unit from July 2017 to June 2019. The patients with sports-related injuries were further identified, classified, and recorded. On average, the unit sees a total of 125 patients per month, therefore an estimated total number of patients

attending the clinic over the 2-year period is roughly 3000. The final confirmed numbers are represented in the results section.

4.4. Sampling and recruitment of participants:

All patients who presented to the orthopaedic accident and emergency/trauma unit with an injury from 1 July 2017 to 30 June 2019 were reviewed. Sports-related injuries were identified from the files and case notes.

4.5. Inclusion/exclusion criteria:

4.5.1. Inclusion criteria:

- Sports-related injuries (22,23)
- Ages 10 and above (43,44)

4.5.2. Exclusion criteria:

- Unknown/unclear causes for injury/presentation
- Missing and incomplete notes, and/or missing files
- Follow-up presentations (post-initial consultation/check-up appointment)

4.6. Measuring tool/instruments:

No specific measuring tool or instrument was required. Data were captured manually using patient files and recorded using Microsoft Excel 2019 (Microsoft Corporation, Washington, USA) and IBM SPSS statistics 27.0 (SPSS Inc, Chicago, USA). Responses were described as percentages.

4.7. Data collection methods:

A sample size of convenience based on all the files available meeting the criteria was used. It was difficult to make an accurate estimation of sample size owing to the lack of previous research, specific diagnostic codes, and available data. The study data were limited to already existing medical records and files. All patient files were retrieved using the orthopaedic clinic injury register. Injuries were analysed from

patient files, and sports-related injuries were identified. Once identified, the data were classified according to the different types of injuries using type of sport, time of onset, tissue type, anatomical region and location, age, and gender. A sample of convenience was used where the files used were limited to and met the above-mentioned criteria only. There was no research assistant at the clinic therefore data were collected by the principal investigator only. All the files were kept at the clinic and all the data were processed and collected at the clinic.

CHAPTER 5 – DATA ANALYSIS

5. Data analysis:

5.1. Statistical methods:

Demographic and baseline injury characteristics were recorded. The characteristics were: age (from 10 years old and above (43,44)), gender (male versus female), time of onset, type of sport (soccer, cricket, rugby, netball, hockey, gym sports, cycling, athletics, skateboarding & other not specified (38)), tissue type (soft tissue versus hard tissue (bony)), anatomical regions (upper limb, lower limb (including hip & pelvis) & back/spine), and location (hand, wrist/forearm, elbow, upper arm, shoulder, clavicle, foot, ankle, lower leg, knee, upper leg, hip/pelvis, and other not specified). They were summarised using descriptive statistics. Time of onset was defined as acute (within 3 days), subacute (more than 7 days and less than 28 days), chronic (more than 28 days) or acute on chronic injuries (new acute or subacute injury occurring on top of a known chronic injury). These definitions were created for this study as there has been no formal definitions previously defined in this setting (3,32).

As this study was retrospective and in a community primary care emergency unit, absolute control over patient notes, admissions, diagnosis, severity scoring, and management was not possible. Therefore, all injuries were classified as: severity score = requiring medical attention (14).

5.2. Statistical variables:

Table 1: The study variables:

Continuous variable	Age
Categorical variables	Gender Injury onset Type of sport Tissue type Anatomical region Anatomical location

Table 1 displays the types of variables used in the study. The only continuous variable in this study was age (45). The categorical variables in this study were the type of sport, injury onset, the tissue type, the anatomical region and location and gender (45). The outcome variable was the incidence rate of each category mentioned above. The main data were presented as frequencies in charts and graphs. The time element is the 2 years in which the data were collected from.

The primary endpoint of this study was to identify the incidence proportion rate of sports-related injuries presenting to an orthopaedic unit at Vanguard CHC and compare the different variables associated with the classification of the injuries. The secondary endpoint was to highlight the need for meaningful epidemiological sports injury data collection in the public primary healthcare sector in South Africa. Retrospective studies are more vulnerable to confounders and bias (25). As the study was retrospective, it was difficult to control for variables not documented in the files. The main form of statistical analyses done was using descriptive statistics.

CHAPTER 6 - ETHICS

6. Ethics:

The research was commenced after ethics approval from the University of the Witwatersrand and the Western Cape Health Research and Ethics Committee (HREC). The University of the Witwatersrand Human Research Ethics Committee (Medical) approval number was M200416, and approval was granted on 08/10/2020. The Western Cape Government Department of Health Research reference number was WC_202010_031 and approval was granted on 31/03/2021. The potential risks of the project were low as no patient identifying information was used in the data collection. There was no direct benefit to the patient nor the institution. There was no direct communication or interaction with participants. No patient names, folder numbers or identity numbers were used in the data collection process. The folder number was used to collect the files from the clinic reception and then only demographic (age & gender) and injury data were recorded. The folders were handled and collected by the principal investigator only. The files were returned to their usual locked storeroom after collection. Confidentiality rules were strictly adhered to, however, there was the risk of a breach in confidentiality if information was leaked. All measures to protect confidentiality, including password-encryption of documents and computers were used.

CHAPTER 7 - RESULTS

7. Results:

A total of 1346 injuries were triaged to orthopaedics between 1 July 2017 and 30 June 2019, resulting in 206 isolated sports-related injuries – resulting in an incidence proportion of 15.3%. 346 orthopaedic injuries were reviewed from 2017 (6 months), 613 orthopaedic injuries from 2018 (12 months) and 387 orthopaedic injuries from 2019 (6 months). There were 61 sports-related injuries identified in 2017 (17.6% of all orthopaedic injuries), 92 sports-related injuries in 2018 (15.0% of all orthopaedic injuries) and 53 sports-related injuries in 2019 (13.7% of all orthopaedic injuries). Figure 2 below illustrates the total number of sports-related injuries (15.3%) compared to non-sporting injuries that presented to the orthopaedic accident and emergency/trauma unit in the study, whereas Figure 3 is a comparative graphical representation of each month (24 months) in the study. Figure 3 graphically shows the incidence proportion of sports-related injuries per month, with an even distribution of injuries each month. Table 2.1 is a summary of the main findings of the injury incidence proportions per variable category and have been studied in the sections below. The population most vulnerable to sports–related injuries were male teenagers, with the female seniors exhibiting the least risk (Table 2.2). Acute soft tissue injuries of the wrist and forearm dominated the clinical presentations and soccer injuries were the most numerous (Table 2.1).

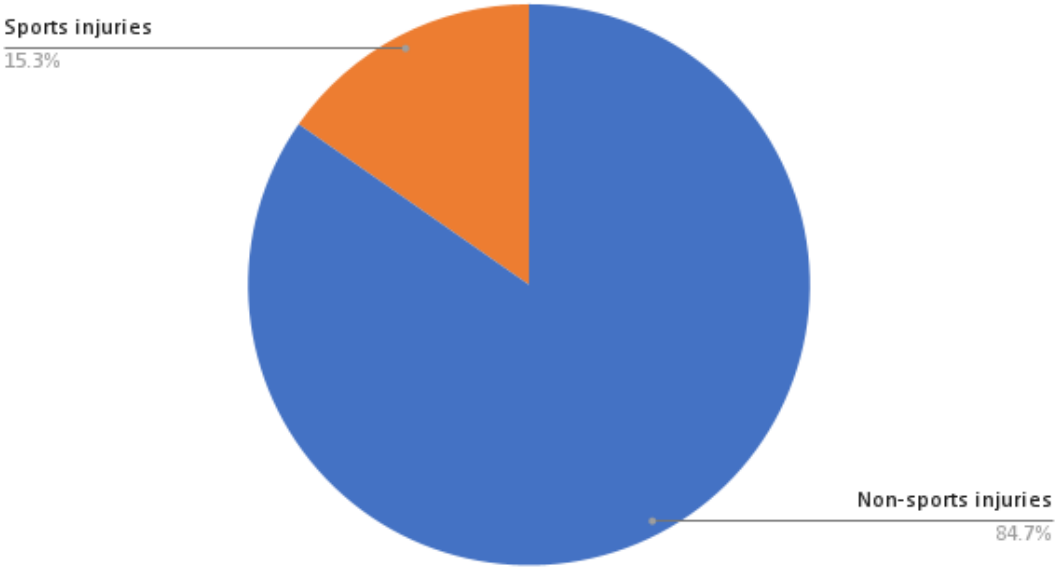

Figure 2: The total number of sports injuries.

