ANALYSIS OF PATIENTS' DIRECT AND INDIRECT COSTS AT THE NATIONAL SPINAL INJURY HOSPITAL IN NAIROBI CITY COUNTY, KENYA

LORNA WANGARI KARANJA (B. PHARM)
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DEPARTMENT OF HEALTH MANAGEMENT AND INFORMATICS

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DECLARATION

Student's Declaration

I declare that this thesis is my original work and has not been submitted in any other university/institution for consideration of any certification.

Signature: _____ Date: 10/4/2025

Lorna Wangari Karanja (B. PHARM)

Q140/CTY/PT/37027/2017

SUPERVISORS' DECLARATION

This thesis has been submitted with our approval as University Supervisors.

Signature: _____ Date: 11.04.2025

Dr. Andre Yitambe

Department of Health Management and Informatics School of Health Sciences

Kenyatta University

Signature: _____ Date: 11/04/2025

Dr. Julius K. Korir

Department of Economic Theory School of Economics

Kenyatta University

DEDICATION

I dedicate the work to my husband and my sons for their immense support as I worked on the project. May the Almighty God bless you all.

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It takes the input of a dedicated team to write a research thesis. Although it would be impossible to include them all, the following should be brought up:

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DEFINITION OF OPERATIONAL TERMS

Cost of Illness study	This aims to itemize the components to be costed and to attach a monetary cost to them that economists call the "opportunity cost," the value of the forgone chance to use the resources during ill health or lost due to ill health in a different way. (Hodgson et.al 1982).
Direct medical costs	Those expenses linked to medical resource uptake which is inclusive of in and outpatient as well as pharmaceutical services consumption within the health care delivery system (Kirigia et.al 2013)
Direct non-medical costs	These are expenses other than medical costs; for example, the cost of transport to and from the health facility, the cost of hiring caretakers, legal and administrative costs (Kirigia et.al 2013)
Indirect costs	The expenses incurred from the cessation or reduction of work productivity as a result of the morbidity and mortality associated with a given health condition or injury" (Bocuzzi 2003).
Spinal cord injury	Any damage to the spinal cord that causes temporary or permanent changes in its function (WHO, 2013)

LIST OF ABBREVIATIONS AND ACRONYMS

COI	Cost of Illness
FCM	Friction Cost Method
GDP	Gross Domestic Product
KNCV	*Koninklijke Nederlandse Chemische Vereniging*
KNSPWD	Kenya National Survey of People Living with Disabilities
MRI	Magnetic Resonance Imaging
NTSCI	Non-Traumatic Spinal Cord Injury
NHIF	National Hospital Insurance Fund
OOP	Out of Pocket
SCI	Spinal Cord Injury
SPSS	Statistical Package for Social Sciences
TSCI	Traumatic Spinal Cord Injury
WHO	World Health Organization
WTP	Willingness to Pay

ABSTRACT

Global statistics indicate that based on the extent of spinal cord injury, the first-year cost ranges between $300,000 and $1,000,000. A review of 68 studies by Hadley et.al 2013, revealed that the average cost of an accident varied greatly, from $14 to $17,400. The cost per disability-adjusted life year saved by injury-prevention measures ranged from $10.90 for the installation of speed bumps to $17,000 for campaigns against drunk driving and breathalyser testing in Africa. This study aimed to determine the economic burden of spinal cord injury (SCI) by analyzing patients' spinal injury costs at the National Spinal Injury Hospital (NSIH) in Nairobi, Kenya. The specific objectives were to: (i) determine the total costs of SCI in the first year of diagnosis and treatment; (ii) analyze variations in costs due to health insurance ownership; (iii) assess cost variations based on the extent of injury; and (iv) examine cost variations based on the employment status of patients. A cross-sectional analytical study was conducted using purposive sampling to select the hospital, the only referral facility for SCI in East Africa. SCI inpatients and outpatients meeting the inclusion criteria were recruited using consecutive sampling until the sample size of 169 was reached. Data were collected through structured questionnaires and secondary data review and analyzed using SPSS version 25. Findings revealed that the average first-year cost of SCI per patient was KSh. 928,326.73, comprising KSh. 187,048 in direct medical costs, KSh. 173,541 in direct non-medical costs, and KSh. 567,738 in indirect productivity losses. Statistical analysis showed no significant difference in total spinal cord injury costs between patients with medical cover and those without medical cover (df=2 |t=0.6129) or patients with different extents of injury (df=3; P=0.6617), but patients' employment statuses significantly influenced the total spinal cord injury costs (df=4; P=0.0000). The conclusions were (i) There is no significant difference in the total SCI costs between the SCI patients with medical cover and those without medical cover (ii) There is a significant difference in the total SCI costs amongst SCI patients of different employment statuses (iii) There is no significant difference in the total SCI costs among the SCI patients with different extents of the injury. Recommendations include reducing indirect costs through modern treatment technologies and affirmative actions, promoting the full implementation of the Social Health Insurance Act, providing direct cash transfers to SCI patients, and encouraging employers to support SCI patients with flexible work arrangements and workplace modifications. These findings emphasise the need for targeted interventions to alleviate the economic burden of SCI and enhance patient care at NSIH.

CHAPTER ONE: INTRODUCTION

1.1 Study Background

Spinal cord injury (SCI) is a significant public health concern that affects both individual well-being and societal productivity. According to the World Health Organization (WHO), between 250,000 and 500,000 new cases of SCI occur globally each year, with road traffic accidents being the leading cause (WHO, 2013). The impact of SCI extends beyond physical health, imposing severe economic and social burdens. The loss of motor and sensory function often leads to long-term disability, reduced earning potential and increased healthcare costs. Studies indicate that individuals with SCI have lower employment rates compared to the general population, with only 12% to 35% returning to work post-injury (Bickenbach et al., 2013). This highlights the critical need for effective prevention and rehabilitation strategies.

In Kenya, the economic and healthcare challenges associated with SCI are particularly pronounced. The Kenya National Survey of People with Disabilities (2008) estimates that 4.6% of Kenyans live with disabilities, with 12% of these attributed to accidents, including spinal injuries. The high incidence of road traffic accidents, which account for approximately 38% of all hospital admissions due to trauma (Ministry of Health, 2017), further exacerbates the SCI burden. Access to specialized care remains a challenge, as many Kenyans cannot afford the high cost of long-term treatment. While initiatives like the National Hospital Insurance Fund (NHIF) and the current Social Health Insurance Fund (SHIF) seek to alleviate financial barriers, disparities persist, leaving many SCI patients without adequate rehabilitative care.

The socioeconomic consequences of SCI are profound. Beyond the direct medical costs, SCI patients face indirect financial strain due to lost income and increased household expenditures on care. A study by Kang et al. (2017) highlighted that SCI-related costs, including hospitalization, rehabilitation, and home modifications, significantly burden affected families, particularly in low- and middle-income countries. The psychological toll is equally substantial, with SCI patients experiencing higher rates of depression and anxiety, which further hinder recovery and reintegration into society (Craig et al., 2015).

Despite the severity of the problem, SCI has received comparatively less attention in global health discussions than communicable diseases such as HIV/AIDS and malaria (Chima et al., 2003; Russell, 2004). This gap in prioritization underscores the urgent need for policies that integrate SCI management into national health strategies. Prevention efforts should focus on strengthening road safety regulations, enforcing workplace safety protocols, and increasing public awareness of high-risk activities. Additionally, investment in rehabilitation services, such as those offered at the National Spinal Injury Hospital, is essential to improving long-term outcomes for SCI patients.

Therefore, addressing the burden of SCI requires a multifaceted approach that includes preventive measures, improved access to specialized care, and financial protection mechanisms. Enhancing policy frameworks, investing in rehabilitation infrastructure, and ensuring equitable healthcare access will be crucial in mitigating the impact of SCI and improving the quality of life for affected individuals.

Out-of-pocket (OOP) health expenditures—payments made directly by individuals at the point of service—are pivotal in understanding the financial burden on

populations and the progress toward universal health coverage. High OOP expenditures can lead to catastrophic health spending, pushing households into poverty.

Globally, OOP health expenditures vary significantly across income groups. In high-income countries, OOP spending constitutes approximately 13.7% of total health expenditure. In contrast, lower-middle-income countries see OOP spending at about 47.3%, and low-income countries at 43.8%. This disparity indicates that individuals in lower-income countries bear a more substantial share of health costs directly, increasing their vulnerability to financial hardship due to health expenses (IHME 2023).

In the African context, the reliance on OOP payments is notably high. For instance, in East sub-Saharan Africa, government health expenditure per capita was $10 in 2009, with OOP payments constituting a significant portion of total health expenditure. This heavy dependence on OOP payments underscores the limited financial protection mechanisms available, leading to increased risks of catastrophic health spending among households (WHO 2023)

Kenya exemplifies the challenges associated with high OOP expenditures. The 2013 Kenya Household Health Expenditure and Utilization Survey revealed that OOP spending accounted for a substantial share of private health expenditure. This high OOP burden indicates that many Kenyans face significant financial barriers when accessing healthcare services, potentially leading to delayed care or unmet health needs (MOH 2014). The graph below from the National Health Accounts GOK shows the percentage of the total health expenditure and gives an overall picture of the health financing in Kenya.

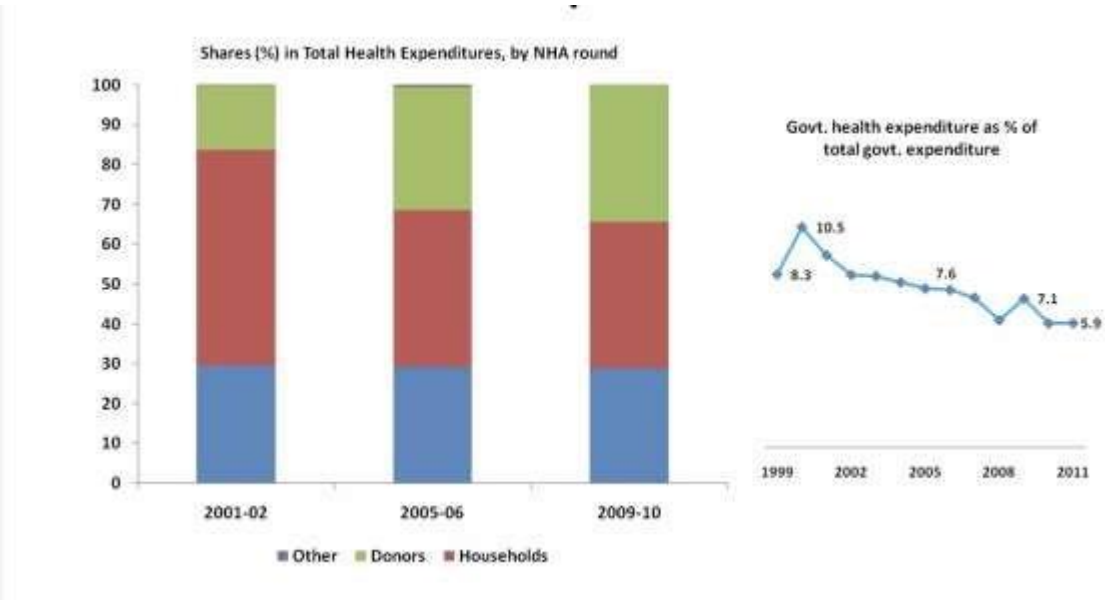

Figure 1.1: Health Financing Options in Kenya (2009/2010)
(Adopted from Ministry of Health, Government of Kenya. (2013) *Kenya Household Health Expenditure and Utilization Survey*)

Moreover, the 2018 Kenya Household Health Expenditure and Utilization Survey highlighted that a considerable portion of households experienced catastrophic health expenditures, defined as OOP spending exceeding 40% of household non-food expenditure. This situation emphasizes the urgent need for effective financial protection strategies to prevent households from being pushed into poverty due to health-related expenses.

