ECONOMIC BURDEN OF VISUAL IMPAIRMENT AND BLINDNESS AMONG ADULT EYE PATIENTS VISITING PCEA KIKUYU HOSPITAL IN KIAMBU COUNTY, KENYA

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A Research Project Submitted to the Department of Economics, Population and Development Studies in Partial Fulfillment of the Requirement for the Award of Master of Science in Health Economics and Policy, University of Nairobi.

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DECLARATION

This project proposal is my original work and has not been presented for a degree in any other university.

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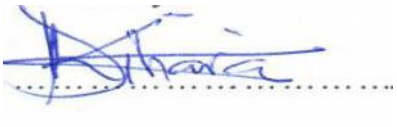
Signature:  Date: 26th October 2021

This proposal has been submitted for examination with my approval as university supervisor;

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Signature 

Date 1st November 2021

Dedication

I dedicate this work to God for enabling me, my family, my wife Carol, my son Emmanuel and my daughter Darlene Joy for your support and mutual encouragement even when I felt like giving up. I am indebted to my lecturers, colleagues, friends and the faculty at the school of economics. Your support was immeasurable.

Acknowledgement

I acknowledge the support, guidance and patience of my supervisor without which I would not have made it. My friends and colleagues, libraries where I managed to get resources. My parents, thank you for the support you have granted me throughout my education. Above all I thank God for all the kind people who have made this achievable.

ABSTRACT

Introduction: Illness is a significant burden on society since it has negative consequences for people's physical, emotional, and social well-being, as well as the nation's economic progress. Visual impairment is one of the most feared disabilities that a person might have around the world. Visual impairment and blindness have a wide-ranging, long-term, and substantial health and economic impact. Unfortunately, unlike in developed countries where studies on the economic burden of low vision and blindness exist, there is scarcity of such studies in African countries. Although several studies investigating the economic burden of disease have been carried out in Kenya, there is hardly any study on the economic burden of visual impairment and blindness. This study was therefore aimed at bridging this gap.

Objectives: The specific objectives of the study were to determine the prevalence of blindness among adult eye patients visiting PCEA Kikuyu hospital eye unit, to examine the risk factors associated with visual impairment and blindness among adult eye patients visiting PCEA Kikuyu hospital Eye Unit and to estimate the economic burden of visual impairment and blindness among adult eye patients visiting PCEA Kikuyu hospital Eye Unit.

Methodology: Using a structured questionnaire, 385 VI&B respondents visiting P.C.E.A Kikuyu Hospital were included in the study. The study used a Generalized Linear Model regression to determine the risk factors associated with visual impairment and blindness among adult eye patients in PCEA Kikuyu hospital Eye Unit.

Results: Majority of the respondents who had visual impairment and blindness were aged between 41 to 50 years of age. Majority (66%) of the respondents were female as compared to 33% who were male. The results further indicated that respondents spent a minimum of Kshs 4,053 and a maximum of Kshs 20,496 to pay for medicines. Notably, the cost of treatment ranged from Kshs 10,014 to Kshs 49,922. The cost of buying spectacles ranged from Kshs 1,467 to Kshs 11,249 while the cost of eye surgery ranged from Kshs 20,322 and Kshs49,842. Regressions results indicated that age (31-40) ($\beta_1 = -6{,}537.19, p = 0.0337; p < 0.05$), gender (female) ($\beta_2 = -4{,}183.50, p = 0.0451; p < 0.05$), education (college) ($\beta_3 = 6{,}694.02, p = 0.0493; p < 0.05$) were statistically significant indicating that they were significant predictors of the model.

Conclusion: It is advised that a more thorough examination of financial assistance for families caring for VI&B people be carried out in order to ensure the affected people's long-term health and, as a result to boost the economic development of productive individuals and households.

Recommendation: There is need for long-term investment in surveillance and subsidizing the services given the high economic burden, Majority of the households earn an income of between Kshs 10,001 - 20,000. The government should subsidize and device effective use of NHIF for compensating providers of the service to ensure that all family income is not channeled towards buying medicine and providing care for the VI&B persons.

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ABBREVIATION/ACRONYMS

CPD	Cost of Productive Time lost due to Permanent Disability
CPM	Cost of Productive Time lost due to Premature Mortality
CPV	Cost of Productivity loss
CTD	Cost of productive time lost
DC	Direct Cost
GOK	Government of Kenya
IAPB	International Agency for the Prevention of Blindness
IC	Indirect Cost
ICD	International Classification of Diseases
MOH	Ministry of Health
SDG	Sustainable Development Goals
TMC	Total annual Medical Cost
TCD	Total annual Cost of prescription Drugs
TOC	Total annual Cost of Ophthalmic services
VI&B	Visual Impairment and Blindness
WHO	World Health Organization

CHAPTER ONE

INTRODUCTION

1.1 Background of the Study

Globally, the severity of visual impairment-related illnesses increased by 47% from 12,858,000 years of disability-corrected treatment (DALYs) in 1990 to 18,837,000 DALYs in 2010 (Ono et al., 2017). Worldwide, visual impairment (VI) is also considered as one of the most dangerous disorders that a person can suffer from (Dev et al., 2015). According to the World Health Organization (WHO), blindness means not only complete loss of vision, but also the inability to see properly from three meters away and thus the inability to cope independently with daily activities (Pezzullo et al., 2018).

Consequently, understanding the expense of the condition is useful to make an economic case about attempts to reduce the burden of the condition. The costs of visual impairment and blindness have been reported in the United States, China, and all over the world (WHO, 2019). Research on the cost of visual impairment can be based on financial, clinical or survey results. Administrative data requires a large number of documents to identify blindness by coded diagnosis, and it does not identify compensated personal care facilities not provided by third party payers, and do not reflect the expense of informal treatment (Pezzullo et al., 2018). VI&B's economic weight can be calculated in a variety of ways. The economic burden is calculated in the Bourne study (2017) using the GDP per capita ratio. In 2016, the United Kingdom, Australia, the United States of America, Japan, and Canada had direct expenditure per capita ratios of 0.071, 0.188, 0.531, 0.421, and 0.341, respectively. The study projected that the overall global

spending on health care in respect to VI&B was expected to rise from US$ 2.30 trillion in 2017 to US$ 2.77 trillion in 2020 (Park et al., 2016). In 2020, Zhou (2020) established that global spending on health care in respect to VI&B is expected to increase to $8.28 trillion worldwide by 2040.

Nuertey (2019) conducted a study in Ghana on the prevalence, causes of visual impairment and blindness among retirees. The findings showed that visual impairment influenced educational attainment, obesity, and protein in the urine. According to Cassell (2019), the prevalence of blindness in Sub-Saharan Africa ranged from 1.1% in an urban district of Cameroon to 7.9% in a rural district in Ethiopia. In Kenya the prevalence of blindness was 0.7% while visual impairment was 2.5% (Bastawrous *et al.*, 2016). This implies that an estimated 280,000 people are blind with an additional 1,000,000 suffering from visual impairment (GOK-MOH, 2012). Cataract was the most common cause of blindness with 43%, followed by trachoma with 19%, glaucoma and childhood blindness with 9% and 6%, respectively. However, available evidence shows that despite the serious effects of disease, over 80% of the cases of visual impairment and blindness are curable and preventable.