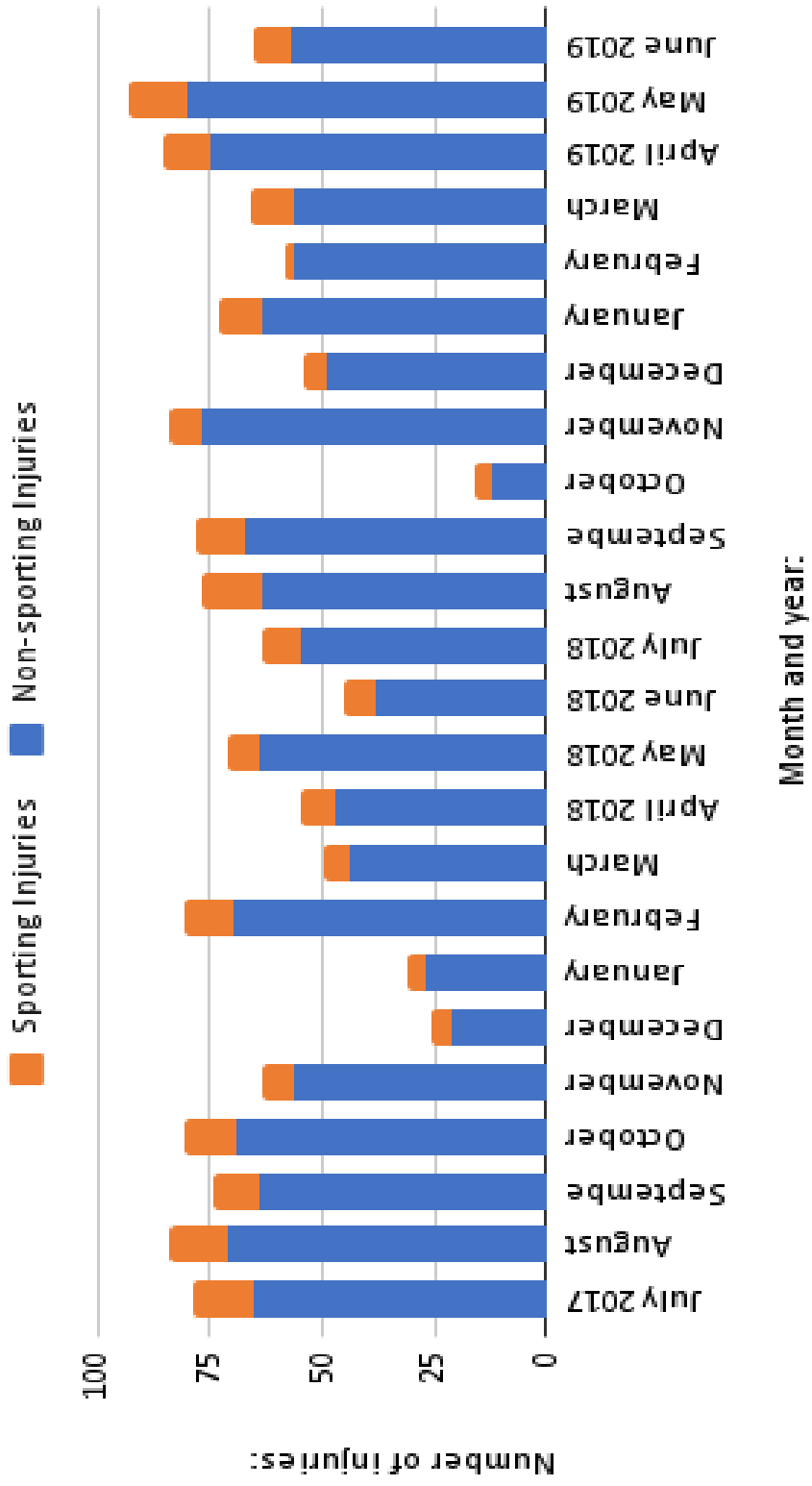

Figure 3: The total proportion of sport-related injuries versus non-sport-related injuries per month and year.

Table 2.1: Total injury incidence proportion per defined variables:

Variable:	Individual variable:	Injury incidence proportion number (& percentage):
Age group (years):	10-19	121 (58.7%)
	20-29	54 (26.2%)
	30-39	23 (11.2%)
	40-49	6 (3.0%)
	50-59	2 (0.9%)
Gender:	Male	179 (86.9%)
	Female	27 (13.1%)
Time of onset:	Acute	188 (91.3%)
	Subacute	18 (8.7%)
Type of sport:	Soccer	116 (56.3%)
	Rugby	34 (16.5%)
	Athletics	17 (8.3%)
	Cycling	8 (3.8%)
	Netball	6 (3.0%)
	Gym sports	5 (2.4%)
	Skateboarding	5 (2.4%)
	Hockey	3 (1.5%)
	Cricket	3 (1.5%)
	Other	9 (4.3%)
Tissue type:	Soft tissue	122 (59.3%)
	Hard tissue (bony)	84 (40.7%)
Anatomical region:	Upper limb	113 (54.9%)
	Lower limb	91 (44.2%)
	Other	2 (0.9%)
Anatomical location:	Wrist/forearm	53 (25.7%)
	Knee	28 (13.6%)
	Ankle	27 (13.1%)
	Hand	27 (13.1%)
	Foot	24 (11.7%)
	Lower leg	12 (5.8%)
	Elbow	9 (4.3%)
	Shoulder	9 (4.3%)
	Clavicle	9 (4.3%)
	Upper arm	3 (1.5%)
	Upper leg	2 (0.9%)
	Hip/pelvis	1 (0.4%)
	Other	2 (0.9%)

Total number injuries = 206

7.1. Demographics:

7.1.1. Age:

Table 2.2: Demographics and injury characteristics stratified by age-groups:

	Patient totals	**Age 10-19 years**	**Age 20-29 years**	**Age 30-39 years**	**Age 40-49 years**	**Age > 50 years**
Patient totals:	**206**	**121**	**54**	**23**	**6**	**2**
Admission (year):						
2017	**61**	38	13	7	2	1
2018	**92**	51	26	11	3	1
2019	**53**	32	15	5	1	0
Gender:						
Male	**179**	105	46	21	5	2
Female	**27**	16	8	2	1	0
Time of onset:						
Acute	**188**	110	48	23	5	2
Subacute	**18**	11	6	0	1	0
Tissue type:						
Soft	**122**	59	41	17	5	0
Hard (bony)	**84**	62	13	6	1	2
Anatomical region:						
Upper limb	**113**	78	20	10	3	2
Lower limb	**91**	42	34	12	3	0
Other	**2**	1	0	1	0	0
Anatomical location:						
Hand	**27**	12	8	6	1	0
Wrist/forearm	**53**	46	4	1	1	1
Elbow	**9**	8	1	0	0	0
Upper arm	**3**	3	0	0	0	0
Shoulder	**9**	2	4	1	1	1
Clavicle	**9**	5	3	1	0	0
Foot	**24**	12	8	3	1	0
Ankle	**27**	14	9	3	1	0
Lower leg	**12**	9	2	1	0	0
Knee	**28**	8	14	5	1	0
Upper leg	**2**	1	0	1	0	0
Hip/pelvis	**1**	0	1	0	0	0
Other (not specified)	**2**	1	0	1	0	0
Type of sport:						
Soccer	**116**	74	29	10	2	1

Cricket	**3**	1	2	0	0	0
Rugby	**34**	19	11	4	0	0
Netball	**6**	3	3	0	0	0
Hockey	**3**	1	1	0	1	0
Gym sports	**5**	3	2	0	0	0
Cycling	**8**	5	1	1	0	1
Athletics	**17**	7	3	6	1	0
Skateboarding	**5**	5	0	0	0	0
Other	**9**	3	2	2	2	0

Most injuries (n = 206) were recorded in the age-group 10-19 years (n = 121; 58.7%), were acute, from soccer, followed by rugby, and the number of injuries per age group decreased as the age groups increased. Hard tissue (bony) was proportionally the most in the age groups 10-19 years and > 50 years, but soft tissue injuries were proportionally more in the remaining age-groups. Wrist and regionally upper limb injuries were the most numerous injuries proportionally across the age-groups, except for knee and regionally lower limb injuries accounting for the most in the age-group 20-29 years.