The high levels of OOP expenditures in Kenya and across Africa highlight the necessity for robust health financing reforms. Strengthening prepayment mechanisms, such as health insurance schemes, and increasing government health spending are critical steps toward reducing the financial burden on individuals. Enhancing financial protection is essential for achieving universal health coverage and ensuring equitable access to healthcare services without financial hardship.

1.2 Problem statement

Spinal cord injury (SCI) is a global health challenge with profound socio-economic implications. The World Health Organization (WHO, 2013) estimates that SCI affects millions worldwide, leading to substantial healthcare expenditures and productivity losses. Studies indicate that SCI patients face exorbitant medical costs, particularly in high-income countries where healthcare systems provide structured rehabilitation and insurance coverage (Villines, 2016; Hadley et al., 2013). However, in low- and middle- income countries (LMICs) like Kenya, these financial burdens are exacerbated by systemic healthcare limitations, insufficient insurance coverage, and inadequate rehabilitation facilities (Mwenda et al., 2016; Thuo et al., 2014).

Despite the well-documented economic burden of SCI in developed nations, there is limited empirical data quantifying these costs in Kenya. For instance, while estimates suggest that SCI rehabilitation costs in Kenya average $105,000 annually (WHO, 2013), the extent of patient out-of-pocket expenditures, the proportion covered by insurance, and the impact of subsidized care remain unclear. Furthermore, the financial implications of lost productivity and reduced economic capacity among SCI patients are poorly quantified in local studies, limiting evidence-based policymaking and resource allocation.

Some studies argue that SCI economic burdens are universally similar, irrespective of healthcare system differences (UAB Model, 2006). However, contradicting research suggests that financial strain varies significantly across regions due to disparities in insurance penetration, employment opportunities, and government healthcare subsidies (KNSPWD, 2008). These conflicting perspectives underscore the need for region- specific studies that assess the economic realities of SCI patients

in Kenya.

Understanding the cost of spinal injuries is crucial for policymakers as it informs healthcare financing, resource allocation, and social protection strategies. Spinal cord injuries impose a substantial economic burden due to high medical costs, long-term rehabilitation, assistive care, and loss of productivity. Without clear cost data, healthcare systems may struggle to allocate funds effectively, leaving patients vulnerable to catastrophic out-of-pocket expenses. Accurate financial estimates can guide investments in prevention, specialized treatment, and rehabilitation, ensuring that spinal injury care is integrated into universal health coverage (UHC) policies.

Moreover, spinal injuries often lead to permanent disability, requiring sustained social and financial support. Policymakers need cost data to design appropriate insurance coverage, disability benefits, and financial assistance programs that prevent economic hardship for affected individuals and families. Without this information, underfunding of essential services and inequitable access to care remain persistent risks. However, despite its significance, data on the economic burden of spinal injuries is scarce, particularly in low-resource settings, making it challenging to develop evidence-based policies and financial protection mechanisms. This study sought to add to the existing body of knowledge by providing insights into the financial impact of spinal injuries, contributing to informed policy decisions and improved healthcare planning.

This study, therefore, aims to bridge this gap by estimating the direct and indirect costs of SCI care at the National Spinal Injury Hospital (NSIH) in Nairobi, Kenya. The study analyzed the financial burden on patients, considering out-of-pocket expenditures, insurance coverage, and subsidized healthcare costs. Additionally, it assessed productivity losses due to time off work and long-term disability.

1.3 Justification for the Study

The study's main objective was to analyze the costs incurred by spinal injury patients at the National Spinal Injury Hospital. Spinal cord injuries (SCI) have a profound socioeconomic impact, particularly in low-income settings. Evidence suggests a close association between low socioeconomic status and the prevalence of spinal injuries, as individuals from underprivileged backgrounds are more likely to engage in high-risk occupations, live in unsafe environments, and face barriers to accessing healthcare (World Health Organization [WHO], 2013; Singh et al., 2019). This highlights the need to focus on SCI within these vulnerable populations.

The financial burden of SCI on both individuals and society is substantial. Global statistics indicate that SCI contributes to increased healthcare expenditure, loss of productivity, and long-term caregiving costs (Villines, 2016; Hadley et al., 2013). In Kenya, the National Spinal Injury Hospital which is the only specialized facility for SCI management, operates at maximum capacity with limited resources, leaving many patients on waiting lists. This underscores the urgent need for evidence-based policymaking to optimize resource allocation and improve access to care.

Moreover, the study's findings are essential for policymakers, offering insights into productivity losses experienced by patients and their families. This data can inform budgetary allocations and research funding aimed at alleviating the financial burden on SCI patients and supporting their reintegration into society.

1.4 Research Objectives

The general objective of this study was to determine the economic burden of SCI by analysing the patients' spinal injury costs at the National Spinal Injury Hospital in Nairobi, Kenya.

The specific objectives were:

1. To determine the total costs of spinal cord injury in the first year of diagnosis and treatment at the National Spinal Injury Hospital.
2. To determine the variations in total costs of spinal cord injury between patients with medical cover and those without medical cover
3. To establish the variations in total costs of spinal cord injury amongst patients with different extents of spinal injury
4. To establish the variations in total costs of spinal cord injury for spinal injury patients of different employment statuses.

1.5 Research Questions

The research questions for this study were:

1. What were the total costs of spinal cord injury in the first year after diagnosis from the patient's perspective at the National Spinal Injury Hospital?
2. What was the variations in total costs of spinal injury between patients with medical cover and those without medical cover?
3. What was the variations in total costs of spinal injury amongst patients with different extents of spinal injury?
4. What was the variations in total costs of spinal injury for spinal injury patients of different employment statuses?

1.6 Null hypothesis

H_0: There's no significant difference in the total SCI costs between patients with medical cover and those without medical cover.

H_0: There is no significant difference in the total SCI costs amongst patients with different extents of spinal injury.

H_0: There is no significant difference in the total SCI costs for spinal injury patients of different employment statuses.

1.7 Significance of the Study

This study serves as a crucial resource for the Ministry of Health, Kenya, aiding in evidence-based decision-making and policy formulation related to Spinal Cord Injury (SCI). Given the government's prioritization of Universal Health Coverage (UHC), the findings offer valuable insights into the economic burden of SCI, ensuring that healthcare planning and resource allocation align with national health objectives.

Additionally, this study provides essential data for donors, international organizations, and research institutions, supporting the prioritization of funding for economic disease burden research. By quantifying the direct and indirect costs of SCI, the findings help justify increased financial commitments toward prevention, treatment, and rehabilitation programs. Furthermore, they inform strategic interventions aimed at alleviating the economic and social burden of SCI on affected individuals, families, and society at large. Ultimately, this research strengthens the case for sustainable investments in SCI healthcare and rehabilitation, contributing to improved health equity and economic stability in Kenya.

1.8 Limitations of the Study

The study does not include assessments of Quality of Life (QoL), Quality-Adjusted Life Years (QALYs), or Disability-Adjusted Life Years (DALYs) as these are typically used to measure health outcomes rather than direct and indirect costs. While these metrics are important in evaluating overall health and rehabilitation success, this study focuses solely on the financial burden incurred by SCI patients and healthcare systems. Future research may integrate these measures to provide a more comprehensive analysis of SCI's impact on both health outcomes and economic costs. Additionally, no comparison of costs and benefits was conducted.

Another limitation was the use of a modified KNCV-TB tool to estimate patient costs, as it only considered those who had begun treatment or rehabilitation in health facilities. This excluded individuals who had not sought assistance, those who had defaulted on treatment, or those who had died before seeking care, introducing a bias toward patients who accessed treatment services. The COVID-19 pandemic further posed challenges, as restricted access to the hospital, especially for inpatients, significantly slowed the data collection process. The hospital's reliance on manual recording and filing also made retrieving data from treatment sheets to identify treatment plans and costs an uphill task, while the traceability of individual payment files was equally challenging. Time and cost constraints further compounded these difficulties.

1.9 Study assumption

An assumption made in this study was that the targeted participants willingly participated in the research as expected by the principal investigator and that the information provided led to the conclusions and recommendations discussed in Chapters Four and Five.

1.10 Conceptual Framework

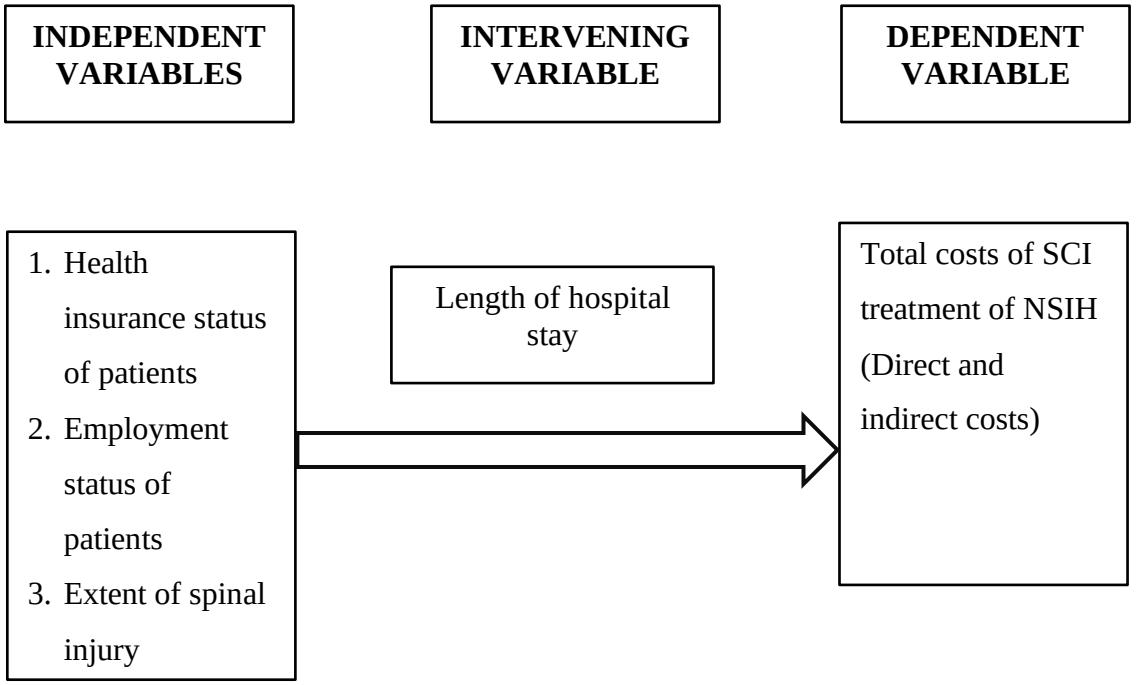

Figure 1.2: Conceptual Framework

Adapted from Kirigia *et.al.* (2009)

CHAPTER TWO: LITERATURE REVIEW

2.1 Introduction

This chapter reviews existing literature relevant to the study. It is structured to incorporate theoretical and empirical literature and provide a critique. The chapter concludes with an analysis of literature gaps. The review examines various cost estimation methods, their applicability to the Kenyan context, and a comparative assessment of spinal cord injury (SCI) cost burdens in Africa and East Africa.

2.2 Spinal Cord Injury

As a component of the neurological system, the spinal cord is separated into four sections. The cervical area, which connects the brain to the spinal cord, is the topmost section. It is made up of eight vertebrae, C1 through C8, that have the shape of a butterfly and connect the back to the neck. The second area consists of the thoracic spinal cord, which is made up of vertebrae T1 through T12. The third segment, which consists of the lumbar region (L1–L5), is where the spinal cord begins to flex. Five vertebrae make up the sacral spine, which is located in the lower area. Figure 2 in Appendix 7 illustrates this using the spinal cord's portions. This area is made up of nerve roots that emerge from the spinal cord at different vertebral locations; there is no physical spinal cord present. (2018) Kang et al. Anywhere along these four spinal cord segments is possible for a spinal cord injury (SCI to develop). There is a breakdown in communication between the brain and the body parts below the injury due to damage to the spinal cord's cells.