Table 1.1 : Burden of disease/disability in Kenya

Disability	**Burden/Cases (%)**
1. Visual (Visual Impairment and Blindness)	0.84 Million (19.09%)
2. Mobility limiting	1.16 Million (26.2%)
3. Auditory	0.55 Million (12.4%)
4. Speech	0.45 Million (10.6%)
5. Cognitive	0.36 Million (8.2%)
6. Others	1.05 Million (23.6%)

1.2 Visual Impairment Blindness and Economic Burden

Visual impairment and blindness cause long-term macroeconomic effects on labor supply, capital accumulation and gross domestic product (Bourne et al., 2017). This threatens future economic and human development as poverty and disease pass from one generation to the next (Pezzullo et al., 2018). Human capital theory states that education or training increases individual productivity by providing useful knowledge and skills. This increases a person's income by increasing his lifetime income (Ryerson et al., 2021). Total vision loss or degradation can be terrifying and widespread, hurting people's ability to maintain their independence, pay for necessary medical care, keep their employment, and care for themselves and their family (Steven & Teutsch et al., 2016). Vision loss has health repercussions that extend beyond the eyes and the visual system. Vision loss can have a negative impact on one's quality of life, independence, and mobility (Khorrami-Nejad & Saraband et al., 2016). Despite the fact that confounding factors play a part in visual impairment, remarks made by people with vision impairments highlight the critical role vision plays in health, work, economics, and social well-being (Heath et al., 2017). According to Hahn and Truman et al., (2015), a significant effect of health on investment and economic stability is in education. Students who are healthier with higher vision and better eye health have higher cognitive levels and fewer cases of absenteeism from school. Since those suffering from Visual Impairment and Blindness are predisposed to educational, occupational, and socio-economic difficulties, they have a higher risk of facing economic burden and impoverishment.

1.3 Statement of the Problem

There are direct and indirect costs associated with improving the health and wellbeing of visually impaired and blind individuals, through screening, treatment, and rehabilitation. This creates a burden to households and society as economic resources are diverted from other investment activities. Treatment, prevention, and psychosocial support for visually impaired and blind individuals will cushion households against adverse economic outcomes. This can be realized by increasing human capital through reduction in school absenteeism and enhancement of cognitive abilities. Improving on training and skill will increase their productivity and economic stability.

VI&B was highly linked to a greater prevalence of comorbidities such as anxiety, falls, death, fractures, injuries, and other consequences, according to Park (2018). According to Finger (2017), VI&B patients with glaucoma were more likely to be depressed and admitted to nursing homes. As a result, unlike patients who do not have a vision impairment, they are susceptible to traumas and falls that result in femur fractures. In terms of the financial effects of vision loss, persons with mild to severe IBD had 46.7 percent greater total yearly health expenditures than people without visual impairment in the UK (Pezzullo et al., 2018).

Salari (2019) analyzed the disastrous and impoverishment effects of healthcare payments (CMOs) in Kenya, noting that high pressures on the poor tend to deplete household wealth or trigger coping strategies, further exacerbating the economic burden on the poor. household. Research on visual impairment and blindness in Kenya focuses primarily on the epidemiology of visual impairment and blindness and, to a lesser extent, on the economic burden and possible risk factors. Efforts to prevent visual impairment and blindness are limited in Kenya. This may be

due to a lack of understanding of the contribution of risk factors and the enormous negative impact of visual impairment and blindness on household economic stability (Muna and Obonyo, 2020).

The existing studies mainly focus on the economic burden for caregivers for malaria, pneumonia, and HIV infected adolescents in the country. Additionally, they have majored on the economic burden for caregivers but not the caregivers in Kiambu County. It is against this background that this study aimed to investigate the economic burden and risk factors of visual impairment and blindness among eye patients visiting PCEA Kikuyu Hospital Eye Unit in Kiambu County, Kenya.

1.4 General Objective

The purpose of this study was to examine the economic burden and risk factors associated with visual impairment and blindness in adult eye patients visiting PCEA Kikuyu Hospital Eye Unit.

1.4.1 Specific objectives

i. To establish the economic burden associated with visual impairment and blindness in PCEA Kikuyu.
ii. To establish the prevalence of blindness among adult eye patients visiting PCEA Kikuyu Hospital Eye Unit.
iii. To examine the risk factors associated with visual impairment and blindness among adult eye patients visiting PCEA Kikuyu Hospital Eye Unit.
iv. To propose recommendations for successful policy implications on VI&B based on the findings of the study.

1.5 Research Questions

1. What is the economic burden associated with visual impairment and blindness?
2. What is the prevalence of blindness among adult eye patients visiting PCEA Kikuyu Hospital Eye Unit?
3. What are the risk factors associated with visual impairment and blindness among adult eye patients visiting PCEA Kikuyu Hospital Eye Unit?
4. What are the policy implications of VI&B based on the study findings?

1.6 Study Justification

Knowing the economic pressures and risk factors for blindness and low vision is essential for the prevention of blindness, which is one of the five priority health-related goals for sustainable development by 2030, Misati & Mwenzwa (2018). At a time of rising healthcare costs, this study highlights the factors driving the increasing prevalence of visual impairment and blindness in Kenya. Although few studies on the economic severity of the disease have been conducted in Kenya, there are almost no studies on the economic severity of blindness, Muma & Obonyo (2020). This study aimed at bridging this gap.

This study offered evidence on the economic burden of visual impairment and blindness, which policymakers might use to look into ways to subsidize visual impairment and blindness treatment and reduce the financial burden on afflicted families. Furthermore, the outcomes of the findings are expected to positively influence the government and policy makers in directing the needed attention and resources in dealing with this phenomenon. The findings of this study provide justification for provision of social, vocational, economic and rehabilitative support services to the visually impaired and blind members of the population as well as their households to mitigate

the negative impacts of the phenomenon to the society. Investment in these programs will improve quality of life of the affected individuals and economic empowerment to their households.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

This chapter examines theoretical and empirical literature relevant to explaining the economic cost and risk factors of vision impairment and blindness among adult eye patients who visit PCEA kikuyu hospital's eye unit. The chapter focuses on the theoretical framework which explains the relevant models of the study. It also reviews empirical literature related to the research.

2.2 Theoretical Literature Review

2.2.1 Human Capital Theory

Human capital theory is an economic theory that describes human behavior. He demonstrated that the desire for tangible and immaterial goods drives human conduct. Skills and education are some examples of intangibles. People Invest in Health and Exercise to Improve Their Vital Signs Becker et al., (1992). Dolan (2003) explained a model which showed that sickness affects the quality and quantity of labour output. Therefore, illness leads to reduced productivity. He presents a theory based on human capital that treats medical care as endogenous. The model illustrates that people invest in health funds by using medical services. Grossman (1972) further argues that improved health not only increases individual productivity, but also affects market and household productivity.