7.1.2. Gender:

The ratio of male:female injuries was 179:27 with the adolescent age-group the most numerous. Acute, soft tissue and soccer injuries (n = 112/179) accounted for proportionally most of the injuries in the males, and netball (n = 6/27) in females. Upper limb injuries were proportionally higher in males compared to females, with wrist (n = 49/179) and ankle (n = 5/27) injuries most numerous respectively.

7.2. Injury Characteristics:

7.2.1. Time of onset:

Acute presentations were the most common (n = 188; 91.3%), followed by subacute (n = 18; 8.7%). There were no chronic or acute on chronic presentations.

7.2.2. Type of sport:

The most common type of sport was soccer (n = 116, 56.3%), followed by rugby (n = 34; 16.5%), athletics (n = 17; 8.3%), cycling (n = 8; 3.8%), netball (n = 6; 3.0%), gym sports (n = 5; 2.4%), skateboarding (n = 5; 2.4%), hockey (n = 3; 1.5%), and cricket (n = 3; 1.5%). Other sports (n = 9; 4.3%). Other sports included basketball (n = 2), ice-skating (n = 2), golf (n = 1), roller blading (n = 1), sailing (n = 1), fishing (n = 1), and horse riding (n = 1).

Tables 2.3 (soccer), and 2.4 (rugby) show the injury incidence proportion breakdown per variable for the 2 most common sports causing injury in this study.

Table 2.3: Soccer injuries per demographic and injury characteristic:

Variable:	Individual variable:	Injury incidence proportion number (& percentage):
Age group (years):	10-19	74 (63.8%)
	20-29	29 (25.0%)
	30-39	10 (8.6%)
	40-49	2 (1.7%)
	50-59	1 (0.9%)
Gender:	Male	112 (96.6%)
	Female	4 (3.4%)
Time of onset:	Acute	106 (91.4%)
	Subacute	10 (8.6%)
Tissue type:	Soft tissue	69 (59.5%)
	Hard tissue (bony)	47 (40.5%)
Anatomical region:	Upper limb	63 (54.3%)
	Lower limb	52 (44.8%)
	Other	1* (0.9%)
Anatomical location:	Wrist/forearm	37 (32.0%)
	Ankle	18 (15.5%)
	Knee	15 (12.9%)
	Foot	13 (11.2%)
	Hand	11 (9.5%)
	Lower leg	7 (6.0%)
	Elbow	5 (4.3%)
	Shoulder	4 (3.4%)
	Clavicle	3 (2.6%)

	Upper leg	2 (1.7%)
	Other	1* (0.9%)

Total soccer injuries = 116

*1 other injury was a rib injury.

Soccer injuries (n = 116) were most numerous in the age-group 10-19 years (n = 74, 63.8%), were majority male (n = 112, 96.6%) acute in onset (n = 106, 91.4%), soft tissue injuries (n = 69, 59.5%), in the upper limb (n = 63, 54.3%), and mostly located at the wrist (n = 37, 32.0%).

Table 2.4: Rugby injuries per demographic and injury characteristic:

Variable:	Individual variable:	Injury incidence proportion number (& percentage):
Age group (years):	10-19	19 (55.9%)
	20-29	11 (32.3%)
	30-39	4 (11.8%)
Gender:	Male	31 (91.1%)
	Female	3 (8.9%)
Time of onset:	Acute	32 (94.1%)
	Subacute	2 (5.9%)
Tissue type:	Soft tissue	19 (55.9%)
	Hard tissue (bony)	15 (44.1%)
Anatomical region:	Upper limb	21 (61.8%)
	Lower limb	13 (38.2%)
Anatomical location:	Wrist/forearm	6 (17.6%)
	Knee	5 (14.7%)
	Ankle	3 (8.9%)
	Hand	6 (17.6%)
	Foot	2 (5.9%)
	Lower leg	2 (5.9%)
	Elbow	1 (2.9%)
	Shoulder	4 (11.8%)
	Clavicle	4 (11.8%)
	Hip/pelvis	1 (2.9%)

Total rugby injuries = 34

Rugby injuries (n = 34) as in soccer above, were most numerous in the age-group 10-19 years (n = 19, 55.9%), were majority male (n = 31, 91.1%) acute in onset (n = 32, 94.1%), soft tissue injuries (n = 19, 55.9%), in the upper limb (n = 21, 61.8%), and mostly located at the wrist and hand (n = 6, 17.6%) equally.

7.2.3. Tissue type:

Soft tissue injuries accounted for 59.3% (n = 122), compared to hard tissue/bony injuries which were 40.7 % (n = 84). Chi-squared analysis showed no association between the type of sport and the tissue type of injury (Pearson Chi-Square = 5.721, p = 0.767).

7.2.4. Anatomical region:

Upper limb injuries accounted for the most (n = 113; 54.9%), followed by lower limb injuries (n = 91; 44.2%) and other not specified (n = 2; 0.9%). There were no back and spine injuries recorded. Other not specified included a rib injury (n= 1) in soccer and a head/face injury (n = 1) in hockey. Most upper (n = 63/206) and lower limb (n = 52/206) injuries were from soccer, followed by rugby (n = 21/206, and n = 13/206 respectively. Chi-squared analysis showed an association between the type of sport and the anatomical region of injury (Pearson Chi-Square = 49.078, $p < 0.001$), but the sample sizes were small.

7.2.5. Anatomical location:

Wrist/forearm injuries were the most (n = 53; 25.7%), followed by knee (n = 28; 13.6%) then by ankle (n = 27; 13.1%), hand (n = 27; 13.1%) and foot (n = 24; 11.7%). The remaining were lower leg (n = 12; 5.8%), elbow (n = 9; 4.7%), shoulder (n = 9; 4.3%), clavicle (n = 9; 4.3%), upper arm (n = 3; 1.5%), upper leg (n = 2; 0.9%), hip/pelvis (n = 1; 0.4%) and other not specified (n = 2; 0.9%). Figure 4 shows the percentage distribution graphically of the injuries per the anatomical location.

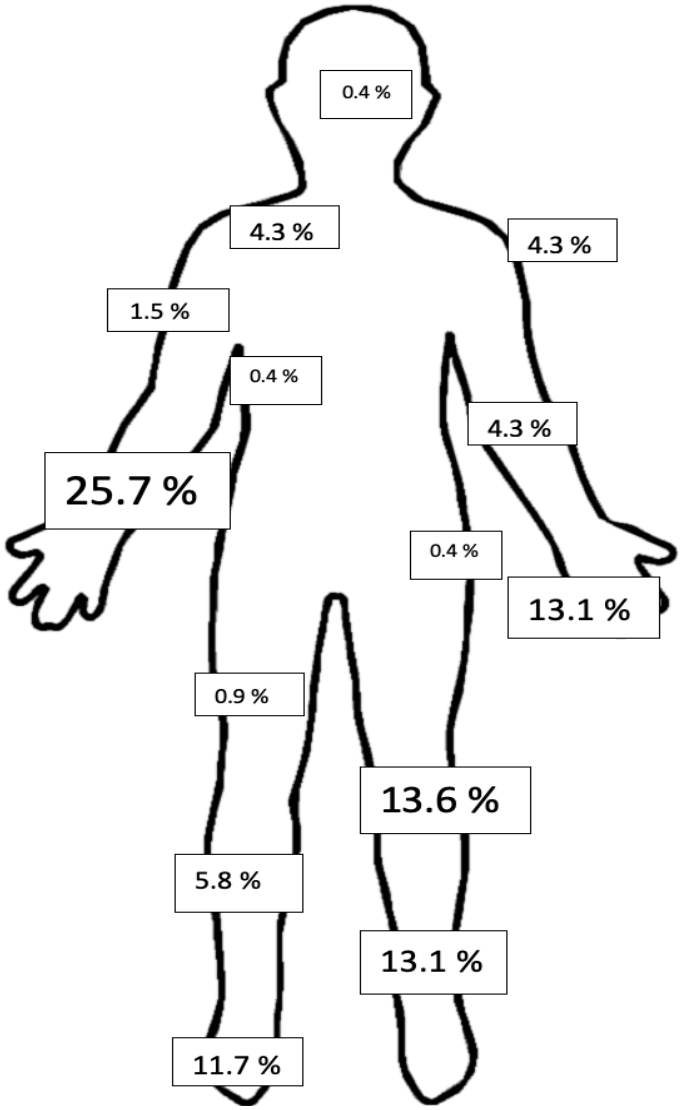

Figure 4: The percentage distribution of injuries per the anatomical location.