There are two main categories of spinal cord injuries: incomplete injuries, in which the victim of the injury still has some function since the spine is only partially severed. The Hagen 2015 The degree of function in these situations varies according

to the severity of the injuries. Complete injuries fall into another category when function is completely lost due to a complete separation or severance of the spinal cord. With medical attention and physical rehabilitation, some functions might be regained. The most common spinal cord injury kinds include tetraplegia, often called quadriplegia, which affects the cervical spinal cord and is the most severe variety.

Tetraplegia usually leads to problems with bowel and bladder control, and problems with the respiratory system as well as other normal body functions. The severity of the injury increase as the damage occurs on the upper part of the spinal cord. The other type is Paraplegia where both sensory and motion of the lower torso are interfered with as damage occurs to the thoracic spinal cord. The other type is Triplegia which is due to an incomplete injury and causes sensory and motion loss in one arm and both feet. Damage beneath the lumbar part of the cord does not usually show signs of paralysis or sensory loss, (Seizer et.al 2015) but does cause neural pain and reduces functions in some parts of the body. To recover some of these functions, several surgical procedures may be carried out.

The term "primary SCI" describes the harm done to the neurological components during the shock. Thus far, irreparable harm emerges from this, which can manifest as shear stresses applied to blood vessels or axons. The body's reaction to an initial damage is known as secondary SCI. After an injury, a variety of cellular cascades have been found to occur that can last for months or even years. Even while these processes are essential to the regular functioning of cells, it has been shown that they worsen underlying injuries and impede neurological healing. Researchers have identified certain targets that may prevent secondary SCI and maybe enhance patient outcomes by describing these cascades. Advances in nonoperative and

operative therapy options have been made with this basis.

The common indications of spinal injuries are varying degrees of paralysis, struggle in breathing, recurrent infections such as pneumonia (common with tetraplegia), difficulties with bowel and bladder functions, chronic neural and muscle pain, mood fluctuations, headaches, loss of libido amongst others. To diagnose spinal injuries a variety of tests are used such as clinical evaluation where a clinician will make an in-depth list of all of the symptoms, blood tests can be done as well as assessing limb movement. Imaging examinations such as Magnetic Resonance Imaging (MRI) can also be conducted on the spinal cord and brain.

Unlike with many other injuries, treatment of SCI begins at the scene of injury. A victim needs to remain still, avoiding moving the spinal column as this can worsen the damage and needs to get swift emergency care. This can significantly improve the chances of surviving and the long-term effects of the injury. At the hospital, emphasis is on stabilizing the victim, as the initial hours after a spinal cord injury is vital to a victim's prognosis. Procedures to address the emerging symptoms may be required such as aid in breathing, a neck collar to keep the neck immobile and blood transfusions (O'Connel 2017).

Global figures show that the first-year cost varies from $300,000 to $1,000,000. This depends on the severity of spinal cord injury. Villinnes, 2016. There is not enough information currently accessible on the prevalence of spinal injuries in Kenya, which will make it possible to create preventative and therapeutic strategies that work. While public health professionals are more concerned with promoting health, preventing spinal injuries and accompanying mortality, and lowering the health and social burden associated with them, health economists are interested in

analysing spinal cord therapy methods as economic investments.

After suffering a spinal cord injury, patients must engage in rehabilitative therapy in order to enhance their functional abilities, avoid the development of secondary complications, and emotionally get ready for the journey ahead. These are priceless abilities that improve people's quality of life and help them become more independent. Following a spinal cord injury, rehabilitation may include:

- Physical therapy: Through targeted exercises, physical therapy aims to improve motor control following a spinal cord injury. A physical therapist will evaluate your functional skills and design an exercise programme specifically for you.
- Occupational therapy: Occupational therapy will help you go back to your regular routine by having you practise everyday tasks like eating and cleaning your teeth. You can also get help from an occupational therapist in getting ready to go back to work or school. To assist you be as independent as possible, they could also suggest certain kinds of adapted equipment.
- Speech therapy: Higher-level SCI patients may have trouble breathing because to paralysis or weakness in the diaphragm, intercostal muscles, and core. During speech therapy, patients will work on strengthening their cough and expanding their lung capacity. Higher level SCI patients may also experience dysphagia, or trouble swallowing. Another way a speech therapist can help with this is by working on strengthening the affected muscles and/or suggesting a modified diet to ensure safe eating.
- Psychoatherapy:. A SCI can have a major impact on a person's mental health in addition to its primary effects on motor function and sensory. People will

discover in psychotherapy the best coping mechanisms for dealing with the consequences of their spinal cord injury.

Rehabilitative therapies are often only covered by insurance policies for a limited period of time. Because of this, people who are unable to pay for treatment out of pocket could find it difficult to receive the therapy required to reduce long-term issues.

One advantage of undergoing spine surgery soon after sustaining a traumatic spine injury is that it maintains your spinal cord's normal blood flow. The secondary damage cascade is facilitated by prolonged spinal cord compression, which results in inadequate blood supply. You might see improved long-term results if the subsequent injuries following the initial SCI are kept to a minimum. Although there aren't enough high- quality studies evaluating the impact of early spine surgery on long-term SCI outcomes, what is known suggests that postponing surgery is associated with worse outcomes.

Decompression surgery is a safe and successful treatment for traumatic spinal injuries, according to several studies. A study conducted on individuals who suffered from a cervical SCI and underwent spine surgery within a day of the injury revealed that the former group was more likely than the latter to see at least a 2-grade improvement on the ASIA Impairment Scale.

Most of the public health systems in developing countries believe in the notion that the government must meet the health requirements of its populace; that healthcare services should be free hence the global appeal policies that advocate for free services (Mills. A et.al 1993) However, such policies are unreasonable for much of these countries as concluded by the World Health Organization’s 1987 World Health Assembly due to the innate inefficiencies in public health care delivery (Lindsay

1975). In the cases where the services are free, the main costs passed to the populace are the patient's own time and travel costs and the state bears the other costs. The results of an economic COI study address a number of policy problems about the effects of illness or injury. A number of these queries touch on the microeconomic household level, state or firms- for example, the effect of SCI on a firm's revenue or household earnings. Others are at the macroeconomic level, analyzing the summative impact of an illness on a country's present and future gross domestic product (GDP). (WHO 2009)

The discussion on the inefficiencies of free healthcare systems and the economic burden of illnesses is particularly relevant to Kenya, a developing country with a rapidly growing population and a high burden of communicable and non-communicable diseases (WHO 2017). Kenya's public health system faces significant challenges, including underfunding, inadequate infrastructure, and a shortage of healthcare workers (WHO 2009). While the government has made efforts to provide free or subsidized healthcare services, such as the Linda Mama program for maternal health and the abolition of user fees in public hospitals, the system remains strained. The indirect costs of healthcare, such as travel expenses and lost productivity, disproportionately affect low-income households, exacerbating inequalities in access to care. (Villines 2016). In Kenya, the indirect costs of illness are often overlooked in policy discussions, yet they play a significant role in determining the overall economic burden of diseases. For instance, a study on the economic impact of malaria in Kenya found that households spend a significant portion of their income on transportation to healthcare facilities and lose productive days due to illness. (Villines 2016). Similarly, the indirect costs of HIV/AIDS, such as reduced labor productivity and increased caregiving burdens, have had a profound impact on

household incomes and the national economy. These findings align with the broader literature on the economic burden of illness in sub-Saharan Africa, where indirect costs often exceed direct medical expenses (WHO,2010).

2.3 Theoretical Literature Review

Theoretical frameworks have guided cost estimation in healthcare. The Human Capital Theory (Schultz, 1961) viewed health as an investment that enhances economic productivity. This theory posited that individuals who maintain good health contribute effectively to economic output, while those who suffer from ailments, such as SCI, experience reduced productivity and earning potential.

Welfare Economics Theory evaluated health interventions based on their impact on societal well-being. This theory emphasized the societal burden of healthcare costs, including both direct expenses (medical costs) and indirect costs (lost income and productivity). The application of this theory in SCI studies provided insights into economic losses incurred by patients, families, and society.

The Cost-of-Illness (COI) Framework (Rice, 1967) was employed to estimate the economic burden of diseases, including direct and indirect costs. This framework was widely used in healthcare research to quantify the financial impact of various health conditions, including SCI, and served as a foundation for developing interventions to reduce cost burdens (Miller & Homan, 2013).

The Willingness-to-Pay Approach measures how much individuals are willing to pay to avoid illness. This method is unique in that it incorporates subjective preferences for health and economic valuation of avoiding SCI (Johannesson & Meltzer, 1998). In developing countries, where access to quality healthcare is limited, willingness to

pay often reflects the extent of financial burden a household is willing to bear for medical care. Lastly, the Production Function Approach examines the reduced productivity in chronic cases. It assesses the broader economic impact of SCI by analyzing labor force participation declines and economic output reductions (Manning et al., 1987). This approach is particularly significant in economies where labor productivity is a key driver of economic growth, as SCI-related incapacitation can have far-reaching consequences.

2.3.1 Relevance to Kenya Health Care

Kenya, like many developing nations, faces unique healthcare cost challenges that make SCI a particularly burdensome condition. The country experiences a high prevalence of spinal injuries, primarily resulting from road accidents and falls (Mwachaka et al., 2018). The lack of comprehensive insurance coverage exacerbates the financial strain on patients and their families, leading to high out-of-pocket expenditures (Kenya National Bureau of Statistics, 2021). With many individuals relying on informal employment structures that offer no social protection, SCI imposes severe economic consequences, rendering affected households vulnerable to financial distress.

Moreover, Kenya's public healthcare system remains underfunded, limiting access to specialized rehabilitation services for SCI patients (Ministry of Health Kenya, 2020). The lack of well-equipped rehabilitation centers forces many patients to seek costly private care or forgo necessary treatments altogether, ultimately worsening health outcomes. Addressing these issues requires targeted policies aimed at improving healthcare financing, enhancing insurance coverage, and expanding rehabilitation services to alleviate the financial burden of SCI on affected individuals and families.

2.3.2 Comparative Analysis: Africa and East Africa

The financial burden of SCI in Africa is profound, largely due to high incidence rates stemming from traffic accidents, workplace injuries, and inadequate road safety measures (World Health Organization, 2019). The limited healthcare infrastructure in many African countries contributes to weak health systems, further increasing indirect costs such as travel expenses and lost wages (Ningwa et al., 2021). Additionally, the scarcity of rehabilitation centers exacerbates long-term financial burdens, forcing many patients to seek alternative, often costly, private healthcare options. Inadequate government funding for SCI treatment and rehabilitation exacerbates these financial strains, leading to poor health outcomes and increased dependency on caregivers (WHO, 2020).

Within East Africa, the financial and healthcare response to SCI varies significantly across countries. In Kenya, SCI cases are prevalent, with limited insurance penetration and substantial out-of-pocket expenditures presenting major challenges (Mwachaka et al., 2018). The high cost of treatment, coupled with poor access to specialized care, increases the economic burden on affected households.

In Uganda, the government abolished user fees in public hospitals to increase healthcare accessibility. However, this policy led to overwhelmed facilities, longer waiting periods, and resource shortages, negatively impacting SCI patients who require immediate and specialized care (Kagwa et al., 2021). In contrast, Tanzania faces chronic underfunding and governance issues in the healthcare sector, restricting access to care for SCI patients. These challenges have resulted in disparities in SCI treatment availability, particularly in rural areas where healthcare services remain insufficient (WHO, 2020).

Conversely, Rwanda has made notable strides in healthcare financing through the implementation of community-based health insurance schemes. These schemes have significantly improved affordability and accessibility of SCI-related healthcare services (Binagwaho et al., 2018). Rwanda's approach serves as a model for other East African nations, demonstrating the benefits of strategic health financing in reducing the economic burden of SCI.

2.4 Empirical Literature Review: Direct And Indirect Costs of SCI

Studies indicated that SCI costs varied significantly based on injury severity. U.S. Data showed that annual SCI costs ranged from $218,000 to $741,000, depending on severity (French et al., 2006). Direct costs included medical treatments, rehabilitation, and assistive devices, while indirect costs accounted for lost productivity and caregiver burdens. The Kenyan Context lacked comprehensive data, though indirect costs (travel, productivity loss) were likely higher than direct costs. Studies suggested that SCI patients in Kenya incurred significant non-medical expenses related to transportation, home modifications, and assistive care.