According to Green (2020), visual impairment is defined as a limitation of one or more eye and/or visual system functions. This has a huge impact on the everyday lives of those impacted,

as well as on the economic well-being of these individuals, their families, relief organizations, towns, and nations. Direct and indirect medical costs are included in the financial costs of blindness. Green et al. (2020) define the direct costs of blindness as the costs incurred by the government and/or other health payers as a result of treating blindness.

A significant proportion relates to the cost of using health services, provision of equipment, medical expenses and procedure costs. The expense of raising the incidence of depression and the occurrence of catastrophic falls in blind persons has been proven to dramatically increase the indirect health care costs of blindness, according to WHO (2019). The non-health-related direct costs of blindness indicate the economic impact of this condition on society as a whole outside of the health-care system. This comprises lost productivity as a result of incapacity to work due to blindness or job loss as a result of the same, as well as expenditures of informal care. The fatal welfare loss is the loss associated with the need to increase additional tax revenues for public funding of health services and benefits for the blind, and the lost tax revenue due to blindness is an indirect cost to blindness health (Green et al., 2020).

According to Bourne (2017), a systematic review and meta-analysis of rates, time trends, and projected global spread of blindness and near and far distance vision impairment estimated the global public cost of visual impairment and blindness at $3 trillion in 2010, partly explained by the direct medical costs associated with the utilization of health services and the indirect costs characterized by the loss of participation in employment. Due to demographic expansion and population aging in Western cultures, the prevalence and economic burden of visual impairment is anticipated to rise by 20% by 2020. (Park et al., 2018). (2018) looked at the prevalence of vision loss-related disorders in Korean VI&B patients, defining various comorbidities and using

the Charlson Comorbidity Index (CCI) using diagnostic codes from the ICD 10th edition (Nuertey et al., 2019). In a previous study Comorbid Depression, fractures, injuries, eye and limb disorders, visual impairment, glaucoma, cataracts and hypertension, emergency care, hospitalization and prescription drugs under the NHI program, the average cost per patient that could have been avoided without VI&B was about 2 times higher than in patients without VI and B. Over one year of adjustment, CCI, and hypertension, cases had 2,692 (95 percent CI = 2,250-3,222) times greater medical expenses than controls. Despite the same age, differences across groups were still statistically significant at 5 years.

According to Salari and Jane et al. (2019), they used logistic regression analysis to investigate household factors connected to the risk of catastrophic health expenditures and looked at the frequency and intensity of catastrophic and depleted health expenditures.

2.3 Empirical Literature Review

Shakel (2018) used cross-sectional data from blind persons to estimate the cost of disease using a disease cost approach from a social perspective. Fatigue severity (FAS), daily living consequences of fatigue (MFIS), and overall public spending were the key objectives. According to studies, visual impairment is linked to a higher incidence of high levels of fatigue, which adds to their financial burden. They believe that the high expense of visual impairment and concomitant fatigue highlights the need for patient-centered therapies to lessen their impact (Schakel et al., 2018).

Bourne (2017) examined the economic impact of vision impairment and blindness in high-income nations to estimate the extent of temporary changes and the expected global spread of

visual impairment. They reviewed 22 studies of interventional and non-interventional medical costs that examined the direct and indirect costs associated with visual impairment and blindness. Hospitalization was recognized as the leading contributors to direct medical costs. The time spent by caregivers was a significant part of the increase in indirect costs from $5.8 per week, or $263 for the visually impaired, to $94.1 per week, or $55,062 per year for the blind and blind.

Based on a representative sample of Medicare members, Köberlein (2013) conducted a systematic analysis of the economic burden of visual impairment and blindness in the United States. According to him, the average yearly costs per patient for moderate vision impairment ranged from $12,175 to $14,029 per year, $13,154 to $16,321 per year for severe visual impairment, and $14,882 to $24,180 per year for general blindness. That's about a hundred percent more than the anticipated median annual cost for blind people. The indirect costs of decreased productivity, reduced employment, and lost income, when compared to the other cost categories, represent the biggest economic burden on patients and their caregivers, accounting for a 2% rise in the blind.

Pezzullo (2018) reported an increase in economic costs of 1.6% for caregivers of blind patients, who reported restrictions on daytime going out to 12% for caregivers of blind patients. Steven et al. (2016) analyzed the average annual cost of potentially disabling chronic diseases such as diabetes and stroke compared to visual impairment and blindness. The study found that the annual economic cost of diabetes was $6,889 and the cost of stroke in the first year was $14,361, which is much lower than the estimated average annual cost of visual impairment and blindness. In the case of the visually impaired and blind, these costs are incurred annually after vision loss and, in contrast to the reported costs of stroke, are not significantly reduced in subsequent years.

According to Pezzullo (2018), the cost of lost healthy life due to vision impairment and blindness in the United Kingdom is projected to be £19.5 (range 15.9 to 23.3) billion or £7.2 (5.9 to 8) billion, depending on the impairment weight chosen.

According to Nuertey (2019), there were considerable regional differences in the prevalence of visual impairment and blindness, with high prevalence in arid and semi-arid areas, as well as rural and non-urban areas. Morbidity and mortality due to visual impairment and blindness affects 19.09% of the population, which is about 0.84 million people. Stephen and Woodbury (2016) claim that despite limited data, estimates in a recent online survey, 88% of 2,044 respondents considered good eyesight to be very important for maintaining general health and 47% viewed their vision loss as compared to loss of limbs, memory, hearing or language as "potentially the biggest impact on your life today".Individual households and society as a whole bear a huge economic burden due to vision impairment and blindness. This emphasizes the critical need for Kenya to enhance investment in the prevention and treatment of vision impairment and blindness. It also highlights a need for social, economic, and psychological support to the affected households so as to mitigate the negative economic impacts it causes (Bastawrous et al., 2016).

In terms of the economic impact of vision loss, Park (2018) found that those with moderate to severe VI&B had a 46.7 percent greater annual total health expenditure than those who did not have vision loss. Furthermore, prices rose with severity VI, and costs for patients who were blind were 2.3 times greater than those who were not blind. Ayieko (2017) found that treatment costs for inpatient malaria, pneumonia, and meningitis varied depending on the type of facility. Households with sick children contribute significantly to provider costs by paying usage fees

2.4 Summary of Reviewed Literature

Several studies estimating the economic burden of diseases exist in Kenya including Salari et al.,2019). Katana (2020) focused on the economic and mental health burden of primary caregivers and found that the average direct and indirect monthly cost of primary caregivers was Ksh 2784.51 ($27.85). Transportation (66.5 percent) and medicine are the biggest contributors of direct expenditures (13.8 percent). Total monthly expenses account for 28.8% of caregivers' stated monthly income. To cope with the tremendous financial strain, the majority of caretakers take out loans. Depressive symptoms were reported by 10.7% of carers. The average monthly direct and indirect expenditures for nurses with positive depression (PHQ-9 score of 10) were substantial. However, the costs borne by caregivers who tested negative for depressed symptoms were not significantly different.