CHAPTER 8 - DISCUSSION

8. Discussion:

The aims of this study were to retrospectively investigate the incidence proportion of sports-related injuries presenting to a primary level government clinic in Cape Town, South Africa from July 2017 to June 2019; and to highlight the need for meaningful epidemiological sports injury data collection in the public primary healthcare sector in South Africa. The basic data collected was sub-categorised to identify the contributing variables. As the study was retrospective, the study focused on the simple and objective and descriptive data available. This study focused on the injury incidence proportion aspect only as severity and burden were not possible to ascertain from the available data. Injury surveillance at primary healthcare emergency centres provides an additional perspective on injuries, but the quality of data collection was limited by resource constraints (33).

8.1. Total incidence:

The study looked at a total of 1346 injuries that presented to the orthopaedic emergency department from July 2017 to June 2019. The sample size was one of convenience as stipulated in the study methodology. A total of 206 varying sports-related injuries were identified retrospectively, through the 2-year period. The study found an injury incidence proportion of 15.3%, which is similar to available literature on SEM injury epidemiology (11,26,27,30). Most studies report their incidence rates per 1000 injuries; therefore, this study's findings should be interpreted differently when comparing directly to an incidence rate or a disease burden (26,27). However, using an incidence proportion is useful when commencing sports epidemiology research (46). There was no study to directly compare the incidence proportion rate to, because nowhere in the literature was there something similar nor in the same setting. These findings confirm that there is a presence of sports-related injuries in the South African primary care setting. The incidence proportion ranged on average from 13.7% in 2019, to 15% in 2018 and to 17.6% in 2017; this was similar to available data (5). A study performed in the Netherlands only found a sports-related injury incidence rate of 2.4% presenting to primary care facilities (30), however it focused on non-acute presentations to primary care clinicians and not presentations to emergency units. The

Dutch study was different to this study as it focused on first world primary healthcare which was different to South African primary care emergency units.
In the study, December 2017, and December 2018, only recorded 5 injuries. School holidays and vacation times in December in South Africa, may have been a cause for less than expected number of injuries during that time in the study. Most organised sporting activities in adolescence are undertaken at and around school time. Most PHC units in South Africa work with skeleton staff in late December and early January, therefore the OPD presentations can be less as the unit does not function at full capacity.

8.2. Demographics:

8.2.1. Age:

Most of the injuries were recorded in the adolescent age-group of ages 10-19 years; they accounted for 58.7% of all the injuries. Adolescents and young adults are the largest contributor of exercise-related injuries in general (11,12), and is confirmed in the study findings. When considering provisions for impactful prevention strategies, targeted approaches need to be made for this age group. The second most common was the age-group of 20-29 years with 26.2% of the injuries. The number of injuries decreased as the age-groups increased, as expected with an age-related decline in competitive sport participation (47). 11.2% from the age-group 30-39 years, 3.0% in the age-group 40-49 years, and 0.9% in the age-group 50-59 years. Other primary care trauma centres have reported 28% of all trauma admissions to be males between 19-35 years, however these numbers are not specific to sports-related injuries, but emergency admissions in general (33). There were no injuries recorded in the >60-year age-group. An increase participation in sport results in an increase in sports-related injuries, as a result a result of greater exposure to sport (24). However, it is unlikely to see many sports-related injuries in the older age-groups and in the extreme ends of the age spectrum (31,47). Older people are participating in sports in this community; however, they participate less frequently and are less involved in the contact and team sports, therefore the injury incidences and proportions are expected to be low (48). General sporting participation trends peak in the age group 10-14, with levels at around 40% of the population (48). The numbers steadily decline as the age groups increase and reaching parity at around 60 years of age (47,48). Sporting

participation rapidly declines in late adolescence, as access to organised sports decreases after high school (48). Potential other contributing factors may include going elsewhere (different healthcare facility), transport and employment issues. Table 3. below shows the average participation percentage per age group in the community.

Table 3: The general sporting participation trends per age group in the community (48):

Age group (years):	Percentage participation in sport (percentage):
< 4	8-10%
5-9	30%
10-14	40%
15-19	18-22%
20-24	8-12%
25-29	6-8%
30-34	5%
35-39	3-4%
40-44	3%
45-49	2%
50-54	1-2%
55-59	1%
60-64	0.5-1%
>65	0-0.5%

The understanding of adolescent and youth skeletal development is very important to fully grasp the risk factors for injuries in this cohort (49). “The development of a young athlete is a dynamic process during which biological maturation, physical growth, and behavioural development changes occur simultaneously, alongside the demands of sport” (49). Musculoskeletal injuries will occur in this ever-changing environment, with intrinsic and extrinsic factors playing a role (49). Their injury patterns may be slightly different to an adult cohort (49). Rapid bone growth and malnutrition, seen in some adolescents in lower income communities, can place an athlete at risk of injuries that

an adult or a well-nourished athlete would not suffer (49). These unique interactions place the need for a different approach to SEM in adolescents (49). Medical officers who staff orthopaedic units should be upskilled in adolescent sports injury management. In this study, most of the injuries occurred in the adolescent and young adult age-groups. The positive relationship between sport exposure and injury risk, may be a contributor to injuries in this cohort (24). This study did not focus on why this would occur, but this data can be used for further research into these risk factors. Older populations have higher risks of fractures, especially wrist, due to physiological factors like decreased bone density, and neurodegenerative changes affecting balance and proprioception (11). In this study, the number differences may be due to participation levels, rather than physiological factors, but it cannot be concluded from the study data.

8.2.2. Gender:

The study findings showed far more injuries in males compared to females. Males accounted for 86.9% of all injuries recorded. These findings were predictable as the current literature shows more male participation in sport in South Africa compared to females, thus resulting in more injuries (38). Males in South Africa tend to represent around 60% of the participating cohorts, therefore more injuries can be predicted (38). The literature shows an increase in female participation in sports generally, however, overall, there are still far more males playing sports compared to females (38). Male and female sporting participation trends are generally similar (48). Both male and female injuries were predominantly acute (>90% of all injuries), as most acute injuries present to an emergency unit. The most common male sporting injury was soccer (62.5%) followed by rugby (17.8%) and the most popular female sporting injury was netball (22.2%) followed by soccer (14.8%). Soccer injuries are very common in both male and female recreational and elite athletes (38,50), so their increased incidence proportion is not surprising. Most soccer injuries are recorded as per playing hours, but this figure was not possible to ascertain in this study, as playing hour was not a recordable variable. In South Africa, soccer is the most popular sport played recreationally, whereas rugby is the most popular at university level (38). The soccer

injury incidence proportion was comparatively high in both males and females, as expected.

The 3 hockey injuries were only in females and the 3 cricket injuries only occurred in males. Surprisingly, there were no male hockey injuries as hockey is a sport enjoyed by both genders but is often more physical with males (38). However, the total number of injuries was very small, it is difficult to form congruent conclusions and comments. Female cricket is an ever-expanding sport and now is being played on the international stage (38), however recreational cricket in the community is still limited, which potentially explains the lack of injuries recorded.
Both male and female injuries were predominantly soft tissue injuries. Upper limb injuries were more numerous in males (56.4%), whereas lower limb injuries were more common in the females (51.9%). Netball and hockey injuries predominantly occur in the lower limb which may have been a contributing factor to this finding (38). The most common male injury site was the wrist (27.4%); followed by the knee (14.0%), hand (12.8%), ankle (12.3%) and foot (11.2%) respectively. Furthermore, the most common injury site in females was the ankle (18.5%); followed by hand (14.8%), wrist (14.8%) and foot (14.8%). Interestingly, there were no female shoulder, clavicle, upper leg, or hip/pelvis injuries. These are common injury sites in female athletes (51), however the small number of female injuries may have contributed to this finding. Overall, it was challenging to formerly compare and draw conclusions regarding the genders as the number of male injuries were far higher compared to female injuries. Research into female specific injuries exists but is far outweighed by male specific injuries; further research into female injuries should be conducted (25,29,30).

Modifications to sport policy, organisational and athlete developmental structures and community interventions are required to bridge the gender disparity in sports participation (51). As seen in this study, the number of female injuries were far less than male. Further research into this area is needed to identify the reasons for this disparity.