African Studies found that indirect costs often surpassed direct medical costs (WHO, 2010). Research in sub-Saharan Africa indicated that SCI patients frequently experienced long-term income losses due to the inability to return to work, further exacerbating economic inequalities.

SCI resulted in job loss, dependency, and increased caregiving burden. Loss of household income and GDP impact at the national level was evident. Studies emphasized the need for economic modeling to measure these losses accurately. Furthermore, studies in developing countries indicated that SCI patients faced social stigma, leading to further exclusion from economic opportunities.

2.5 Critique of Existing Literature and Summary of Literature Gaps

Most existing studies have focused heavily on empirical findings without a clear theoretical foundation, leading to limited theoretical integration in SCI cost research. The lack of regional SCI-specific costing studies has resulted in a gap in understanding the financial burden of SCI in Kenya and East Africa. Furthermore, indirect costs have been underestimated, with most studies primarily analyzing direct medical expenses while overlooking productivity loss and long-term financial implications for families. Additionally, a limited focus on policy implications has been observed, with studies failing to provide actionable recommendations for improving healthcare financing and SCI management.

The summary of literature gaps highlights the lack of Kenya-specific SCI cost data, as most studies generalize from global data. There is also limited research on indirect costs, particularly regarding travel expenses and lost wages. Many studies demonstrate weak theoretical frameworks, lacking robust economic modeling. Moreover, comparative studies are needed, as few studies analyze Kenya's SCI costs in relation to other African nations. Lastly, inadequate policy recommendations are evident, as many studies focus solely on cost estimation without proposing interventions to mitigate economic burdens.

The literature highlighted significant gaps in SCI cost estimation in Kenya and the broader East African region. Future research required stronger theoretical foundations and a focus on indirect costs to provide a more comprehensive analysis. Additionally, research should integrate policy recommendations to inform decision-making in healthcare financing and SCI management in Kenya and other African nations.

CHAPTER THREE: MATERIALS AND METHODS

3.1 Introduction

This chapter outlines the study population used as well as the methodology and study design, study variables, inclusion and exclusion criteria and the research tools that were used. It also describes the ethical issues relating to this study.

3.2 Study design

The research design chosen was an analytic cross-sectional design. This type of study design involves collecting data at a single point in time (cross-sectional) and analysing relationships or associations between variables (analytic). Unlike purely descriptive cross-sectional studies, which focus on the prevalence or distribution of variables, analytic cross-sectional studies aim to test hypotheses and examine potential causal relationships**.** Purposive sampling was employed to recruit the SCI patients in their first year of diagnosis.

The overall expenditures and average costs per patient were calculated after taking into account any subsidized fees or costs. Because it is easy to gather data on missed revenue, the Human Capital Approach was utilized to estimate the indirect costs. According to Jefferson et al. (2000), the purpose of COI research is descriptive: to describe, quantify, and total the expenses associated with a specific medical condition in order to provide an estimate of the financial burden brought on by that sickness.

The research is Prevalence-based since it estimates the number of hospitalizations and deaths attributable to a specific disease in a given year and then adds up the expenses associated with these hospital stays and deaths (Jo C 2014). In contrast, incidence-based studies concentrate on the quantity of newly diagnosed cases of a

disease and the expenses incurred during the course of the illness until it is resolved.

The most practical method for measuring long-term conditions that need long follow- up periods, like SCI, is the prevalence-based approach. 1998; Kortt et al. Since all associated costs have already been incurred and can be measured and recorded in a dataset, a cross-sectional design was selected due to its lower cost and shorter time requirements. Additionally, it works well for estimating chronic conditions like SCI.

3.3 Study variables

The summary of the study variables is highlighted in the table below:

Table 3.1: Table Showing Summary of Study Variables

S No.	Variable name	Type of variable	Measurement
1.	Health insurance status of the patients	Independent variable	Variance of the means
2.	Employment status of the patients	Independent variable	Variance of the means
3.	Extent of spinal injury	Independent variable	Variance of the means
4.	Total costs of SCI treatment	Dependent variable	Sum of direct medical, direct non-medical and productivity losses

3.4 Location of Study

The National Spinal Injury Hospital in Nairobi County, Kenya's Kilimani area was the site of this study. The appendices section contains the map. It is Kenya's only spinal cord injury referral hospital, according to the Ministry of Health website. The Cheshire family founded the hospital in order to treat, rehabilitate, and relocate troops with spinal cord injuries who returned from World War II. However, the

government assumed control of the facility after independence and changed its name. It has a 40-bed capacity with a waiting list of over 100 at any given time from its catchment zone. Data maintained by NSIH indicated that it attends to an average of 205 spinal injury patients (inpatients) and 6,812 outpatients annually (MOH 2015). Most SCI patients are victims of road accident injuries, falls from heights, gunshots and assaults.

3.5 Study population

Since this study looked at SCI costs from the perspective of the patient, the target population of the study was SCI patients seeking treatment at National Spinal Injury Hospital in the month of 11th January 2021 to 2nd April 2021. It focused on both inpatient and outpatient patients. The focus of the outpatient clinic was on those attending physiotherapy as well as the specialized diabetes clinic. These patients had undergone diagnostic procedures that indicated any form of spinal injury for the past year.

About 300 patients—both inpatient and outpatient—had spinal cord injuries at the hospital during the 4-month study period, according to the institution's health records department. According to hospital data records, the outpatient physiotherapy department saw 10 to 15 patients per day, with three clinic visits per week. In addition, a fluctuating number of patients who were referred from other medical facilities were there. Target Population was all SCI patients who sought treatment at the National Spinal Injury Hospital from January 11 to April 2, 2021, including both inpatient and outpatient groups. Study Population includes the subset of SCI patients who were actively treated during the study period and from whom data on treatment costs, resource utilization, and other factors are collected.

3.6 Criteria

All Spinal cord injury patients seeking treatment at the National Spinal Injury Hospital

3.6.1 Inclusion criteria

1. Patients between the age of 18 years – 65 years
2. Patients who willed to take part in the study and sign an informed consent document.
3. Patients diagnosed with spinal cord injury for at least one year.

3.6.2 Exclusion criteria

1. Patients who are too ill to communicate (e.g., unconscious, critically ill), and whose caregivers are also unwilling or unable to provide information.
2. Patients who have not undergone the full confirmatory diagnostic tests required for spinal cord injury diagnosis.

3.7 Sample size and sampling procedures

3.7.1 Sampling procedures

Purposive sampling was employed first in the selection of the hospital as it is the only referral hospital in East Africa for SCI cases. Secondly, this sampling was used to select the Spinal cord injury inpatients that meet the inclusion criteria as it is a 40-bed capacity hospital thus very few SCI inpatients. The outpatient clinic serves a wide range of patients other than SCI patients therefore the focus was on SCI patients booking in for physiotherapy and here simple random sampling was used to select the participants who had met the inclusion criteria until the sample size was attained.

3.7.2 Sample Size

Since the study population was not static, the research applied the formula by Fischer et al (Mugenda, 2003) since the study focused on sampling respondents who had been diagnosed with spinal cord injury.

$$n = (z^2\ pq) \div d^2$$

Where z = standard normal deviate commonly set at 1.96 n = desired sample size for an infinite population

p = fraction of the characteristic that is of interest (0.5) is the prevalence of SCI amongst patients seeking treatment at the hospital. (Nang'ole F.W 2003)

q = (1 – p) =0.5

d = accuracy degree set at 0.05.

Consequently, the lowest estimated sample size is

$$(1.96^2\ \times 0.5 \times 0.5) \div 0.05^2\ = 384$$

The finite correction factor will be used as the population is finite: nf = n/ {1+ (n/N)}. According to hospital data, approximately 95 SCI physiotherapy patients are seen every month (Nang'ole F.W 2003)

Hence 285 cases per 3-month period. 384/ {1 + (384/285)} = 163.

Factor due to attrition or non-responses was set at 5% therefore the sample size chosen was **171.** A total of 171 questionnaires were administered to obtain the data, giving a response rate of 98.9%, that is **169** valid respondents.

3.8 Data Collection Tools

Appendix 1 of the questionnaire instrument Koninklijke Nederlandse Chemische Vereniging (KNCV) was used to gather primary data for the purpose of assessing patient costs. Data on the indirect costs or productivity losses brought on by SCI were

gathered using this. Part of the tool was the data that was recorded on patient files during their regular visits. This tool was administered by the main researcher assisted by one research assistant. The parameters that were measured included productivity losses in terms of the percentage decrease of productivity due to SCI, annual income loss due to the spinal cord injury and the relatives' foregone income as a result of taking care of the SCI patient.

The secondary data review from the hospital finance department and the hospital records department were the main sources of data for the direct medical costs. The data was recorded on an excel worksheet template (see appendix 6). Records on the percentage of medical costs covered by insurance as well as waivered costs were also noted. These were drawn from patient files of patients interviewed using the structured questionnaire using the inpatient/outpatient number as the tracing tool.

3.9 Pre-testing

Before the main data collection phase, the researcher conducted a pretest to ensure the reliability and clarity of the data collection tools. The pretest involved administering the survey and interview questions to a small sample of patients at the National Spinal Injury Hospital who met the inclusion criteria. This trial run helped to identify any potential issues with the questionnaire, such as ambiguous wording, unclear instructions, or inadequate response options. It also provided an opportunity to assess the time required to complete the survey and ensured that the data collection process was feasible within the hospital's setting. Feedback from the pretest participants and the research team allowed the researcher to refine the instruments, ensuring that they effectively captured the relevant information on SCI treatment costs. The pretesting phase was essential to enhance the quality and accuracy of the study, ensuring that the final data collection would be reliable and valid.

3.10 Validity

Content validity referred to whether the study measured all the relevant aspects of spinal cord injury (SCI)-related treatment costs. In this study, the researcher ensured that all significant cost factors, such as hospitalization, diagnostic tests, surgeries, physiotherapy, outpatient care, medications, and any other treatment-related expenses, were included in the data collection process. To enhance content validity, the researcher consulted experts in the field, such as medical professionals and healthcare economists, to ensure that the study comprehensively captured all critical cost dimensions.

Criterion validity evaluated how well the study's findings aligned with external, established measures of SCI treatment costs. In this case, the researcher compared the study's results with existing studies or national healthcare cost reports—such as those from other hospitals or trusted medical organizations—to confirm that the estimates were consistent with broader data. This validation process helped to ensure that the results of the study reflected established norms and standards for SCI treatment costs, increasing the study's credibility.

Construct validity referred to the degree to which the study measured the concept of "spinal cord injury treatment costs." To ensure construct validity, the researcher made sure that the methods used to collect cost data accurately reflected the true costs associated with treating SCI. This included ensuring that the categories for costs, such as inpatient care, outpatient services, and lost productivity, appropriately captured the full range of economic impacts. Additionally, the tools used to gather data, like interviews, patient records, and hospital financial data, were scientifically validated to measure the true cost burden of SCI and were deemed suitable for this type of research.

3.11 Reliability

The researcher ensured the reliability of the study's data collection instruments by using standardized methods and pretested tools. Reliability refers to the consistency and stability of the measurement process over time. To enhance reliability, the researcher used a well-structured questionnaire, which was pretested and revised to ensure clear, unambiguous questions. Furthermore, consistent training was provided to the research assistants involved in data collection to minimize variations in how questions were asked or responses were recorded. By maintaining a structured approach, the researcher aimed to ensure that the data collection process would yield consistent results across different participants and time points, thereby increasing the reliability of the study findings.

3.12 Data Analysis

The Statistical Package for Social Sciences (SPSS) version 25 was used to analyze the data. Standard deviation, mean, and median were among the descriptive statistics used to characterise the demographics and baseline data. Measures of the total, mean and standard deviation were used to analyze the data for the first aim, which focused on direct medical expenditures, and the second objective, which focused on direct non- medical costs like transportation. The information on the expenses resulting from lost productivity was totalled, and the mean indirect costs were analyzed from the data.