According to Salari (2019), catastrophe payouts for the poorest households are more frequent in rural locations, owing to outpatient services. According to the poverty effect, the proportion of poor persons in both rural and urban areas increased by 2.2 percentage points after implementing cash handouts (CMO). CMO payments force between 1 and 1.1 million people into poverty. The presence of the elderly and those suffering from chronic ailments revealed significant results among the factors associated to the possibility of spending on GMOs. They come to the conclusion that Kenya is still trailing behind in terms of shielding its residents from the financial risks connected with disease and dependency.

More work is needed to safeguard the most vulnerable groups from disease's high costs (Salari et al., 2019). In conclusion, the literature analysis reveals that outpatient visits, hospitalization, and medical services associated to early detection and treatment of visual impairment account for the

majority of direct medical costs. Informal care is seen as an important factor in other indirect costs because of increased lost productivity, reduced jobs and lost income for patients and caregivers, creating a heavy economic burden. It has also been observed that increased mortality is associated with impaired vision and blindness (Choi et al., 2020).

CHAPTER THREE

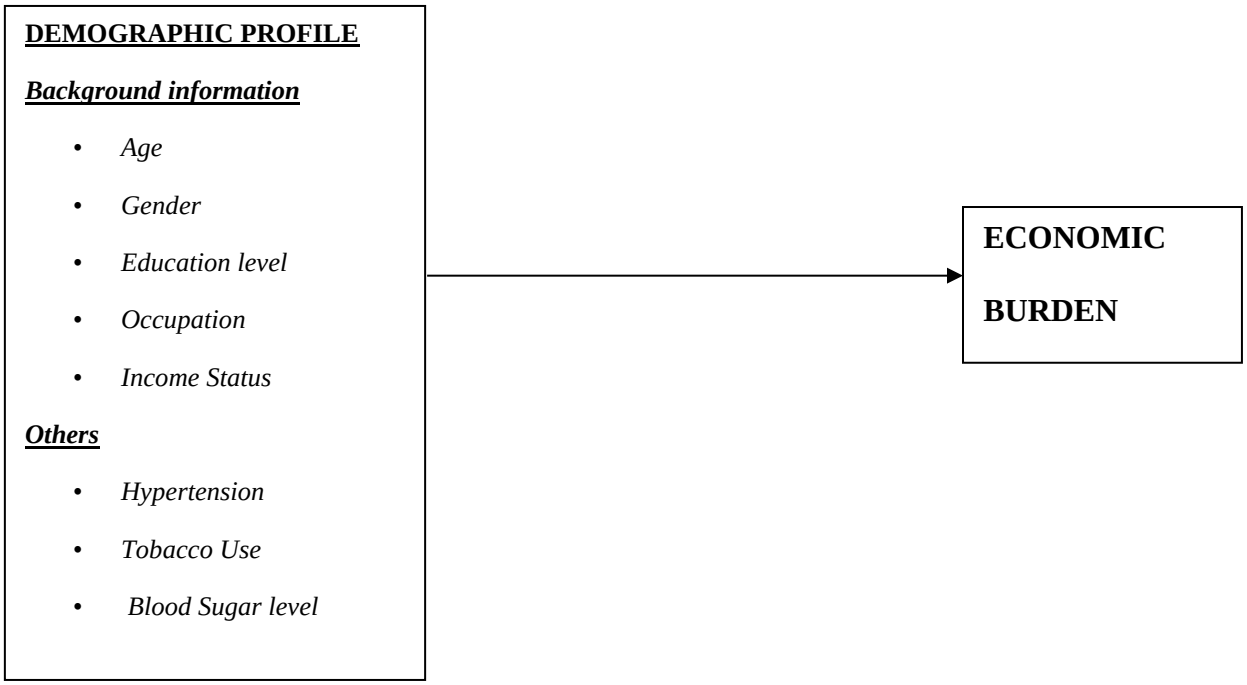
RESEARCH METHODOLOGY

3.1 Study design

The study was a quantitative, descriptive cross-sectional study with the goal of describing the size, demography, prevalence, and relationships between risk variables and visual impairment and blindness. The study population's economic severity of vision impairment and blindness was assessed using the cost of disease technique.

3.2 Conceptual Framework

Independent Variables **Dependent Variable**



3.3 Perspective of Costing

The study was undertaken from a societal perspective encompassing the study participants and their households. In this perspective the costs considered were classified as direct and indirect costs. Direct costs considered included medical costs (cost of drugs, cost of ophthalmic services including diagnosis, corrective vision aids), transportation and other out-of-pocket expenditures. Indirect costs, lost wages, productivity loss as well as informal care. The sum of direct medical costs, direct non-medical costs, and indirect costs is used to assess the overall cost of vision impairment and blindness. The aggregate of costs related with lost productivity and informal care is known as indirect costs. All patients with visual impairment and blindness who visited the eye department of the kikuyu PCEA Mission Hospital were included in this study. All respondents are over 18 years old.

3.4 Approaches to Estimating the Economic Burden of Visual Impairment and Impairment

There are four approaches used in estimating the economic burden of a disease. They include production function, willingness to pay, cost of illness and human capital approach. The approaches are briefly discussed below. However, the study focuses on the cost of illness approach and it utilizes its functionality in examining the health care expenditure that is geared towards Visual Impairment and Blindness.

3.4.1 Production Function Approach

The production function approach, according to Kirigia (2011), has a macroeconomic perspective. The gross domestic product (GDP) of a country is calculated as a function of gross investment, labor force participation, other exogenous variables, and the disease's spread. Folland (2013) discovered that, from an economic standpoint, health may be viewed as a long-

term benefit, a product that humans can create by integrating various suitable medical and non-medical data from a specific level of medical expertise. In this study, the production function is denoted by Q. This is influenced by several interrelated factors based on basic health data; Health care and behavior, habits and living conditions related to human health, and work are influenced by the age of the worker (Sloan & Hsieh et al., 2012).

The following is the mathematical relationship between these inputs and the population health outcome:

$$Q = f(HC, HB, L, M) \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots 2$$

If Q is gross domestic product, HC is a measure of how much society spends on health care to combat visual impairment and blindness, HB is a measure of the population's average exposure to risk factors for visual impairment and blindness, L is labor effort for workers (15-65 years), and M is a measure of existing medical knowledge for the prevention and treatment of visual impairment and blindness, then M is a measure of existing medical knowledge for the prevention and treatment of visual impairment and blindness. This basic production function simply states that, given M, any society can improve the health of its population by altering the distribution of resources for health interventions or altering people's lifestyles and living environments by altering all other economic and social factors that affect health. Health benefits from more resources and better health-related conditions. Medical knowledge is enhanced through availability of interventions and technology for prevention and management of health conditions.