8.3. Injury Characteristics:

8.3.1. Time of onset:

Most injuries occurred acutely at an incidence proportion of 91.3%, and 8.7% were subacute injuries. Primary care state emergency units are often very busy and patients with non-life-threatening ailments are made to wait a longer time, which could explain the slightly delayed presentations (3). Another potential reason is the socio-economic status and culture of the community investigated, and the attitudes toward seeking healthcare, competing with more urgent basic needs (52). There were no chronic nor acute on chronic injuries, which aligns with the setting of an emergency unit. This may have been due to poor history taking in a resource limited setting and undermining the extent of the injuries. Furthermore, pre-exiting injuries may not be deemed important by the patient; especially if previously they did not consult for them or they recovered with minimum effort (52). Potentially a lack of understanding surrounding the injury severity, may contribute to not seeking care appropriately (52).

8.3.2. Type of sport:

In South Africa, unofficially the most popular sports are soccer, athletics, rugby, cricket, cycling and golf. The most common sport-related injuries from this study were from soccer at an incidence proportion of 56.3%. These findings were not unexpected, as unofficially, soccer is the most popular sport in South Africa and around 2 million people play the game. Youth soccer was further found to have more injuries than most contact sports and considering that the majority of the injuries in this study occurred in the youth, it consolidates these results (50). In soccer specifically, there was a slightly different order of injury incidence proportion with respect to anatomical location compared to the total overall injury incidence proportion order. The most common soccer injury was wrist/forearm, followed by ankle, knee and foot. In soccer, ankle injuries occur more than knee injuries so that finding would have been expected (35,36,50,53). Soccer injuries however are predominantly lower limb in nature (11,35,36,53), but most research has been done in elite and semi-professional sportsmen, with limited research done at the community level. Research in Europe looking at children and adolescent community soccer injuries showed a relatively high proportion of bony injuries (15.4%) to the upper limbs (53). A hypothesis for higher upper limb presentation may include increased risk of falling onto irregular surfaces,

casual nature of the game, compounded by the use of incorrect or no sporting gear, as a result of the lower socioeconomic status of the study's cohort.

Rugby injuries were the second most common. Players competing in full contact sports such as rugby, are expected to experience a higher rate of injuries compared to non-contact and semi-contact sports (54). Rugby is considered the biggest official sport in South Africa with unofficially over 430 000 registered players, and the national side has had multiple successes on the international stage. It is therefore not surprising for rugby to contribute the second highest injury count. The most common rugby injury was wrist/forearm and hand, followed by knee, shoulder, clavicle and ankle. There were predominantly upper limb injuries in the rugby group and there was a slightly different order of injury incidence proportion with respect to anatomical location compared to the total overall injury order. Rugby injuries can occur frequently in the lower and upper limbs as the sport is full-contact and involves a variety of skills and tactics (34,54–56). Both soccer and rugby together accounted for 72.8% of all the injuries and this is an expected outcome considering the South African population (30,34,35,57).

Athletics was the third most common sport causing injury with an incidence proportion of 8.3%. The athletics bracket included injuries from recreational running and hiking, along with the traditional athletic sports. Organised running and athletics injuries are potentially underrepresented in South Africa due to socio-political reasons (57,58). Soccer and athletics may be underrated as they are more popular in poorer communities where official sport and injuries are not properly documented (57–59). Lower limb injuries were more common than upper limb injuries in athletics which was opposite to the general trend of the study, but an expected outcome for athletics as a sport (38). Furthermore, the age-group 30-39 was second most common instead of 20-29 which was different to the general trend of the study and injury incidence proportions (11,50). In marathon running, there is a larger proportion of older competitors (60), which may have been a potential contributor to this finding. Low-intensity sports like walking, hiking, and jogging are more attainable to the older age-groups (61). These sports offer low-intensity exercise and less risk of injury, with good cardiovascular benefits which makes it more accessible to all age-groups (10).

The remaining sports in order of incidence were cycling (3.8%), netball (3.0%), gym sports (2.4%), skateboarding (2.4%), hockey (1.5%), and cricket (1.5%). Gym sports included weight training, boxing, dancing, and gymnastics. The remaining 4.3% was made up of other sports not classified as they had less than 3 injuries each – basketball, ice-skating, golf, roller blading, sailing, fishing, and horse riding. There were no tennis nor swimming injuries; both are low contact sports, but they are also attributed with higher income communities and access to swimming pools and tennis courts (57). It was not surprising that tennis and swimming had no injuries as the target population in this study has limited access to sophisticated facilities and infrastructure. Interestingly, golf and cricket did not feature with high injury rates despite their popularity in South Africa. However, they are both low contact sports and tend to have lower injury rates compared to most contact sports (38). Furthermore, these sports are less common in lower income communities as highlighted in the study's results. Interestingly, Skateboarding accounted for 2.4% of the injuries. Skateboarding is becoming more popular as seen by its inclusion in the Tokyo 2020 Olympics for the first time (62). By nature of the instability of roller skating and the need for stronger skills, it lends itself to a significant risk of falling. In these communities the surfaces are also not ideal and there are no formal facilities, so most children skate on official traffic roads with a high risk of accidents.

8.3.3. Tissue type:

Soft tissue injuries were the most common with an incidence proportion of 59.3%.. Adolescent soft tissue soccer injuries have been reported up to 85% of injuries in the community game (53). It was difficult to differentiate the exact type of soft tissue injury as there was limited (x-ray only) access to further imaging studies in the emergency unit. In soccer injuries, sprains, strains, and contusions – soft tissue injuries - were the most common (50). Hard tissue (bony) injuries, fractures, accounted for 40.7% of all the injuries. Fractures tend to only represent 3-10% of all sports-related injuries in other studies (11,50). However, it has been shown that up to 28% of all soccer injuries presenting to the emergency departments specifically are fractures (50). As this study was looking at all sports-related injuries and incidences, the figures were expected to be slightly different to international literature which focused on specific sporting codes. The higher rates of hard tissue (bony) injuries compared to other studies, may have

been due to the socioeconomic, educational, and resource-related factors in the community, as soft tissue injuries are often neglected, observed, and managed at home, prioritising hard tissue (bony) as severe (2). Patients with soft tissue injuries are less likely to present to an emergency unit (2), however as seen in the findings, patient's will still present to potentially rule out a hard tissue (bony) injury.

8.3.4. Anatomical region and location:

Upper limb injuries accounted for 54.9% of all the injuries; this finding was contrary to current literature, especially when soccer and rugby were the most common sports (5,20,30,31,35,38,44,50,53,63). This has been the most interesting finding of the study. The majority of youth soccer injuries involve the lower limb, and the ankles and knees are the most common body sites affected (50). Lower limb injuries still accounted for 44.2% of all the injuries but as most of the injuries were caused by soccer, lower limb injuries were expected to dominate. The most common anatomical location was wrist/forearm. They accounted for 25.7% of all the injuries. A potential hypothesis for this is falling on an outstretched arm on an uneven and rough surface, which is where the majority of the sports are being played in these communities (42). An informal game and improper equipment could further contribute to this hypothesis. However, the same reasons mentioned prior could also contribute to higher rates of lower limb injuries; no studs on grass, studded shoes on hard surfaces or falling whilst running on an uneven surface (50). In terms of upper limb injuries, the literature has shown shoulder injuries to account for 5% - 8% of total injuries (11). Shoulder injuries in this study however, only attributed 4.3%. The most common location of lower limb injury were the knee and ankle, with 13.6% and 13.1% respectively. Ankle injuries have been shown in the literature to be responsible for roughly 10% - 40% of all injuries, therefore these findings were fairly similar (11). Hand injuries interestingly were tied 3rd most common with 13.1% of the injuries. This could further contribute to the hypothesis highlighted above regarding upper limb injuries. Lastly, foot injuries were 5th most common with 11.7% of the injuries, which corresponds to the general trend in the available of 5 – 35% of sports-related injury presentations (11,34,64,65). Some studies show an increased incidence of lower back strains in youth soccer players (11). However, there were no back or spinal injuries recorded in this study.

8.3.5. Injury severity:

Injury severity was difficult to ascertain as there was no formal recordings and follow-up processes incorporated into the existing clinic. As it was an emergency centre and the severity of injury was difficult to differentiate, a minimum severity of “requiring medical attention” was applied to all the injuries (14).