Regression analysis: ANOVA and T-tests were done using the same SPSS, and were also used to describe and evaluate the statistical differences in the economic burden of the SCI patients at NSIH based on health insurance ownership, the extent of injury and employment status of the patients

3.13 Logistical and Ethical Considerations

Research approval was obtained from the Kenyatta University Graduate School and the Kenyatta University Ethics Review Committee. In addition, a research permit (reference no. 261686) was secured from the National Commission for Science, Technology and Innovation (NACOSTI). Further approval was granted by the National Spinal Injury Hospital Management, following a formal request submitted via a letter dated 6th January 2021.

To ensure ethical compliance, consent forms based on the Kenyatta University Ethics Review Committee format were attached to the KNCV Tool. Participants were required to sign these forms after fully understanding the research objectives and procedures. Those who consented to participate were interviewed privately, and the completed questionnaires were securely stored at Kenyatta University to maintain confidentiality.

Research assistants received training on the proper use of the research instruments and on how to clearly interpret the consent forms to participants. To protect participant anonymity, no names or personal identifiers were recorded on the data collection tools, and no specific participant information was disclosed in any reports or presentations.

CHAPTER FOUR: RESULTS

4.1 Introduction

This chapter presents the results and discussions of the study. The first section provides sample characteristics using descriptive statistics while the second section presents results derived from ANOVA analysis. For the direct non-medical and indirect costs, a total of 171 questionnaires were administered to obtain the data, giving a response rate of 98.9%, that is 169 valid respondents. A consent form was signed before the participant could proceed with the interview, in this case, the SCI patient or caregiver could fill it in. In most cases, the participant was assisted to fill in by my research assistant and myself.

4.2 Socio-Demographic Characteristics

The sample focused on the outpatients, previously admitted at the NSIH and were discharged but regularly attend physiotherapy clinics as well as inpatients admitted at the ward and in the first year of diagnosis and treatment. The clinic was open during weekdays and had the highest patient flow on Wednesdays. A consent form was signed before the participant could proceed with the interview, in this case, the SCI patient or caregiver could fill it in. In most cases, the participant was assisted to fill in by my research assistant and myself. The social demographic characteristics of the respondents have been summarized in Table 2 below:

Table 4.1: Social Demographic Characteristics of the Respondents

Variables	Frequency (n)	Percentages (%)
Gender of the SCI patients		
Male	102	60.2
Female	67	39.8
Total	**169**	**100**
Location of injury		
Cervical (Tetraplegia)	53	31.4
Thoracic (paraplegia)	48	28.4
Lumbar/sacral (triplegia)	68	40.2
Total	**169**	**100**
Education level		
Primary level	69	40.9
Secondary level	67	39.8
College/tertiary level	33	19.3
Total	**169**	**100**
Health insurance		
With cover	148	88.1
Without cover	20	11.9
Total	**168**	**100**
Employment data		
Unemployed	77	45.5
Self-employed	44	26.1
Employed	25	14.8
Retired	17	10.2
Casual jobs	6	3.4
Total	**169**	**100**

From the table, the male gender was the highest in percentage at 60.2% compared to females at 39.8%. Patients with tetraplegia, which was the most severe form of the SCI injury were at 31.4% compared to paraplegia (28.4%) and triplegia who comprised of patients with injuries at the lumbar/sacral level was at 40.2%. The demographics for the education level of the participants indicated those who had attained and stopped at primary level were 40.9% followed by secondary level at 39.8% while college/tertiary level were the least at 19.3%.

Health insurance ownership was also an important demographic analysed with those with cover being the majority at 88.1% and those without any cover at 11.9%. Employment data indicated the unemployed were the majority at 45.5% followed by self-employed(26.1%), employed (14.8%), retired (10.2%) and the least with casual

jobs (3.4%).

4.3 Normality tests: Jarque-Bera test

A Jarque-Bera test was conducted to assess the normality of the dataset **(**n = 169**)** basing the test on the age of the SCI patients. The corresponding histogram illustrates the distribution of the data based on patients' age. The dataset was normally distributed thus exhibiting the symmetric bell-shaped curve.

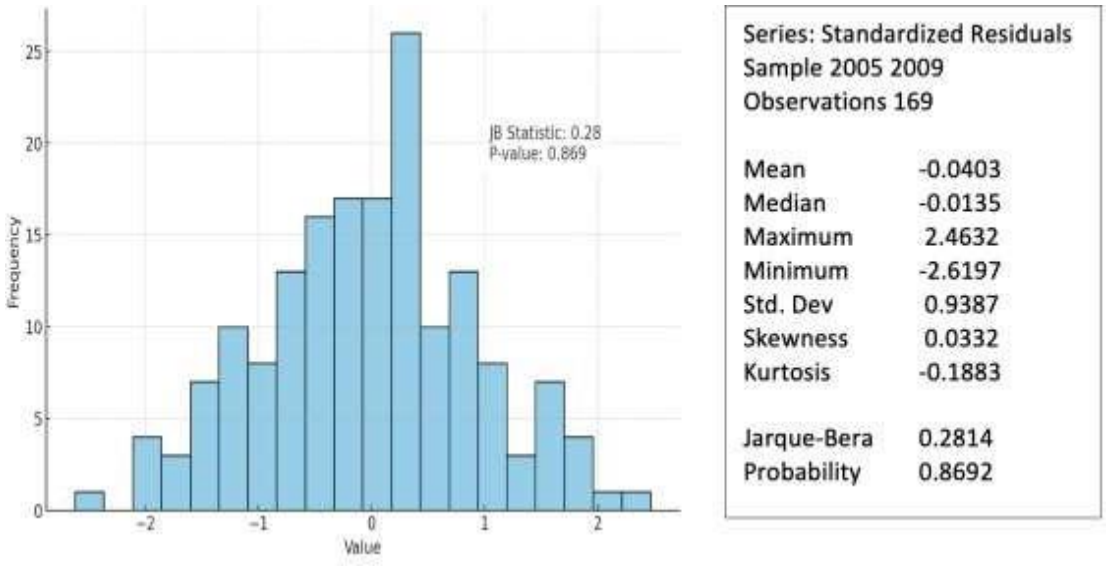

Figure 4.1: Distribution of study dataset of 169 patients based on the age of the patients (Jarque-Bera Test)

The test results indicate a p value of 0.869; that is a p-value >0.05: showing that the data does not significantly deviate from normality**.** A p-value of <0.05 would have indicated that the data deviates significantly from normality, indicating a non-normal distribution. Therefore, parametric statistical methods were applied for this normal data based on age of the patients.

4.4 Direct Medical Costs

The treatment sheets and records for the patients interviewed were also reviewed to get the direct medical costs. These were files for patients diagnosed, reviewed and treated in the past one year, that is year 2020. One major challenge was incomplete file records as most of the treatment sheets had not been filled. Some of the treatment costs had to be obtained from the accounts department while referring to the unique patient file numbers.

The table below gives a summary of the findings of the individual direct medical costs obtained from the 169 patient treatment files.

Table 4.2: Direct Medical Costs of Inpatients at National Spinal Injury Hospital.

Cost	**Sum in**	**Mean(KSh)**	**%**
Laboratory tests	404,842	5,060.52	2.1
Radiology tests	523,000	6,378.05	2.7
Admission and nursing	4,691,800	53,315.91	24.0
Surgery	9,060,764	96,391.11	46.4
Rehabilitation	1,047,000	13,776.32	5.4
Amount waived from total bill	1,517,932	39,945.58	
Actual amount paid	15,571,976	152,666.43	
Patient total bill discharge	**19,539,434**	**187,047.73**	**100**

The study measured the direct medical costs by looking at the following costs: laboratory test, radiology tests, admission and nursing, surgery and rehabilitation costs which included physiotherapy and counselling services. Surgery costs contributed the highest percentage of these costs at 46.4%. Some of the surgical interventions employed included decompression procedures, spinal stabilization procedures such as instrumentation and fusion.

The main laboratory tests include urea electrolytes creatinine, full hemogram, liver function test c-reactive protein and urinalysis. The main radiology tests included X-rays and magnetic resonance imaging scans (MRI). The rehabilitation programmes were offered as a package which included physiotherapy, counselling and psychotherapy support and were offered to all inpatients with SCI.

From the Accounts department, the total patient bill obtained for all the patient files included the actual amount paid by either self or insurance be it NHIF or any other private health insurer. It was worthwhile noting that most patients had an NHIF insurance cover which catered for the bed charges, nursing costs and surgical costs that formed a huge percentage of the inpatient total bill. Depending on the type of cover, the NHIF catered for all or part of the surgical fees as well as the admission and nursing costs. The Ministry of Health sets aside an annual budget for the NSIH of which part of it caters for needy SCI patients by wavering part of their fees/ hospital bill. Out of the 169 patient files reviewed, 38 had part of their costs waivered by the hospital.

The total amount waivered for the 38 patients was KSh. 1,517,932 and mean of KSh. 39,945.58. The average patient bill (direct medical costs) was KSh.187,047 while the mean costs paid out of pocket was KSh. 152,666.43 with the total coming to KSh. 15,571,976 for the patients. The total of the patient bill on discharge including all waived bills was coming to KSh 19,539,434 and the average bill per patient was KSh 187,047.73. This included all amount regardless of whether it was out of pocket and/or paid by insurance.

4.5 Direct non-medical costs

The direct non-medical costs data was extracted from 169 SCI patients from the weekly physiotherapy and orthotrauma clinics at the NSIH. The study focused on the following direct non-medical costs:

- Annual transport costs to attend regular physiotherapy clinic after discharge.
- Personal nurse services costs
- Occupational therapy costs
- Caregiver services
- Adjustment costs

The table below gives a summary of the means of transport used to attend clinics.

Table 4.3: Means of Transport Used to Attend Clinics by the Spinal Cord Injury Patients

Mode of transport	**Frequency**	**percentage**
car hire	8	4.5
personal car	25	14.8
Ambulance	27	15.9
public means	62	36.4
taxi	47	28.4
Total	**169**	**100.0**

From this data, the most frequently used means of transport used by the SCI patients and their relatives to attend clinics was public means at 36.4% while very few used car hire as the main means of transport to attend clinics. Most inpatients were brought to the hospital by ambulance.

The average number of clinic visits made annually by an SCI patient was 41 visits and the approximated annual transport costs to the clinics were calculated by multiplying the average transport cost per clinic visit per participant by the number of clinic visits in the past year then totalling these annual costs for all the 169

participants.

The table below gives a summary of the direct non-medical costs estimated in the study.

Table 4.4: A Summary of Direct Non-Medical Costs incurred by Patients at the National Spinal Injury Hospital

Type of direct non-medical cost	**No of valid patients (n)**	**Total cost in KSh**	**Mean cost in KSh**	**%**
Personal nurse costs in past 1 year	16	3,000,000	187,500	10
Caregiver services costs in past 1 year	60	4,032,000	67,200	13.4
Approximate annual transport costs To clinic	168	10,114,190	60,203.51	33.6
Estimated total personal adjustments cost	150	8,504,526	56,696.84	28.3
Occupational therapy	110	4,235,200	38,501.82	14.1
Counselling services costs in past 1 year	30	175,600	5,853.33	0.6
Total		**30,061,516**	**173,540.59**	**100**

From this table, annual transport costs topped the direct non-medical cost category in terms of costs at 33.6% followed closely by personal adjustment costs at 28.3%. Some of these personal adjustments included renovation of homes to accommodate the disability such as build of ramps, purchase of specialized beds and wheelchairs, reconstruction of the washroom facilities among many other adjustments. The least in terms of costs was counselling services. The total direct non-medical costs for the 169 patients was coming to KSh 30,061,516 and an average per patient of KSh 173,540.59. After summing up all the means of the direct medical and non-medical costs, the mean direct cost per SCI patient comes to KSh. 360,588.32. This is summarized in the table below:

Table 4.5: Direct Medical and Non-Medical Costs incurred by Spinal Cord Injury Patients at National Spinal Injury Hospital.