3.4.2 Willingness to pay

It is argued that a theoretically adequate way of estimating the true cost of disease to household well-being is to determine the value they would give to avoid it. If it is possible to obtain the monetary value that households would pay to prevent disease, it is likely to bear the household's burden of medical expenses and the costs of lost productivity. It also depicts the worth of remaining free time as well as the cost of disease-related pain and suffering. Finally, difficult-to-quantify intangible costs are reported (Okorosobo et al., 2011). The willingness-to-pay approach, also known as conditional assessment, uses household surveys to try to determine this value.

In theory, this technique has the advantage of incurring all of the disease's personal expenses. It should be noted, however, that results are occasionally influenced by respondents' desire for strategic action and may be skewed by their personal interpretation of the questions (Okorosobo et al., 2011).

$$\mathrm{WTP}_j = \left(\frac{V_j}{V_p}\right) \ldots\ldots\ldots\ldots\ldots\ldots\ldots 3$$

The value (mean coefficient) of the feature j is Vj, and the price's value (mean coefficient) is Vp. All prices must be positive or all prices must be negative. Price and preference must have a linear connection (that is, preference for lower prices must be higher or vice versa).

3.4.3 Human Capital Approach

The most widely used tool for calculating the worth of human life and the cost of illnesses is the human capital approach. This method calculates the present value of a human life as the discounted future expected benefit by considering human beings as active actors. This method

posits patients as active actors in calculating the socioeconomic costs of diseases and applies unique discount rates to the income they would have received from their labor in order to quantify their loss of working hours and subsequent productivity losses. This method equates the cost of death and disease with the loss of the overall expected gains that patients might have received if they stayed healthy. This approach focuses on the losses in labor production caused by illnesses of individuals and exposes the cost of illnesses and death.

3.4.4 Cost-of-Illness Approach

The cost of treatment approach uses direct costs of disease, indirect costs of disease, and institutional costs of patient care to estimate disease severity in an accounting sense. The cost of disease weighs on the economy in these three different ways. The disease cost approach calculates the severity of VI&B based on direct and indirect costs. It includes the share of gross domestic product that must be spent on treating and rehabilitating patients. This is a direct cost burden borne by households and the government in managing the situation. It also takes into account the amount of output lost when VI&B causes disability, lost productivity for caregivers who have to leave income-generating activities to care for victims, and death or injury from illness. These lost benefits represent VI&B productivity costs, also known as indirect disease burden. It also demonstrates the costs that individuals and governments are prepared to pay to prevent the pain and suffering caused by VI&B, referred to as the intangible costs of Seal (2006). The formula for calculating the cost of illness (COI) is as follows:

TC = DC + IC + ITC …… (4)

Where, TC is the Total Cost, DC is the Direct Cost, IC is the Indirect Cost and ITC is Intangible Cost.

Direct cost (DC) – Direct costs refer to all costs of using a resource that are entirely attributable to the use of a medical procedure or treatment of a disease. It comprises the cost of goods and services used in the disease or disorder's prevention, diagnosis, treatment, and rehabilitation. For example cost of drugs, hospitalization, outpatient visits and diagnostic procedures Heggenhougen & Quah, (2008)

Indirect Cost (IC) –The term "indirect cost" refers to all costs borne by households as a result of lost productivity. It involves lost production as a result of a sickness or ailment that causes impairment. It can be either short-term or long-term in nature. Indirect costs might include lost productivity, entire absence from work owing to illness, or early death. It also encompasses lost time and wages of caregivers who abandon their economic activities to take care of the diseased individual Heggenhougen & Quah, (2008).

Intangible Cost (ITC) – intangible costs relate to the loss of well-being due to physical and psychological pain. Due to the stigmatization of chronic illness, the associated psychosocial costs for affected households can be devastating (Kirigia et al., 2009). Intangible costs are difficult to value since they do not have a monetary value; they refer to pain, suffering and social stigma.

Direct cost (DC) is expressed as.

DC = TMC +TOC …….…… (5)

Where, TMC is total annual medical cost including cost of drugs, consultation fees, diagnosis, surgery, TOC is total annual cost of general ophthalmic services including eye examination, corrective vision aids and devices.

Indirect cost (IC) is expressed as.

IC = CTD + CPD +CPM + CPV …….... (6)

Where CTD is the total cost of lost production time due to low vision or blindness associated with temporary disability, CPD is the total cost of lost production time due to low vision or blindness associated with permanent disability, CPM is the total cost of lost production time due to low vision or blindness associated with premature death, and CPV is the total loss of productivity due to time lost from family members or caregivers who accompany or care for someone with low vision.

Assuming an individual works 240 days per year, the total annual productive time in absence of VI&B can be computed by multiplying the number of days per year times the number of hours an individual works per day. However, if we assume that the productive time depends on the state of an individual described by Ω i.e., incidence of VI&B, then the expected annual productive time (P) under a four-month probability of contracting VI&B the expected available productive time (P) under VI&B risk is given by.

P = (Ω - ¥) × ὰ × d …….. (7)

Where, P is the expected annual productive time in the presence of VI&B, Ω is the number of days per year that an individual can be productively engaged, ¥ is the total number of VI episodes per year or incidence of blindness, ὰ is the probability of an individual contracting

VI&B, d is the expected duration of the illness. There are no top-down data on total eye health care expenditure in Kenya, for this reason the direct cost components for which data will be available will be summed to estimate the total direct cost of low vision and blindness among adult patients.

This method was preferred because the information needed for cost estimation was reasonably readily available and the results of the study were relatively less affected by the bias or subjective perception of the researcher. In addition, this method converts the direct costs and indirect costs incurred through treatment of diseases into potential income losses, calculated on the basis of the existing level of income of patients.

3.5 The Study Site

The research was carried out in the PCEA Kikuyu Hospital's eye department in Kiambu District, Kenya. Kikuyu Hospital's eye department was established in 1975 as a result of a collaboration between the hospital and Christoffel Blindenmission (CBM), a German non-governmental organization. Kikuyu Hospital's eye department is Nairobi's eye facility and a referral center for the East African region. Every year, the hospital sees between 70,000 and 80,000 patients. It is Kenya's only eye unit with a low vision department, a comprehensive range of services, and cutting-edge procedures for clinical diagnosis of eye issues. Clinical eye care services offered at PCEA Kikuyu Hospital include:

a) General Ophthalmic services, these include services such as screening and treatment of uncomplicated eye conditions.

b) Specialized Ophthalmic services, specialist eye clinics provide eye care services such as vitreo-retinal services, occuloplastic services and pediatric/squint services.

3.6 Sampling Design for the Respondents

3.6.1 Sampling

The study utilized systematic sampling and simple random techniques because of the availability of the respondents at the hospital. Although the researcher did not have a list of the entire patients visiting the hospital, this method provided a representative sample of the adult eye patients since their order of entry and exit at the hospital was random. Therefore, the researcher chose to approach every 10^{th} patient exiting the eye unit section at P.C.E.A Kikuyu Hospital and requested them to participate in the study. This was conducted until a desired sample size of 385 respondents was obtained. This ensured that each patient had an equal chance of being selected and participating in the study. The researcher had clearly defined the inclusion and exclusion criteria. The inclusion parameters were set as the adult (above 18 years old) eye patients visiting P.C.E.A Kikuyu hospital. Exclusion parameters set as the respondents must be drawn only form the patients visiting P.C.E.A Kikuyu. This guaranteed that the population's characteristics were accurately estimated.