CHAPTER 9 – STUDY LIMITATIONS

9. Study limitations:

Vanguard CHC is a primary care government unit. As a result, multiple clinicians of various levels of expertise were consulting the patients, so there was limited uniformity in the diagnosis and management. Injuries requiring critical care or were catastrophic, do not present to this level of care. Therefore, only the simple and objective variables were included in the study. There was a difficulty in following up all the injuries, the severity, treatment modalities, formal diagnoses, and recoveries. Therefore, the study was limited to and focused on the available variables: age, gender, type of sport, injury onset, tissue onset, tissue type, anatomical region, and anatomical location. The injuries recorded over the two years were not always seen by experienced clinicians and as a result, injury severity was not a feasible variable to measure.

The clinics' administration and personnel were a challenge as in some instances there was missing patient information in the notes, missing files, limited investigations recorded by clinicians, a lack of good clinical records and a general lack of resources at the clinic to form appropriate diagnoses in all cases. There was a difficulty when differentiating social play versus organised sport in the community as it was information that was retrospectively gained and not objectively witnessed. It would have been better to label the injuries as exercise related or sporting activity related. Potential mistakes made by the PI were difficult to recognise as there was no other data collector, therefore an increased risk of individual mistakes. The target community in the study was of lower socio-economic status and had fewer formal facilities and organised sport. This affected the study as it undermined and under-recognized many activities that were popular in the community, yet poorly defined in the study. The lack of formal organisations made it difficult to define and quantify the true number of community members who participated in sports, which in turn underrepresented the number of sports-related injuries. It was not possible to record player-hours which would be needed to give a true incidence rate and a true injury risk per category.

The difficulty with further statistical testing was that most of the sports had small sample sizes for comparisons. A chi-squared test was performed using the question

of “does sport affect injury region and tissue type?”. The injury region turned out to be significant. It is however important to note that numbers in each group were small (<5) which when the numbers are <5, the result becomes less accurate. Therefore, it was not useful to test all variables, and a designated section in the report was not done.

This study was retrospective, therefore only the appropriate variables defined in the study were identifiable then recorded and used. Injury severity was not recorded in the notes analysed retrospectively; therefore, including it as a variable was not possible. The ideal injury incidence and incidence proportion study should be a prospective cohort study, with all the key steps considered, highlighted in the literature review. Potentially, this study could next be carried out prospectively over a two-year period at Vanguard, with better controls by the PI and therefore better mitigation of the above-mentioned limitations. This then opens opportunities for future research.

In order to improve and enhance the study’s findings, more research needs to be done in this area. It can be replicated across other clinics and emergency units in South Africa and consider a prospective version of the study. Further research must be done to identify the total burden of sports-related injuries/diseases in the public primary sector in South Africa and understand the nature of injuries in different communities to inform prevention and treatment guidelines and policies on resource management. The injury incidence rate and proportion forms only one part of a disease burden assessment.

CHAPTER 10 - STUDY CONCLUSIONS

10. Study conclusions:

Fifteen percent of all the orthopaedic injuries which presented to a primary level government clinic in Cape Town, over a 2-year period, were sports-related. The most common type of sport causing injury was overwhelmingly soccer. Most of the injuries occurred acutely, were male, between the ages of 10-19 years, and soft tissue injuries were more common than hard tissue (bony) injuries. Surprisingly, there were more upper limb than lower limb injuries. As soccer was the most common sport causing injury, more lower limb injuries were expected. The socio-economic status and the casual nature of the game may have been a contributing factor but cannot be proved in this study.

Active lifestyles are being promoted to the general public and it has become a priority for the National Department of Health in South Africa. Therefore, the risk of musculoskeletal injuries is present and should be prepared for. As the largest number of injuries were in adolescents and young adults, a targeted youth protocol should be prioritised. There needs to be a holistic approach to disease prevention and treatment, and Sport and Exercise Medicine provides that at a primary care level. In order to advocate for this care at a primary care level, the sports injury load needs to be identified and appreciated, which is what this study aimed to do. Exercise/physical activity has been shown to be a crucial part of preventative medicine and is an underutilised asset in the public primary healthcare sector in South Africa. This study set out to achieve something simple in Sport and Exercise Medicine epidemiology in the South African primary healthcare system. The study was retrospective and encountered substantial challenges, but it can assist in assessing the need for the South African healthcare system and policy makers to recognise and acknowledge the sports injury rates and have appropriate facilities that will allow for proper consultation, surveillance, and management of sports related injuries.

CHAPTER 11 - REFERENCES

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CHAPTER 12 - APPENDICES

12. Appendices:

Appendix A – Data collection sheet.

Appendix B – University of the Witwatersrand Human Research Ethics Committee (Medical) approval.

Appendix C – University of the Witwatersrand Master of Science in Medicine approval of title.

Appendix D – Western Cape Government Department of Health research approval document.

Case number:	Year:	Month:	Type of sport:	Time of onset:	Tissue type:	Anatomical region:
Example:						
1	2019 (3)	*June*	*Soccer (21)*	*Acute (11)*	*Soft tissue (17)*	*Lower limb (7)*
1	1 July	28	11	18	6	
2	1 July	30	11	18	6	
3	1 July	26	11	18	6	
4	1 July	23	11	18	6	
5	1 July	23	11	17	7	
6	1 July	21	11	18	6	
7	1 July	21	11	18	6	
8	1 July	28	11	18	6	
9	1 July	23	11	18	6	
10	1 July	23	11	18	6	
11	1 July	21	12	17	7	
12	1 July	21	11	17	6	
13	1 July	21	11	17	7	
14	1 July	21	11	17	7	
15	1 August	21	11	18	6	
16	1 August	21	12	18	7	
17	1 August	23	11	18	7	
18	1 August	21	11	18	6	
19	1 August	23	11	17	6	
20	1 August	28	11	17	7	
21	1 August	23	11	17	7	
22	1 August	29	11	17	7	
23	1 August	21	11	17	6	

24	1	August	21	11	17	7
25	1	August	21	11	18	6
26	1	August	23	11	18	6
27	1	August	23	12	17	7
28	1	September	21	11	18	6
29	1	September	26	11	17	7
30	1	September	21	11	18	6
31	1	September	21	11	17	7
32	1	September	23	11	18	6
33	1	September	21	11	17	6
34	1	September	21	11	17	6
35	1	September	21	11	18	6
36	1	September	21	11	18	6
37	1	September	23	11	17	7
38	1	October	21	11	18	7
39	1	October	21	11	17	7
40	1	October	28	11	17	7
41	1	October	23	11	17	7
42	1	October	21	11	18	6
43	1	October	21	11	17	7
44	1	October	23	11	17	6
45	1	October	27	11	18	6
46	1	October	21	11	18	6
47	1	October	21	12	18	6
48	1	October	29	12	18	7
49	1	October	26	11	18	6
50	1	November	21	11	17	7
51	1	November	21	11	18	6
52	1	November	21	11	17	7
53	1	November	23	11	18	6
54	1	November	21	12	17	6
55	1	November	21	11	17	7
56	1	November	21	11	17	6
57	1	December	23	11	17	6
58	1	December	21	11	18	6

59	1	December	21	11	18	7
60	1	December	28	11	18	7
61	1	December	23	11	17	6
62	2	January	21	11	17	7
63	2	January	21	11	17	6
64	2	January	30	11	18	6
65	2	January	21	11	18	6
66	2	February	29	11	17	7
67	2	February	21	11	17	7
68	2	February	28	11	17	7
69	2	February	23	11	18	6
70	2	February	21	11	18	6
71	2	February	23	11	17	7
72	2	February	23	11	17	6
73	2	February	21	11	18	6
74	2	February	21	11	18	6
75	2	February	28	11	17	7
76	2	February	21	11	17	7
77	2	March	21	11	17	7
78	2	March	23	11	18	6
79	2	March	21	11	17	7
80	2	March	29	11	18	7
81	2	March	22	12	18	6
82	2	March	26	11	17	7
83	2	April	27	11	18	6
84	2	April	21	11	17	7
85	2	April	21	11	17	7
86	2	April	25	11	17	6
87	2	April	27	11	18	7
88	2	April	21	11	18	6
89	2	April	26	11	17	7
90	2	April	28	11	17	7
91	2	May	21	11	17	6
92	2	May	21	11	17	7
93	2	May	21	11	17	7