	Sum(KSh)	**Mean (KSh)**
Direct medical cost	19,539,434	187,047.73
Direct non-medical cost	30,061,516	173,540.59
Total direct costs	**49,600,950**	**360,588.32**

4.6 Indirect Costs

Indirect costs or costs due to productivity losses were estimated by the estimated loss of income as a result of the spinal cord injury as well as the relatives' foregone income as a result of offering care to the SCI patients.

4.6.1 Monthly Income

Most patients reported to have had a monthly income of below KSh 20,000 per month (29.6%) and also an equal share of those who didn't earn any income before the SCI happened (30.7%). After the SCI majority of the patients (62.5%) reported to not earning any monthly income and this was a result of the injury that led to most of them hospitalized, bedridden or left with disability that hindered or slowed movement and unable to carry out basic duties.

It was worth noting that few of the employed participants still had their full monthly salaries paid as most of them had applied for sick leaves and were past their statutory sick leave and which costed them part of their salaries. Most of the employed had their employers grant requests for work adjustments such as seeking lighter duties and office modifications to cater for their new status.

Table 4.6: Monthly Income of Spinal Injury Patients at Time of Interview

Monthly income	**Frequency**	**Percentage**
below KSh 20000	27	15.9
KSh 20000-50000	33	19.3
above KSh 100000	4	2.3
Dont earn	105	62.5
Total	**169**	**100.0**

4.6.2 Estimated Income Loss Incurred by Patients Due to the Spinal Injury

The estimated income loss from the data of the 169 patients interviewed was calculated by summing the estimated patient income loss after the spinal injury given by the participant and the relatives' foregone income. The estimated annual income loss from the data of the patients interviewed was calculated from the estimated monthly income loss after the spinal injury given by the participant in the questionnaire multiplied by 12 months or from time of SCI diagnosis for those who had less than a year after being diagnosed. The table below gives a summary of the estimated income loss:

Table 4.7: Estimated Annual Productivity Losses incurred by Spinal Injury Patients and their Relatives.

Costs	**Sum (KSh)**	**Mean(KSh)**	**%**
Estimated patient annual income loss	48,330,351	285,978.41	53.3
Relatives'foregone income (n=150)	42,264,000	281,760	46.7
Total indirect costs	**90,594,351**	**567,738.41**	**100**

The total indirect costs was KSh 90,594,351 with an average of KSh 567,738.41. The patients' income loss was highest at 53.3% followed closely by the relatives' foregone income at 46.7%

4.7 Summary of the total costs incurred by Spinal Injury Patients

Table 4.8: The Summary of the Costs of Spinal Cord Injury at the National Spinal Injury Hospital

Type of costs	Sum (KSh.)	Mean (KSh)	Percentage
Direct medical costs (n=106)	19,539,434	187,047.73	20.15
Direct nonmedical costs (n=169)	30,061,516	173,540.59	18.69
Indirect costs (n=169)	90,594,351	567,738.41	61.16
Total	**140,195,301**	**928,326.73**	**100**

The summary of the costs indicates that it costs a total of KSh 140,195,301 to treat the 169 patients at NSIH and an average of KSh. **928,326.73** in treatment costs in the first year of diagnosis and treatment. The indirect costs were highest at 61.16% followed by direct medical costs at 20.15% and least was direct non-medical costs at 18.69%.

4.8 The variations in the total spinal injury costs incurred by Spinal Injury patients with medical cover and those without medical cover at the National Spinal Injury Hospital.

To analyse the variations in the total spinal injury costs incurred by patients with medical cover and those without medical cover, an independent T-test was used as there were only two groups to compare; those with medical cover and those without. The table below gives a summary of the independent t-test used to analyze the statistical difference in the total spinal injury costs incurred by Spinal injury patients with medical cover and those without medical cover.

Table 4.9: The Differences in total spinal injury costs incurred by patients with medical cover and those without medical cover (Independent T-test)

Group	no	Mean	std error	SD	95%confidence interval Upper.	Lower
Without cover	20	710995.4	121278.7	542374.7	457156.2	964834.6
with cover	148	782516.8	39671.75	482627.2	704116.1	860917.4
Combined	168	774002.3	37720.93	488919.1	699531	848473.7
Diff		-71521.38	116696.9		-301922.8	158880

diff = mean(0) - mean(1) t = -0.6129 H0: diff = 0

Degrees of freedom = 166

The above t-test used for the data indicated that the t value as -0.6129. The absolute T value (0.6129) being more than 0.05 implies no rejection of the null hypothesis; that there is no significant difference in the total SCI costs between patients with medical cover and those without medical cover. Therefore, owning a medical insurance cover or not does not cause a significant variation in the treatment costs of spinal cord injury at the National Spinal Injury Hospital.

4.9 The variation in Spinal Cord Injury costs incurred by patients of different employment statuses.

There were four categories or groups of the patients' employment status; employed, unemployed, self-employed and those with casual jobs. ANOVA was used to analyse the differences in the total costs incurred by patients of the four different groups.

Table 4.10: An analysis of the variations in total spinal injury costs incurred by patients of different employment statuses (ANOVA test)

Variation sources	**SS**	**df**	**MS**	**F**	**P-value**
Between Groups	7.6565e+12	4	1.9141e+12	9.67	0.0000
Within Groups	3.2263e+13	163	1.9794e+11		

The tests of difference in total SCI costs of patients of different employment statuses given as unemployed, employed, self-employed and casual produced an F value of 9.67. This value was statistically significant at a 5 per cent level given P value of 0.0000 which is less than P of 0.05. This result implies a rejection of the null hypothesis; there were significant differences in the total SCI costs of patients of different employment statuses.

Therefore, this necessitated a further post hoc analysis to establish the differences in

the variations of the SCI costs of patients in the different groups or categories of employment statuses. Post hoc analysis was done using Scheffe's method to establish the significant differences in the SCI costs among the four groups of patients as shown in Table below.

Table 4.11: The Post Hoc Comparison of Total Spinal Injury Costs of Patients in the Different Employment Status Groups. (Scheffe's Method)

Employment status	**Unemployed (1)**	**Employed (2)**	**Self-employed (3)**	**Casual (4)**
Unemployed (1)	-	775423	121654	577606
Employed (2)	0.000	-	-653769	-671612
Self-employed (3)	0.640	0.000	-	455952
Casual (4)	0.182	0.005	0.410	-

The comparisons between groups of the total SCI costs that were statistically significant were between the employed and unemployed group (KSh 775,423 at 0.0% level), self-employed and employed (KSh 653,769 at 0.0% level) and the Casual and employed (KSh 671,612 at 0.5% level).

The comparisons of the mean SCI costs between other groups showed no statistical differences, that is between unemployed and self-employed (KSh 121,654 at 64% level), unemployed versus casual (KSh 577,606 at 18.2% level) and casual versus self-employed (KSh 455,952 at 41.0% level)

4.10 The variation in total spinal cord injury costs amongst patients with different extents of injury.

The table below gives a summary of the regression analysis using ANOVA test to analyze the variation in the total SCI costs of patients with different extents of injury.

There were three categories or groups of this status; cervical who ranked highest in the severity of the injury followed by Thoracic and finally lumbar/sacral who ranked lowest in terms of severity of injury. The three groups gave the following results:

Table 4.12: An Analysis of Variations in Total Spinal Injury Costs Amongst Patients with Different Extents of Injury (ANOVA)

Variation sources	**SS**	**df**	**MS**	**F**	**P-value**
Between Groups	1.9928e+11	3	9.9641e+10	0.41	0.6617
Within Groups	3.9721e+13	165	2.4073e+11		
Total	**3.9920e+13**	**167**			

The tests of difference in the total SCI costs of patients with different extents of injury given as cervical, thoracic, lumbar/sacral produced an F value of 0.41. This value was not statistically significant at 5 percent level given P value of 0.6617, which is more than 0.05. This result implies no rejection of the null hypothesis; that there were no significant differences in the total SCI costs amongst patients with different extents of injury.

4.11 Distribution of data

The costs are divided into three main categories**:** Indirect costs: Account for the largest proportion of 61.16%. Direct medical costs: Account for 20.15%.Direct non-medical costs: Account for 18.69%. This indicates that the distribution of the total costs is heavily skewed towards indirect costs**,** such as income loss and relatives' forgone income. The employment status of patients shows a statistically significant difference in SCI costs (F=9.67, P=0.0000). Employed individuals incur

higher outpatient healthcare costs compared to unemployed ones. Health insurance ownership does not result in significant differences in the SCI costs (t=-0.6129). The extent of spinal injury also does not cause a significant variation in costs (P=0.6617). These results suggest that employment status of the patients is a critical factor affecting cost variations, while health insurance coverage and injury severity are not statistically significant contributors of total SCI costs. The study employed ANOVA and independent T-test to analyze the variations in total SCI costs amongst the different groups of patients.

CHAPTER FIVE: DISCUSSION, CONCLUSION AND RECOMMENDATIONS

5.1 Discussion

The objective of this study was to analyze the patient costs of SCI treatment at the National Spinal Injury Hospital. The direct medical costs analyzed were radiology tests, laboratory tests, surgery costs, rehabilitation costs, admission and nursing costs while the direct non -medical costs included transport costs, counselling costs, occupational therapy costs, caregiver costs and personal nurse costs. The indirect costs analyzed were the estimated patient's annual income loss as well as the relatives' forgone income. A posterior cervical laminectomy and fusion, anterior cervical corpectomy, anterior cervical discectomy and fusion, and posterior thoracic lumbar fusion were among the surgical operations carried out.

Several regional investigations have explored the economic impact of spinal injuries, offering a useful context for evaluating the outcomes observed at the National Spinal Injury Hospital in Kenya. For example, Malekzadeh et al. (2022) documented a broad range in acute care costs for spinal cord injuries (SCI), from as little as $290 in Nigeria to as much as $612,590 in the United States. First-year post-injury expenditures were also highly variable, ranging from $32,240 to $1,156,400. These disparities underscore the global differences in healthcare access and cost structures. In a related study, Diop and Epstein (2024) conducted a systematic review focusing on veterans with SCI, estimating annual treatment costs between $30,770 and $62,563. Their findings highlighted that patients with cervical injuries or complications such as pressure ulcers incurred notably higher medical expenses, reinforcing the correlation between injury severity and overall healthcare costs.

These findings resonate with the current study's observations on the financial strain of SCI.

Evidence from Low- and Middle-Income Countries (LMICs) further supports this study's conclusion that indirect costs—such as lost income and caregiving expenses—constitute a substantial part of the financial burden. For instance, Malik et al. (2020) reported that in Bangladesh, 76% of families who were not previously impoverished fell below the poverty line after a member sustained an SCI, due to catastrophic healthcare spending. Such parallels emphasize the pressing need for enhanced support systems, including financial aid, affordable rehabilitation, and policy reforms to alleviate the long-term economic impact on patients and their families.

These regional insights correspond with this study’s findings, which highlight the prolonged economic hardship resulting from SCI, primarily driven by decreased earning potential and increased dependency. Unlike some countries that benefit from structured government or NGO support, the Kenyan context reveals a lack of comprehensive financial safety nets, underlining the necessity for targeted policy action to improve the quality of life for affected individuals.

The WHO report on spinal injuries states that while indirect costs, such as lost wages, frequently outweigh direct costs in the years that follow, direct costs are highest in the first year following an accident and subsequently decline dramatically over time. It claims that although direct costs are highest in the first year after an injury and then drastically decrease over time, indirect costs—like lost wages—often surpass direct expenses in the years that follow. One SCI victim requires rehabilitation that costs an average of 105,000 USD, which is prohibitively expensive

for the typical person (WHO 2013).

It should come as no surprise that TSCIs, regardless of severity, rank among the most incapacitating injuries that a person may sustain and frequently result in severe financial hardship. Results from this study indicate that the primary cause of income loss in people with TSCI is spinal cord damage, even if many of them have the desire and ability to work. After a traumatic spine injury, many patients find that they are unable to return to their previous professions and are forced to rely on their relatives for financial support. If the accident does not result in complete incapacity, they may also be obliged to work for themselves.