3.6.2 Study Population

The sampled population of the study was all adults above eighteen years of age males and females who had visited the facility by the time of study. The rationale for using study population of adults from eighteen years of age and above, is to comprehensively capture the risk factors and household economic burden of the study population on the measured outcomes (visual impairment and blindness), other than older age only where visual defects increases

significantly with increasing age Hickenbotham et al., (2012). The elderly make up the majority of people with vision impairment and blindness (WHO, 2011).

3.6.3 Sample Size Determination

Kothari (2004) formula was used to calculate the sample size of the study. A 95% confidence level and p value of 0.05 was assumed. Using the formula, the sample size will be calculated by:

$$n = \frac{z^2 * p * q}{e^2} \quad \text{.....1}$$

Where **n** is the sample size

z is the value of standard variate at a given confidence level and to be worked out from table showing area under normal curve.

p is the sample proportion

q = 1 – p

e is the given precision rate or acceptable error

Therefore, given z = 1.96 (at 95% confidence interval from table), p = 0.5; q = 1 – 0.5 =0.5; e = 0.05, and substituting in the formula gives:

$$n = \frac{1.96^2 * 0.5 * 0.5}{0.05^2} \cong 385 \quad \text{.....2}$$

3.7 Regression Model

3.7.1 Generalized Linear Models (GLM)

The generalized linear model (GLM) is the foundation of applied and social science statistical tests. T-test analysis, analysis of variation (ANOVA), analysis of covariance (ANCOVA),

regression analysis, and other multivariate methodologies, including as factor analysis, cluster analysis, multidimensional scaling, and canonical analysis, are all built on this foundation (Nelder & Wedderburn et al., 1972). Since this study uses general health as the dependent variable, it makes sense to use the GLM in the analysis as it provides a linearization function that is smooth and reversible in terms of changing the variable response expectations.

Furthermore, one of the advantages of the GLM model over response transformations of linear regression variables is that the linear transformation option is partially isolated from the linear regression distribution and the same transformation should not and do not normalize the linear Y distribution on Xs. The gamma distribution is useful for modeling a continuous positive variable response in which the conditional variation in the response increases with the mean, but the coefficient of variation in the response is constant (Nelder & Wedderburn et al., 1972).

The model equation has one dependent variable namely, economic Burden. The equation is expressed as:

$$\mathrm{Y}_i = \beta_0 + \beta_1 X_{1i} + \beta_2 X_{2i} + \ldots\ldots\ldots\ldots + \beta_n X_{ni} + \mathcal{E}$$

$$\begin{aligned}\text{Economic Burden}_i &= \beta_0 + \beta_1 Age_i + \beta_2 Gender_i + \beta_3 Education_i + \beta_4 MaritalStatus_i \\ &+ \beta_5 Income_i + \beta_6 EmploymentStatus_i + \beta_7 SpectacleUse_i \\ &+ \beta_8 Hyptersion_i + \beta_9 Diabetics_i + + \beta_{10} Glaucuma_i + \mathcal{E}\end{aligned}$$

$$\text{Economic Burden}_i = \beta_0 + \beta_1 X_{1i} + \beta_2 X_{2i} + \beta_3 X_{3i} + \beta_4 X_{4i} + \beta_5 X_{5i} + \beta_6 X_{6i} + \beta_7 X_{7i} + \beta_8 X_{8i} + \beta_9 X_{9i} + \beta_{10} X_{10i} + \varepsilon \quad \ldots\ldots 8$$

3.7.2 Definition of Variables

In this study, the outcome variable took a continuous response being the Economic Burden experienced by adult eye patient at Kikuyu Hospital. The independent variables of this study included age, gender, income status, employment status, marital status, education level, spectacle use, diagnosed with diabetics, glaucoma, hypertension and whether they smoked or not.

Table 3.7 : Definition of Variables

Dependent Variable	**Measurement**	**Apriori expected effect and Source**
Economic Burden	Sum of direct cost, indirect cost incurred by the patient and the costs to service provider	
Independent Variables	**Measurement**	
Age	This is a continuous variable being reported as the age of the respondents at the time of conducting the study.	Positive sign (Nazroo et al., 2017) Positive

Employment Status	A dummy variable taking the values of 1 if employed; 0 otherwise	(Vittinghoff & Cohen et al., 2015)
Education Level	The highest degree of education acquired by the respondents is referred to as this. A dummy variable with the values 1 = primary school, 2 = secondary school, 3 = college, and 4 = university. None as a reference variable	Positive or negative sign Han & Chen (2019), Hargreaves et al.,2015
Gender	A dummy variable taking the value of 1 = male, 0 otherwise	Positive (Lokshin et al., 1999)
Income Status	This is continuous variable reported by respondents at the time of conducting the study.	Positive Goldenberg (2015)
Marital Status	This variable was a dummy variable coded as 1= married, 2=Widow/widower, 3=Divorced/Separated, 4 =Single/never married Reference variable = Single	Positive sign (Barz et al., 2014)
Spectacle	A dummy variable taking the value of 1 = if a patient uses	(Filmer, 1998)

Use	spectacles and 0 otherwise.	
Hypertension	A dummy variable taking the value of 1 = if a patient is hypertensive , and 0 otherwise	Positive
Glaucoma	Dummy variable measured as 1=Yes if a patient is diagnosed with glaucoma, 0 otherwise.	Positive sign
		Bekker et al., 2015
Diabetics	Dummy variable taking the value of 1=Yes if a patient is diagnosed with diabetics, 0 otherwise.	
Smoking	A dummy variable taking the value of 1 = yes if a patient is a smoker and 0 otherwise	Positive sign Alemu (2017)

3.8 Chi Square Test

When conducted as a test of independence, the chi-square test helps the researcher to determine if the two attributes under consideration are associated or not. A null and alternative hypothesis is formed for this test, with the null hypothesis being that the two characteristics are not related and the alternative hypothesis being that they are. The predicted frequency is then determined from the given data, followed by the chi-square value. The null or alternative hypothesis is accepted based on the estimated chi-square value. The null hypothesis is accepted if the calculated chi-square value is smaller than the value in the selected significance level table,

which indicates that there is no relationship. The researcher utilized chi square to test for association between blindness and hypertension, diabetics, glaucoma and smoking.

3.9 Data Collection, Processing and Analysis

Data collection tools were developed and the principal investigator employed three study assistants to administer the questionnaire. This questionnare was coded through CSPro and then transefered to the mobile version which was used to collect data on the field. Demographic information, health information as well as medical costs were collected from the respondents. Data for caregivers was also collected from the respondents. Information on the cost of spectacles were collected from the service providers. Data analysis entailed organizing the collected information, modifying, cleaning, and coding it, and then entering it into the Statistical Package for Social Sciences (SPSS) package version 24.0 and STATA version 13.0 for analysis.