94	2	May	30	11	17	6
95	2	May	23	11	17	7
96	2	May	21	11	18	6
97	2	May	21	11	17	9
98	2	June	23	11	17	6
99	2	June	21	11	17	7
100	2	June	21	11	18	6
101	2	June	21	11	18	6
102	2	June	28	11	17	7
103	2	June	21	11	17	7
104	2	June	21	11	17	6
105	2	July	21	11	17	6
106	2	July	21	11	18	6
107	2	July	21	11	17	6
108	2	July	29	11	18	6
109	2	July	21	11	18	6
110	2	July	21	11	17	6
111	2	July	30	11	17	6
112	2	July	28	11	17	6
113	2	August	22	12	17	6
114	2	August	21	11	17	6
115	2	August	21	11	17	6
116	2	August	23	11	17	6
117	2	August	23	11	18	6
118	2	August	30	11	18	6
119	2	August	25	11	17	6
120	2	August	21	11	17	6
121	2	August	21	11	17	7
122	2	August	23	11	18	7
123	2	August	23	11	17	7
124	2	August	21	11	17	7
125	2	August	21	11	17	7
126	2	August	29	12	17	7
127	2	September	21	11	18	6
128	2	September	29	11	17	6

129	2 September	21	12	17	7
130	2 September	21	11	17	6
131	2 September	23	11	17	7
132	2 September	28	11	18	7
133	2 September	21	11	18	6
134	2 September	28	11	17	6
135	2 September	21	11	17	7
136	2 September	21	11	18	6
137	2 September	24	11	17	6
138	2 October	24	11	18	7
139	2 October	21	12	18	6
140	2 October	21	11	17	7
141	2 October	21	11	18	6
142	2 November	21	11	17	7
143	2 November	21	11	17	7
144	2 November	28	12	17	7
145	2 November	21	12	18	6
146	2 November	21	11	18	6
147	2 November	21	11	17	7
148	2 November	21	12	18	6
149	2 December	24	11	18	7
150	2 December	21	12	18	7
151	2 December	21	11	17	6
152	2 December	27	11	18	6
153	2 December	27	12	18	6
154	3 January	21	11	17	6
155	3 January	24	11	17	6
156	3 January	21	11	17	7
157	3 January	23	12	18	6
158	3 January	21	11	17	6
159	3 January	21	11	18	7
160	3 January	22	11	17	7
161	3 January	29	11	17	7
162	3 January	21	11	17	7
163	3 January	21	11	17	6

164	3 February	28	11	17	7
165	3 February	21	11	17	7
166	3 March	27	11	17	6
167	3 March	28	11	17	7
168	3 March	21	11	17	6
169	3 March	28	11	17	6
170	3 March	21	11	17	7
171	3 March	21	11	17	7
172	3 March	24	11	17	7
173	3 March	21	11	18	6
174	3 March	21	11	18	6
175	3 March	21	12	18	6
176	3 April	21	11	18	7
177	3 April	21	11	17	7
178	3 April	23	11	17	6
179	3 April	21	11	18	6
180	3 April	21	11	17	6
181	3 April	21	11	18	6
182	3 April	21	11	17	7
183	3 April	21	11	17	7
184	3 April	21	11	17	7
185	3 April	21	11	17	6
186	3 May	23	11	17	6
187	3 May	23	11	18	6
188	3 May	23	11	17	6
189	3 May	21	11	18	7
190	3 May	21	11	17	7
191	3 May	21	11	18	6
192	3 May	24	11	17	7
193	3 May	21	11	18	7
194	3 May	28	11	18	6
195	3 May	21	11	17	7
196	3 May	27	11	17	6
197	3 May	21	11	17	7
198	3 May	29	11	18	6

199	3 June	21	11	17	7
200	3 June	21	11	17	6
201	3 June	23	11	18	7
202	3 June	21	11	18	7
203	3 June	23	11	18	7
204	3 June	21	11	17	6
205	3 June	27	11	17	6
206	3 June	25	11	17	9

Code Key:
Year:
2017 = 1
2018 = 2
2019 = 3

Anatomical location:	Age:	Gender:
Hand (41)	22 (32)	*M (4)*

44	31	5	Athletics
43	31	5	Skateboarding
44	31	4	Gym
46	32	4	
50	31	5	
41	31	4	
42	31	4	
46	31	4	Athletics
46	33	4	
41	33	4	
50	32	4	
41	31	4	
50	32	4	
48	31	4	
43	31	4	
47	32	4	
49	31	4	
42	31	4	
41	31	4	
50	33	4	Athletics
47	31	4	
48	33	4	Golf
42	31	4	

Total:
2017 = 61
2018 = 92
2019 = 53

48	31	4	
42	31	4	
46	31	4	
52	32	4	
41	31	4	
50	32	5	Dancing
42	33	4	
50	31	4	
41	31	4	
45	34	4	
43	31	4	
41	31	4	
41	31	4	
47	32	4	
49	31	4	
47	31	4	
50	32	4	Athletics
50	31	4	
42	35	4	
50	32	4	
42	31	4	
42	31	4	
42	31	4	
42	31	4	
49	31	4	Ice skating
41	31	4	Weights
50	31	4	
46	31	4	
49	32	4	
42	31	4	
41	32	4	
48	32	4	
50	31	4	
41	33	5	
42	34	4	

49	31	4	
49	33	5	Athletics
41	32	4	
47	33	4	
41	31	4	
42	31	4	Skateboarding
46	32	4	
47	33	4	Sailing
47	32	5	
48	31	5	Athletics
42	31	4	
42	31	4	
50	32	4	
42	32	4	
42	31	4	
41	31	4	
50	32	4	Athletics
48	33	4	
47	31	4	
41	32	4	
50	32	4	
49	31	5	Rollerblading
42	31	4	
48	32	5	Dancing
46	32	4	
47	31	4	
47	31	4	
41	34	5	
47	31	4	
42	31	4	
50	31	5	Dancing
48	34	4	Athletics/hiking
42	31	4	
48	31	4	
48	31	4	

42	31	4	Skateboarding
50	32	4	
41	33	4	
53	33	4	
45	32	4	
48	32	4	
46	31	4	
42	31	4	
50	33	4	Athletics
47	32	4	
45	32	4	
45	32	4	
42	31	4	
42	31	4	
42	31	5	Ice skating
42	31	4	
42	31	4	
43	31	5	Skateboarding
41	33	4	Athletics
41	32	4	
42	31	4	
43	31	4	
45	31	4	
46	31	4	
42	31	4	Skateboarding
41	32	5	
42	31	4	
50	32	4	
49	31	4	
48	31	4	
47	32	4	
47	32	4	
50	34	4	Basketball
42	31	4	
41	32	4	Fishing

50	31	4	
45	33	4	
48	31	4	
47	31	4	Athletics
42	31	4	
41	33	4	Athletics
48	31	4	
42	31	4	
42	31	5	Netball
47	32	5	Netball
42	31	4	
48	31	4	
42	31	4	
51	33	4	
50	32	4	
50	32	4	Athletics
42	31	4	
42	32	4	
47	32	4	
42	31	4	
47	31	5	Netball
49	31	4	
50	33	4	
45	35	4	
42	31	5	
42	31	4	
41	32	5	Netball
48	32	4	
42	31	4	
43	32	4	
49	32	4	
48	32	4	
47	34	4	Horse riding
48	32	4	
42	31	4	

47	31	4	Athletics
48	31	5	
41	33	4	
47	33	4	Athletics
42	31	4	
42	31	4	Athletics
47	31	4	
50	33	4	
47	31	5	Netball
42	31	4	
47	31	4	
42	31	4	
49	31	4	
50	31	4	
43	31	5	
42	32	4	
41	31	4	
42	32	5	
50	32	4	
48	31	4	
50	33	4	
42	31	4	
45	31	4	
42	31	4	
45	32	4	
48	31	5	
48	31	4	
42	31	4	
48	32	5	Netball
49	31	4	
43	31	4	Athletics
48	31	4	
42	31	4	
48	32	4	
41	32	4	Basketball