Acknowledging this challenge in Kenya, the People with Disability Act of 2003 was passed in order to guarantee the rights, rehabilitation, and opportunity parity for those with disabilities. This statute created the National Council for Persons with Disabilities, whose primary responsibility is to promote the rights of individuals with disabilities, including SCI sufferers. Under this act, people with disabilities are expected to receive a variety of benefits, such as the exemption from taxes on all employment-related income, nondiscrimination in hiring or educational opportunities, access to workplace facilities that are modified to meet their needs, and an extension of the retirement age to 65 years old.

In a bid to meet the first research objective, the findings of the study established that the average patient cost in the first year of SCI diagnosis is KSh. **928,326.73** with the indirect costs consuming the largest percentage of the costs at 61.16% followed by direct medical costs at 20.15% and the least being direct non-medical costs at 18.69%.

In this study the indirect costs consumed the largest percentage of the costs at

61.16% followed by direct medical costs therefore diverging from the WHO report of 2013. A major limitation to this study was the record management of the hospital. Being manual, it took quite a lot of time tracing treatment sheets for the participants/patients therefore may have contributed to oversight of some direct medical costs. The assistant and I did our level best to ensure all costs were consolidated and avoid to the very best of our knowledge, any oversight of these costs.

The Kenyan government launched a cash distribution programme during the Covid-19 epidemic to protect economically disadvantaged populations from the severe economic consequences of the pandemic. People with impairments, including those suffering from spinal cord injuries, made up this vulnerable population. Although this was a commendable step on the part of the government, it raises concerns about the program's viability because the disabled will still be at risk of financial hardship even after the pandemic ends. Therefore, in order to maintain this cash transfer programme and guarantee honesty and openness in the choice of recipients and distribution of monies, the government should seek out ongoing funding sources.

To answer the other three research objectives that had corresponding null hypothesis regression analysis was done and the results for the ANOVA indicate that different employment statuses of the patients ($F= 9.67$, $P=0.0000$) was a significant factor in causing variations in the total SCI costs, since the p-value was less than 0.05. The different categories of patients' extent of spinal injury ($P=0.6617$) and health insurance coverage ($t=-0.6129$) did not cause significant variations in the total SCI costs. These results on the extent of injury conflict with the study by Villines et.al 2016 that states the expense of managing an injury increases with severity; extreme

tetraplegia in C1–C4 is the most expensive to treat, costing around $1,023,000.00 in the first year. The UAB model from 2006 also demonstrates that the estimated yearly cost of SCI is $9.7 billion. Depending on the degree of injury, the average yearly living and medical expenditures vary significantly; for incomplete motor function and high tetraplegia (C1–C4) injuries, respectively, the estimated first-year costs range from 218,504 to $741,425 (UAB model 2006).

The study results led to the acceptance of two null hypotheses and the rejection of one as follows:

- An acceptance of the first null hypothesis; that there is no significant difference in the total SCI costs between patients with medical cover and those without medical cover
- A rejection of the second null hypothesis concluding that there is a significant difference in the total SCI costs amongst patients of different employment statuses
- An acceptance of the third null hypothesis; there is no significant difference in the total SCI costs amongst SCI patients with different extents of spinal injury.

Kenya, being a lower and middle-income country, depends mostly on paying for medical care out of pocket. One study by Nguyen et.al 2012 contrasted the out-of-pocket health payments for all medical services for the insured vs. uninsured groups and discovered that, for lower-income individuals, health insurance significantly reduced out-of-pocket costs, ranging from 16% to 18% (UAB model 2006).This study did not focus on out-of-pocket payments only but on all including those paid by insurance and showed no significant differences in the SCI costs of the insured versus the uninsured groups.

The choices one has for health insurance often depend on the employment position.

Investigating potential areas of cooperation between the labour force and the health care sector begins with a basic understanding of the various ways that employment status affects health care coverage. One's employment status frequently influences the health insurance options available to them. Gaining a knowledge of the different ways that health care coverage is impacted by employment status is the first step towards exploring possible areas of collaboration between the workforce and the health care industry. Spending on outpatient healthcare could be influenced by financial health, which leads to choices about where to seek care (Mwenda et.al 2021) This study showed there was a significant difference in the total costs based on employment status of the SCI patients. A post-hoc comparison between the different groups indicated the most significant differences were between the employed and unemployed group at p=0.000. Therefore, agreeing with the study by Mwenda et.al 2021 that employment status leads to higher outpatient healthcare costs.

5.2 Conclusions

The study concluded that:

- The average patient costs in the first year of SCI diagnosis is KSh. 928,326.73 with the indirect costs consuming the largest percentage of the costs at 61.16% followed by direct medical costs at 20.15% and the least being direct non-medical costs at 18.69%.
- An acceptance of the first null hypothesis; that there is no significant difference in the total SCI costs between patients with medical cover and those without medical cover
- A rejection of the second null hypothesis concluding that there is a significant difference in the total SCI costs amongst patients of different employment statuses

- An acceptance of the third null hypothesis; there is no significant difference in the total SCI costs amongst SCI patients with different extents of spinal injury.

These results suggest that employment status of the patients is a critical factor affecting cost variations, while health insurance coverage and injury severity are not statistically significant contributors of total SCI costs. The study employed ANOVA and independent T-test to analyze the variations in total SCI costs amongst the different groups of patients.

5.3 Recommendations

5.3.1 Recommendations from the Study

1. Enhance Universal Health Coverage (UHC) and Social Health Insurance Fund (SHIF) Programs by expanding the benefits to include comprehensive support for SCI patients covering direct medical and rehabilitative programs.
2. Increase funding for SCI prevention and rehabilitation. This can be by allocating additional public and donor funds that focus on prevention programs such as road safety campaigns and workplace safety initiatives. Specialized SCI centres with modern equipment and well-trained personnel need to be set up in the counties.
3. Encourage employers adjustments for SCI victims by mandating workplace accomodations such as flexible working hours, accessible office layouts and establishment of re-integration programs.

5.3.2 Recommendations for Further Research

1. Further studies can be done on the Cost-benefit analysis (CBA), Cost-effectiveness analysis (CEA) as well as Cost-utility analysis (CUA) on SCI treatment at the National Spinal Injury Hospital Nairobi County
2. Further analysis of cost studies can be done to include intangible costs as one of the cost factors to consider.

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APPENDICES

Appendix 1: Structured Questionnaire-KNCV Tool

Questionnaire Number……
Patient code. : ……..
Date of Interview (dd/mm/yy):……

My name is Lorna Wangari. I am a student at the Kenyatta University pursuing a Masters in Health Management. As part of my thesis, I am interested in the costs that spinal cord patients incur while seeking treatment. Please note that it is voluntary to participate in this study. Your consent to participate in the study will be appreciated. However, your refusal to participate will not warrant any loss of benefits that you are entitled to such as receiving treatment and care at the hospital.

Upon agreeing to participate in this study you have the right to withdraw from it at any point without giving any explanation. Your responses will be handled with uttermost confidentiality. The information provided on your personal and household income will not be revealed to any tax or welfare authorities. This survey will take approximately 15 minutes.

Please tick inside the box where appropriate.

A. DEMOGRAPHIC DETAILS:

1. Date of Birth:

Date Month Year

2. Marital Status

Single	
Married	
Widowed	
Divorced/Separated	

3. Area of Residence (where do you currently live)?

Name of village/estate……
County……

4. Religion:

Christian	
Muslim	
Others (please specify)	

5. What is your current work status?

Unemployed	
Employed	
Self Employed	
Others (Specify)	

EDUCATIONAL LEVEL

6. What is your highest educational level?

Never attended	
Primary level only	
Secondary level only	
College/university	
Other Specify	

7. Are you covered by NHIF? YES ☐ NO ☐

b) Do you have any other private health insurance cover?

YES ☐ NO ☐

B. SPINAL CORD INJURY DIRECT NON HEALTHCARE COSTS

1. a) Date of diagnosis of Spinal cord Injury: Date ☐ Month ☐ Year ☐

b) Location of injury: Cervical ☐ Thoracic ☐ Lumbar/sacral ☐

Outpatients transport costs

2. Which means of transport do you normally use to attend clinics? (E.g. personal car, taxi etc.) _____

b) If you normally use car or ambulance, please give an estimate of return mileage to the clinic: _____ km

c) If you usually use public transport or taxi what is your usual return fare per visit: KSh. _____

d) In the past one year, how many times have you attended clinic due to the SCI?

_____

e) Does a caregiver/relative usually accompany you to these visits?

_____

Inpatient transport costs

3. For how long have you been hospitalized?

_____

b) What was the means of transport used to transport you to this hospital?

_____

c) Approximately how much did this means cost you/relatives?

_____

d) In a week, how often does your close relative visit you at the clinic?

_____

e) On average how much does it cost them to travel to visit at the hospital?

_____

Nursing, Occupational therapy and Social Services

4. a) Since your diagnosis with SCI, have you received any of the below services? YES☐ NO ☐

b.) If YES please give further details below:

	Number of visits	Location of visit	Did you incur out of pocket expenses on these services. Yes or No.	If yes, what were approx. costs per visit	Are you covered by a medical insurance that pays for this? Yes or No	If this involved travelling kindly indicate approx. travel costs per visit.
Nurse						
Occupational therapy						
Counselling services						
Social worker services						
Caregiver services						
Other (please specify						
Interviewer: please use this row to include any other service received.						

C. <u>INDIRECT COSTS</u>

1. . What is your current work status?

Employed	
Unemployed	
Retired	
Self Employed	
Others(Specify)	

b). If employed, are you on any sick leave due to the spinal injury?

1. Yes ☐ 2. ☐

2. a) What was your approximate net earnings per month BEFORE the Spinal

Cord Injury?

Under Kes 20,000 per month	
Kes 20,000 - 50,000 per month	
Kes 50,001 to 100,000 per month	
Above Kes 100,000 per month	
Don't Earn	

b). what is your current approximate net earnings per month?

Under Kes 20,000	
Kes 20,000 to 50,000	
Kes 50,001 to 100,000	
Above Kes 100,000	
Don't Earn	

c) If there's a change in the net earnings above, is that change related to the Spinal Cord Injury?

Yes ☐ No ☐

3 a) Are you currently receiving any government benefits or allowances as a result of the SCI?

Yes ☐ No ☐

b) If yes, how much in Kes per month?.....

4 a). As a result of the Spinal cord injury, have you ever ceased working/going to school/doing housework?

Yes ☐ No ☐

b) What is your estimated monthly income loss as a result of the Spinal cord Injury?

……

5 a) Does a caregiver stay at home specifically to take care of you?

Yes ☐ No ☐

b) If yes in 5a above, did that person quit their job or forego any income earning activity so as to fully take care for you?

1. Yes ☐ 2. No ☐

c) Approximately what's the monthly income loss your relative (s) has had to incur so as to take care of you?

6 a). If you were working before the injury, on average, how many hours per day did you work?..... Hours

b) . Currently how many hours do you work on average per day?

Hours

c) If there's a change in b) above, is the change related to the spinal cord injury?
Yes ☐ No ☐

D. Personal adjustments due to SCI

Kindly give details of the categories listed	Did you have to pay for anything? Yes or no	Estimated cost if known	Did you have medical insurance to cover this cost? Yes or No
Equipment to assist in rehabilitation such as wheelchair. Kindly specify			
Any childcare arrangements made due to the injury. Kindly specify			
Any physical adjustments done to your home such as a ramp, bathroom changes or lifts. kindly specify:			

Thank you for your time

Appendix 2: Patient Consent Form

Informed consent

My Name is Lorna Wangari Karanja. I am MASTERS student from Kenyatta University. I am conducting a study on 'Analysis of Patients' Direct and Indirect Costs at the National Spinal Injury Hospital in Nairobi, Kenya'. This information will be used by the Ministry of Health to improve accessibility of Spinal Cord treatment services through cost reduction measures and increasing funds allocated to Spinal Cord Treatment in Kenya.