3.10 Diagnostic Tests

Diagnostic tests were conducted to test for the violation of assumptions of the Generalized Linear Model (GLM). Therefore, to run the regression model, it was ensured that the GLM assumptions were not violated. If any of the assumptions were violated, the investigator needed to account for that violation in order to get unbiased, efficient and consistent estimates. Based on Gujarati (2003) the study tested for the presence of severe Multicollinearity and for serial correlation in the data. Further the study tested for Heteroskedasticity among other panel diagnostics Greene (2008).

3.11 Reliability of the Study

A pilot study was conducted and drew respondents from the target population; however, these respondents were not involved in the actual study. Preliminary tests were carried out and the results were evaluated accordingly, and then the questionnaire was adjusted to capture all the data required for the study. A pilot study was undertaken to allow the researcher to determine the instrument's reliability and validity, as well as becoming familiar with the questionnaire's management methods in order to improve the instrument's procedures. According to Amina, a recommended reliability of 70% will be considered for data collection Amina et al., (2005).

3.12 Validity of the Study

The questionnaire was piloted by 10% of randomly selected respondents. Information from the pilot study was analyzed and used to adapt the questionnaire. The validity of the contents of the questionnaire was checked by submitting it to the supervisor, who identified the defective elements and suggested any necessary corrections. Supervisor's recommendations are included in the final questionnaire.

3.1.3 Ethical Considerations

This was an academic project and approval was sought from the University of Nairobi school of economics (Appendix). To meet the ethical requirements of the study, the researcher only collected data that was not personal and that could not disclose critical information of the patients. The health officials were assured that the study findings were used solely for academic purposes and no one was to be victimized and confidentaility was upheld. This was in line with the Belmont principles. Informed consent was sought from the study participants and additional information was provided to the health officials prior to data collection.

CHAPTER FOUR

4.1 Introduction

The study findings are presented in this chapter. Sections 4.2 Descriptive statistics, 4.3 Econometrics Results, and 4.4 Regression Analysis are included.

4.2 Descriptive Statistics

Majority of the respondents who had visual impairment and blindness were aged between 41 to 50 years of age. Twenty four percent of the respondents were aged between 18 to 30 years old while 21% of the respondents were aged between 31 to 40 years old. Majority (66%) of the respondents were female while 39% and 22.9% had secondary education and primary, respectively. Seventeen percent had attained college education while 19.1% had not gone to school. Less than 10% of the respondents had attained university education, 42% were married, 30% were single while 16% and 11% of the respondents were divorced and separated. Only 11% were widowed or widowers.

Slightly more than 26% had a monthly income of between Kshs 10,000 and Kshs 20,000, while 35% had a monthly income of about Kshs 30,000 to Kshs 40,000. About 22% had a monthly income that was over 40,000. Only 12% had a monthly income of about Kshs 10,000 and below. The study findings show that persons with visual impairment and blindness were employed and were given the opportunity to contribute to the labor force. The results show that majority (66.2%) of respondents were employed with slightly above third (33.8%) not employment. The purpose of the survey was to see if the respondents had borrowed money from banks or friends and family. The majority of respondents (36%) borrowed money from relatives, while 21%

borrowed money from acquaintances, according to the findings. Additionally, 15% borrowed from a private bank while 19.9% borrowed from Sacco Cooperative.

Table 4.1: Descriptive Statistics

		Frequency	Percent (%)
Age	18-30 Years Old	96	24.9
	31-40 Years Old	82	21.3
	41-50 Years Old	117	30.4
	51-60 Years Old	90	23.4
	Total	385	100
Gender	Male	129	33.5
	Female	256	66.5
	Total	385	100
Education	None	73	19
	Primary	88	22.9
	Secondary	150	39
	College	66	17.1
	University	8	2.1
	Total	385	100
Marital Status	Single	116	30.1
	Married	163	42.3
	Widowed/Widower	43	11.2
	Separated/Divorced	63	16.4
	Total	385	100
Income Status (Kshs)	0 - 10,000	48	12.5
	10,001 - 20,000	101	26.2
	20,001 - 30,000	58	15.1
	30,001 - 40,000	91	23.6

	Over 40,000	87	22.6
	Total	385	100
Employment Status	Yes	130	33.8
	No	255	66.2
	Total	385	100
Money Borrowing	Family	84	36.4
	Friend	49	21.2
	Private Bank	36	15.6
	Sacco Cooperative	46	19.9
	Employer	15	6.5
	Black Market	1	0.4
	Total	231	100

4.2.1 Prevalence of Blindness

To measure the prevalence of various types of blindness and visual impairment, the WHO classification based on appearance of vision were used. The results show that majority (99%) of the respondents had visual impairment. The prevalence of blindness among the adult eye patients visiting P.C.E.A Kikuyu hospital was at 0.52%.

Table 4.1: Prevalence of Blindness

Prevalence is the percentage of people in a population who have a specific condition or trait at a given time or during a given period of time (World Health Organization, 2018). From the study population, the prevalence of blindness was found to be 0.52%.

Visual Difficulty Level	Observations	Prevalence (%)
Visually Impaired	383	99.48
Totally Blind	2	0.52
Total	385	100

4.2.2 Direct Medical Cost

The study established that majority of the respondents paid a mandatory consultation fee of Ksh550. On average the cost of medicine was Kshs11, 868 (range from Kshs 4,053 - Kshs 20,496 On average, the cost of spectacles was Kshs. 6,174.08 (Range from 1,467-Kshs 11,249).

Table 4.2: Direct Cost

Variable	Observation	Mean	Standard Deviation	Minimum	Maximum
Consultation Fees	385	636.10	401.13	550.00	2,500.00
Cost of Medicine	385	11,868.94	4,733.38	4,053.00	20,496.00
Cost of Spectacles	266	6,174.08	2,884.81	1,467.00	11,249.00

4.2.2.1 Cost of Treatment

The results show that on average the cost of treating glaucoma was Kshs. 14,809.35 while the cost of ophthalmology treatment was Kshs. 2,862.29. The cost of cataract surgery was Kshs. 29,107.79.

Table 4.3: Cost of Treatment

Variable	Observation	Mean	Standard Deviation	Minimum	Maximum
Glaucoma Treatment	385	14,809.35	7,961.08	2,000.00	30,000.00
Ophthalmology	385	2,862.29	1,070.40	1,500.00	5,000.00
Cataract Surgery	385	29,107.79	6,969.57	20,000.00	49,000.00

4.2.3 Direct Non-Medical Cost

The study indicated that transport to the hospital ranged from Kshs 30 to Kshs 2,000. On average, each respondent spent about Kshs 330 to get to the hospital. Concerning the cost of food and drinks while at the hospital, the findings showed that on average, majority of the respondents spent about Kshs 399 which was within Kshs 100 to Kshs 1,250 per every hospital visit. The results further showed that some respondents had borrowed money to cater for the hospital expenses. The amount borrowed ranged from Kshs 1,500 to Kshs 55,000 whereas others had sold properties and assets to cater for hospital expenses. See table 4.5.