51	31	4
43	31	4
48	33	4
48	32	4
50	32	4
41	31	4
44	31	4
53	31	5

Type of sport:	Time of Onset:	Tissue type:	Anatomical region:
Soccer = 21	Acute = 11	Soft tissue = 17	Upper limb = 6
Cricket = 22	Sub acute = 12	Hard tissue/fracture =	Lower limb (hip & pelvis) = 7
Rugby = 23	Chronic = 13		Back & spine = 8
Netball = 24	Acute on chronic = 14	**Total:**	Other = 9
Hockey = 25		Soft tissue = 122	
Gym = 26		Hard tissue/fracture =	**Total:**
Cycling = 27	**Total:**		Upper limb = 113
Athletics = 28	Acute = 188		Lower limp (hip & pelvis) = 91
Other = 29	Sub acute = 18		Back & spine = 0
Skateboarding = 3	Chronic = 0		Other = 2
	Acute on chronic = 0		
Total:			
Soccer = 116			Rib = 1
Cricket = 3			Head/face = 1
Rugby = 34			
Netball = 6			
Hockey = 3			
Gym = 5	Gym (Incl. weights, gymnastics, dancing and boxing)		
Cycling = 8			
Athletics = 17	Athletics (Incl. Running)		
Other = 9			
Skateboarding = 5	Skateboarding		
			Month:
Rest of other:			July 2017
Basketball = 2			August 2017
Ice-skating = 2			September 2017
Golf = 1			October 2017
Rollerblading = 1			November 2017

Sailing = 1
Fishing = 1
Horse riding = 1

December 2017	
January 2018	
February 2018	
March 2018	
April 2018	
May 2018	
June 2018	
July 2018	
August 2018	
September 2018	
October 2018	
November 2018	
December 2018	
January 2019	
February 2019	
March 2019	
April 2019	
May 2019	
June 2019	
Total:	

Non-sports injuries	84,70%
Sports injuries	15,30%

Anatomical location:
Hand = 41
Wrist/Forearm = 42
Elbow = 43
Upper Arm = 44
Shoulder = 45
Clavicle = 46
Foot = 47
Ankle = 48
Lower Leg = 49
Knee = 50
Upper Leg = 51
Hip/Pelvis = 52
Other/Not Specified = 53

Age:
10-19 = 31
20-29 = 32
30-39 = 33
40-49 = 34
50-59 = 35
> 60 = 36

Gender:
Male = 4
Female = 5

Total Male = 179
Total Female = 27

Total:
10-19 = 121
20-29 = 54
30-39 = 23
40-49 = 6
50-59 = 2
> 60 = 0

Total:

Hand	27
Wrist/Forearm	53
Elbow	9
Upper Arm	3
Shoulder	9
Clavicle	9
Foot	24
Ankle	27
Lower Leg	12
Knee	28
Upper Leg	2
Hip/Pelvis	1
Other/Not Specified	2

Patients:	Injuries:
65	14
71	13
64	10
69	12
56	7

21	5	61	346
27	4		
70	11		
44	6		
47	8		
64	7		
38	7		
55	8		
63	14		
67	11		
12	4		
77	7		
49	5	92	613
63	10		
56	2		
56	10		
75	10		
80	13		
57	8	53	387
1346	206		

UNIVERSITY OF THE WITWATERSRAND, JOHANNESBURG

HUMAN RESEARCH ETHICS COMMITTEE (MEDICAL)

Office of the Deputy Vice-Chancellor (Research & Post Graduate Affairs)

TO: Dr DI Tadmor
School of Therapeutic Sciences
Centre for Exercise Science and Sports Medicine
Medical School
University

E-mail: tadmor.di@gmail.com

CC: Supervisor: Dr M Lichaba <Mamosilo.Lichaba@wits.ac.za>
and <HREC-Medical.ResearchOffice@wits.ac.za>

FROM: Iain Burns
Human Research Ethics Committee (Medical)
Tel: 011 717 1252

E-mail: Iain.Burns@wits.ac.za

DATE: 2020/10/08

REF: *R14/49*

PROTOCOL NO: **M200416** *(This is your ethics application study reference number. Please quote this reference number in all correspondence relating to this study)*

PROJECT TITLE: *A retrospective analysis of the incidence of sports injuries presenting to a primary healthcare clinic in Cape Town*

Please find attached the Clearance Certificate for the above project. I hope it goes well and that an article in a recognized publication comes out of it. This will reflect well on your professional standing and contribute to the Government funding of the University.

MSWorks2000/Iain0007/Clearscan.wps

UNIVERSITY OF THE WITWATERSRAND, JOHANNESBURG

R14/49 Dr DI Tadmor

HUMAN RESEARCH ETHICS COMMITTEE (MEDICAL)
CLEARANCE CERTIFICATE NO. M200416

NAME: **(Principal Investigator)**	Dr DI Tadmor
DEPARTMENT:	School of Therapeutic Sciences Centre for Exercise Science and Sports Medicine Medical School University
PROJECT TITLE:	A retrospective analysis of the incidence of sports injuries presenting to a primary healthcare clinic in Cape Town
DATE CONSIDERED:	2020/04/24
DECISION:	Approved conditionally
CONDITIONS:	A copy of an approval letter from the Western Cape Provincial Health Research Committee should be submitted to the HREC (Medical)
SUPERVISOR:	Dr M Lichaba
APPROVED BY:	CB Penny Dr CB Penny, Chairperson, HREC (Medical)
DATE OF APPROVAL:	2020/10/08

This clearance certificate is valid for 5 years from the date of approval. Extension may be applied for.

DECLARATION OF INVESTIGATORS

To be completed in duplicate and **ONE COPY** returned to the Research Office Secretary on the 3rd Floor, Phillip Tobias Building, Parktown, University of the Witwatersrand, Johannesburg.

I/we fully understand the conditions under which I am/we are authorized to carry out the above-mentioned research and I/we undertake to ensure compliance with these conditions. Should any departure be contemplated, from the research protocol as approved, I/we undertake to submit details to the Committee. **I agree to submit a yearly progress report**. When a funder requires annual re-certification, the application date will be one year after the date when the study was initially reviewed. In this case, the study was initially reviewed in **April** and will therefore reports and re-certification will be due early in the month of **April** each year. Unreported changes to the application may invalidate the clearance given by the HREC (Medical).

Principal Investigator Signature

11/10/2020
Date

UNIVERSITY OF THE
WITWATERSRAND,
JOHANNESBURG

Private Bag 3 Wits, 2050
Fax: 027117172119
Tel: 02711 7172076

Reference: Mrs Sandra Benn
E-mail: sandra.benn@wits.ac.za

22 April 2021
Person No: 529951
PAG

Dr DI Tadmor
103 Albert Road
Hout Bay
7806
South Africa

Dear Dr Daniel Tadmor

Master of Science in Medicine: Approval of Title

We have pleasure in advising that your proposal entitled *A retrospective analysis of the incidence of sports injuries presenting to a primary healthcare clinic in Cape Town* has been approved. Please note that any amendments to this title have to be endorsed by the Faculty's higher degrees committee and formally approved.

Yours sincerely

Mrs Sandra Benn
Faculty Registrar
Faculty of Health Sciences

STRATEGY & HEALTH SUPPORT
Health.Research@westerncape.gov.za
tel: +27 21 483 0866: fax: +27 21 483 6058
5th Floor, Norton Rose House,, 8 Riebeek Street, Cape Town, 8001
www.capegateway.gov.za)

REFERENCE: WC_202010_031
ENQUIRIES: Dr Sabela Petros

1 Jan Smuts Ave
Braamfontein
Johannesburg
2000

For attention: Dr Daniel Isaac Tadmor

Re: A retrospective analysis of the incidence of sports injuries presenting to a primary healthcare clinic in Cape Town

Thank you for submitting your proposal to undertake the above-mentioned study. We are pleased to inform you that the department has granted you approval for your research.
Please contact the following people to assist you with any further enquiries in accessing the following sites:

Vanguard CHC	**Mr Luntu Mbanga**	**021 695 8244**

Kindly ensure that the following are adhered to:

1. Arrangements can be made with managers, providing that normal activities at requested facilities are not interrupted.
2. Researchers, in accessing provincial health facilities, are expressing consent to provide the department with an electronic copy of the final feedback (**annexure 9**) within six months of completion of research. This can be submitted to the provincial Research Co-ordinator (Health.Research@westerncape.gov.za).
3. In the event where the research project goes beyond the *estimated completion* date which was submitted, researchers are expected to complete and submit a progress report (**Annexure 8**) to the provincial Research Co-ordinator (Health.Research@westerncape.gov.za).
4. The reference number above should be quoted in all future correspondence.

Yours sincerely

DR M MOODLEY
DIRECTOR: HEALTH IMPACT ASSESSMENT
DATE: 31 March 2021
CC