Procedures to be followed

Participation in this study will require that I ask you some questions and record the information provided in a questionnaire.

You are free to decline taking part in this research. Whether you decide to participate in the study or not, you will receive the same medical care, and your choice will not affect the care you receive from the clinic now or in the future from any other clinic.

Please keep in mind that taking part in the study is completely voluntary. You are always welcome to ask questions about the study.

You have the right to end an interview at any moment and to decline to answer any questions. Additionally, you can opt out of the study at any point, with no negative effects on the services you currently or in the future receive from this clinic or any other organisations.

Discomforts and risks

You might find some of the questions uncomfortable because they deal with private matters. If this occurs, you have the option to decline to respond to these inquiries. Additionally, you can end the interview at any moment. You might have to wait an extra 30 minutes or so after the interview to get your regular services.

Benefits

If you participate in this study you will help us to identify the different costs patients incur and on ways to reduce this cost and overall patient burden of spinal cord injury treatment.

Confidentiality

In a confidential environment within the clinic, the tests and interviews will take place. Nothing on the questionnaire will have your name on it. The survey will be stored securely at Kenyatta University in a secured cabinet. We'll keep everything discreet.

Contact information

For any queries do not hesitate to contact Dr. Julius Korir on 0722754482 or Dr. Andre Yitambe on 0715720568 or the Kenyatta University Ethical Review Committee Secretariat on chairman.kuerc@ku.ac.ke .

Participant's statement

I understand the information above about my involvement in the study. I had the opportunity to ask questions, and I was satisfied with the answers I received. I willingly choose to participate in this study in full. I am aware that whether I choose to leave the study or not, I will continue receive the same medical care, and that my choice will not affect the care I receive from the clinic now or from any other clinic at any other time. Code of participant…….

…… ……

Signature or thumb print Date

Investigator`s statement

I, the undersigned, have described to the volunteer the protocols to be followed in the study as well as the risks and rewards associated with it in a language that she/he can understand.

Name of interviewer……..

……. ……

Interviewer signature Date

Appendix 3: Location of the Study

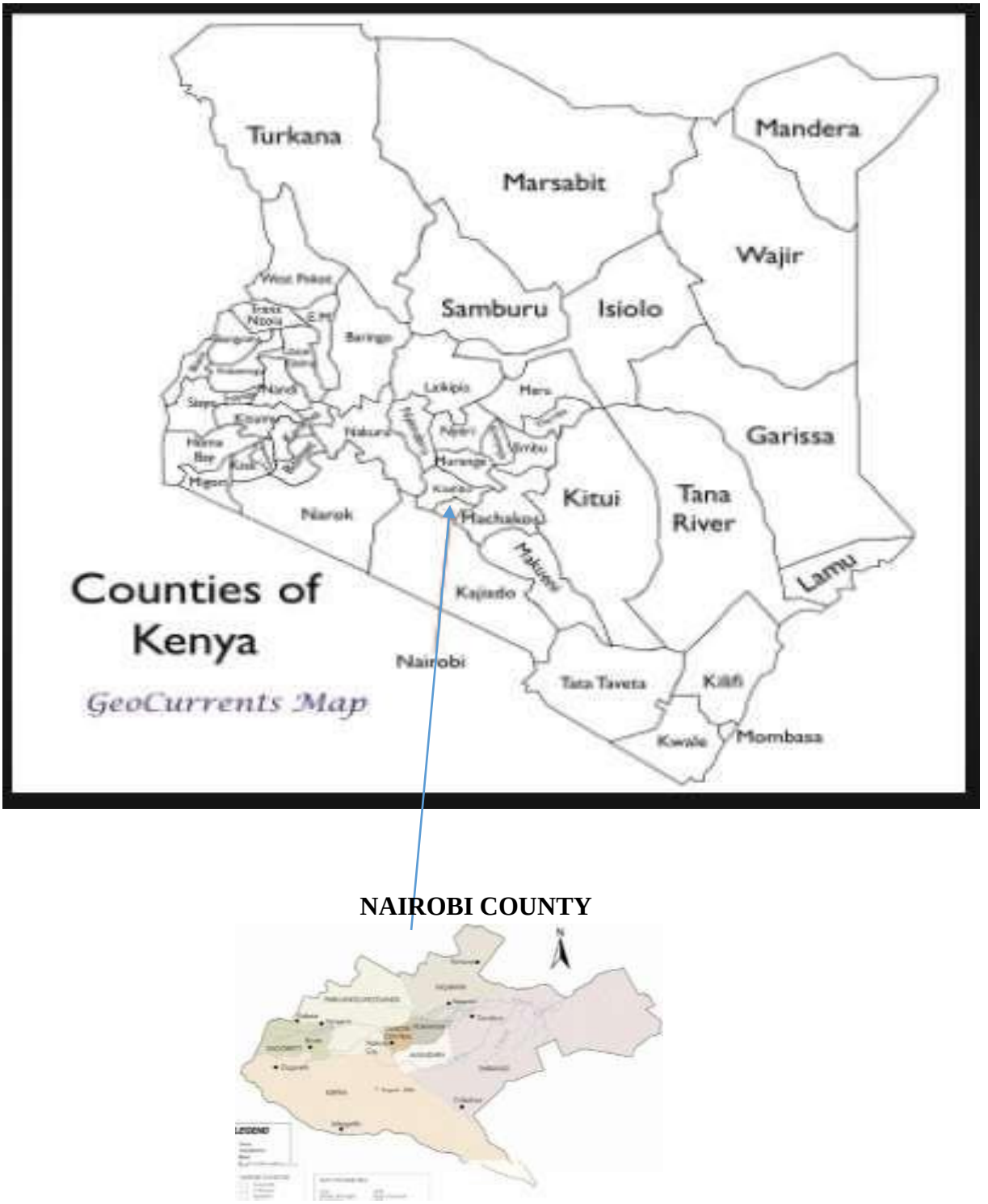

Figure 4: The National Spinal Injury Hospital within Nairobi City County

Source: Map of Kenya. Extracted from www.herstorykenya.org

Appendix 4: Excel Worksheet on Direct Medical Costs

DIRECT COSTS OF SPINAL CORD INJURY TREATMENT							
PATIENT FILE NO:		AGE:	SEX:				
SHEET NO:							
TREATMENT GUID	DIRECT COSTS	ACTIVITIES/TESTS INVOI	FREQUENCY OF TESTS IN FIRST YEAR OF TREATMENT	ACTUAL COST PAYABLE BY PATIENT/INSURER PER TEST/ SCHEDULE	COSTS WAIVED PER SESSION	TOTAL COSTS PER SESSION	ANNUAL COSTS
1. DIAGNOSIS	Laboratory tests						
	Radiology						
2. TREATMENT	Admission						
	Nursing						
	medical						
	Surgical						
	Rehabilitation	physiotherapy					
		nutrition					
		psychotherapy					
Patient total bill at discharge:	Actual	waived					

Appendix 5: National Commission for Science, Technology and Innovation Research License

REPUBLIC OF KENYA

NATIONAL COMMISSION FOR SCIENCE,TECHNOLOGY & INNOVATION

Ref No: **261686**

Date of Issue: **03/November/2020**

RESEARCH LICENSE

This is to Certify that Ms., LORNA WANGARI KARANJA of Kenyatta University, has been licensed to conduct research in Nairobi on the topic: ANALYSIS OF PATIENT'S DIRECT AND INDIRECT COSTS AT THE NATIONAL SPINAL INJURY HOSPITAL IN NAIROBI,KENYA for the period ending : 03/November/2021.

License No: **BAHAMAS ABS/P/20/7244**

261686

Applicant Identification Number

Director General
NATIONAL COMMISSION FOR SCIENCE,TECHNOLOGY & INNOVATION

Verification QR Code

NOTE: This is a computer generated License. To verify the authenticity of this document, Scan the QR Code using QR scanner application.

Appendix 6: National Spinal Injury Hospital Letter

LORNA WANGARI KARANJA,
P.O BOX 2397 01000 THIKA,
6TH JANUARY 2021
0725624993

To makeupt.
Kindly advise
+COD

THE MEDICAL SUPERITENDENT,
THE NATIONAL SPINAL INJURY REFFERAL HOSPITAL,
P.O. BOX 20906 00202 NAIROBI, KENYA

Dear Sir,

RE: REQUEST FOR APPROVAL TO COLLECT RESEARCH DATA AT YOUR FACILITY

I am a postgraduate student at Kenyatta University undertaking a Masters in Health Management. As part of my course I am doing a thesis and my proposal is titled; Analysis of Patients' Direct and Indirect Costs at the National Spinal Injury Hospital in Nairobi, Kenya.

I hereby request your approval to collect data on the direct and indirect costs that the spinal patients incur. My main source will be the outpatients especially those booked for physiotherapy. Another data source will be the finance section and the pharmacy so as to get data on direct costs such as medicine costs and insurance costs or other subsidized costs which the patient may not know. Upon your approval, this will be done with the help of one research assistant. As part of my ethical duty, the patient data will be kept confidential and upon completion of this thesis, the hospital administration will get a copy of the findings and recommendations of this study.
I have attached a copy of my proposal, research approval letter from the University and NACOSTI research license. Looking forward to your response.

Thier is a good study
May proceed for academic purposes
for a period 3 months.

Yours Sincerely
Lorna Wangari

NATIONAL SPINAL INJURY HOSPITAL
07.01.2021
P.O. Box 20906
NAIROBI

Appendix 7: Research Authorization

KENYATTA UNIVERSITY
GRADUATE SCHOOL

E-mail: dean-graduate@ku.ac.ke
Website: www.ku.ac.ke

P.O. Box 43844, 00100
NAIROBI, KENYA
Tel. 020-8704150

Our Ref: Q140/CTY/PT/37027/2017 DATE: 9th October, 2019

Director General,
National Commission for Science, Technology
and Innovation
P.O. Box 30623-00100
NAIROBI

Dear Sir/Madam,

RE: RESEARCH AUTHORIZATION FOR MS. LORNA WANGARI KARANJA
REG. NO. Q140/CTY/PT/37027/17

I write to introduce Ms. Lorna Wangari Karanja who is a Postgraduate Student of this University. She is registered for M.Sc. degree programme in the **Department of Health Management & Informatics.**

Ms. Karanja intends to conduct research for a M.Sc. thesis Proposal entitled, **"Analysis of Patients' Direct and Indirect Costs at the National Spinal Injury Hospital in Nairobi, Kenya."**

Any assistance given will be highly appreciated.

Yours faithfully,

04 DEC 2019

for PROF. ELISHIBA KIMANI
DEAN, GRADUATE SCHOOL

Appendix 8: Research Approval

KENYATTA UNIVERSITY
GRADUATE SCHOOL

E-mail: dean-graduate@ku.ac.ke
Website: www.ku.ac.ke

P.O. Box 43844, 00100
NAIROBI, KENYA
Tel. 020-8704150

Internal Memo

FROM: Dean, Graduate School

DATE: 8th October, 2019

TO: Ms. Lorna Wangari Karanja
Department of Health Management & Informatics

REF: Q140/CTY/PT/37027/17

SUBJECT: APPROVAL OF RESEARCH PROPOSAL

We acknowledge receipt of your Research Proposal after fulfilling recommendations raised by the Graduate School Board of 7th August, 2019.

You may now proceed with your Data collection, subject to clearance with the Director General, National Commission for Science, Technology & Innovation and Ethics Review Committee, Kenyatta University.

As you embark on your data collection, please note that you will be required to submit to Graduate School completed Supervision Tracking Forms per semester. The form has been developed to replace the Progress Report Forms. The Supervision Tracking forms are available at the University's Website under Graduate School webpage downloads.

Thank you.

04 DEC 2019

EDWIN OBUNGU
FOR: DEAN, GRADUATE SCHOOL

CC. Chairman, Department of Health Management & Informatics

Supervisors:

1. Dr. Julius K. Korir
   C/o Department of Economic Theory
   Kenyatta University

2. Dr. Andre Yitambe
   C/o Department of Health Management & Informatics
   Kenyatta University