Table 4.4: Direct Non-Medical Costs

Variable	Observation	Mean	Standard Deviation	Minimum	Maximum
Transport	385	330.47	352.06	30.00	2,000.00
Food and Drinks	385	399.48	83.07	100.00	1,250.00
Borrowed Money	231	10,442.21	12,266.44	1,500.00	55,000.00
Sold Property or Asset	145	40,748.28	28,535.01	5,000.00	100,000.00

4.2.4 Indirect Costs

4.2.4.1 Loss of Income

The study examined previous work history of the respondents and the results indicated that majority (68.8%) of the respondents had missed work to seek eye treatment. Only 31.2 percent of respondents stated that they had not missed work. The study also discovered that the majority of respondents (57.1%) had lost their jobs due to vision and eye difficulties. Only 42.9% of the respondents stated that they had not lost their employment due to vision and eye problems.

Table 4.5: Summary

		Frequency	**Percent (%)**
Work Attendance	Absent Seeking Eye Treatment	265	68.8
	Present at Work Place	120	31.2
	Total	**385**	**100**
Lost Employment in the Past	Yes	220	57.1
	No	165	42.9
	Total	**385**	**100**

Consequently, the findings indicate that some of the respondents spent up to six hours per day at the hospital while other respondents spent only one hour per day at the hospital. On average, time taken at the hospital was two hours and thirty minutes per every visit. Among the respondents who took some days off from work, some stayed away for up to twenty days while others stayed for only two days. On average, respondents took approximately five days per month while seeking eye care treatment.

Table 4.6: Time Spent at Hospital

Variable	Observations	Mean	Standard Deviation	Minimum	Maximum
Hours Spent at Hospital	385	2.3325	1.3282	1	6
Days off Work	385	4.1091	2.4513	2	20

The goal of this study was to figure out how much money people wasted while seeking treatment. The guidelines on the wage rate are provided on Appendix 1. The results indicate that on average, income lost by respondents working in the hotels was Kshs 553.03 per hour while average income lost per day was Kshs 3,347.27. The average income loss for respondents who worked as laundry operators was of Kshs 612.51 per hour and Kshs 3,477.32 per day while seeking eye treatment. The average income loss for respondents working in sales and marketing was of Kshs 778.11 per hour and Kshs 5,464.27 per day each time they sought eye treatment. This summary is presented in table 4.8. The loss of income was computed based on the table presented on Appendix 1. To get the loss per job, the amount of time spent or days lost at the hospital were multiplied by the rates given at the Appendix 1 and the time given by the respondents at table 4.6 above.

Table 4. 2: Estimated Income Loss per Job Category

		Income Loss Per Hour (Kshs)	Income Loss Per Day (Kshs)
Chef	Mean	553.03	3,347.27
	Minimum	237.10	1,629.20
	Maximum	1,422.60	16,292.00

Laundry Operators	Mean	612.51	3,477.32
	Minimum	262.60	1,692.50
	Maximum	1,575.60	16,925.00
Receptionist	Mean	684.11	4,787.50
	Minimum	293.30	2,330.20
	Maximum	1,759.80	23,302.00
Cyber Café Attendant	Mean	629.53	4,069.23
	Minimum	269.90	1,980.60
	Maximum	1,619.40	19,806.00
Tailor	Mean	723.30	5,008.16
	Minimum	310.10	2,437.60
	Maximum	1,860.60	24,376.00
Sales & Marketing	Mean	778.11	5,464.27
	Minimum	333.60	2,659.60
	Maximum	2,001.60	26,596.00
Junior Clerk	Mean	612.51	3,477.32
	Minimum	262.60	1,692.50
	Maximum	1,575.60	16,925.00
Messenger	Mean	527.84	3,135.65
	Minimum	226.30	1,526.20
	Maximum	1,357.80	15,262.00
Gardener	Mean	527.84	3,135.65
	Minimum	226.30	1,526.20
	Maximum	1,357.80	15,262.00
Shop Keeper	Mean	684.11	4,787.50

	Minimum	293.30	2,330.20
	Maximum	1,759.80	23,302.00
Store Manager	Mean	684.11	4,787.50
	Minimum	293.30	2,330.20
	Maximum	1,759.80	23,302.00

4.2.4.2 Informal Care

The study sought to examine whether the respondents were receiving informal care while at home or at their place of work. The findings show that majority (75.3%) of the caregivers were family members. About 2.9% of the caregivers were professional caregivers. About 1.0% of the caregivers were volunteers. However, 19.2% of the respondents indicated that they were able to take care of themselves both at home and at work.

Additionally, some of the respondents (44.5%) indicated that they had provided allowances and payments to their caregivers while majority (55.5%) indicated that they did not provide allowances to their caregivers.

Table 4.9: Informal Care

		Frequency	**Percent (%)**
Caregiver	Family Member	290	75.3
	Professional Caregiver	11	2.9
	Volunteers	4	1.0
	Myself	74	19.2
	A Friend	6	1.6
	Total	**385**	**100**

Payments/Allowances to Caregiver	Yes	153	44.5
	No	191	55.5
	Total	**344**	**100**

4.2.3.3 Productivity Loss for Caregivers

A major cost of lost productivity is caring for visually impaired & blind family members. Ganesh (2016) previously estimated the number of hours and estimated costs for informal care due to low vision among individuals. In his study, the estimated amount of care for the VI&B persons was 7 hours per day. The number of hours spent by caregivers would have been used in being productive at work or for leisure activities. Using the given wage rate in appendix 1, the investigator sampled a few job types and estimated the amount of income that potentially the caregivers could earn if they were in work force. Indeed, results ascertain that caregivers could significantly contribute in the work force and become very productive.

Table 4. 3: Estimated Productivity Loss for Caregivers

JOB TYPE / GRADE	Estimated Productivity Loss (Kshs) for Seven Hours/Per Day	Estimated Productivity Loss (Kshs) Per Year
Night Watchmen	955.85	257,123.65
Car Driver	1,154.30	310,506.70
Clerk	1,318.10	354,568.90

Kenya Subsidiary Legislation, 2020. (THE LABOUR INSTITUTIONS ACT (No. 12 of 2007-2020)

4.2.5 Risk Factors Associated with Blindness

The study examined whether the respondents had any other health risks associated with blindness. 61% of the respondents had previously been diagnosed with hypertension while 38% of the respondents reported that they had not been diagnosed with any other condition. The results show that majority (61%) of the respondents had not been diagnosed with glaucoma. Only 39% reported having been diagnosed with the disease. Moreover, majority (62%) of the respondents were non-smokers while 38% indicated to have been smokers. Furthermore, the findings revealed that the majority of respondents (66%) had not been diagnosed with diabetes, compared to 33 percent who had been diagnosed with diabetes.

Table 4. 4: 5 Risk Factors Associated with Blindness

		Frequency	**Percent (%)**
Diagnosed with Hypertension	Yes	237	61.6
	No	148	38.4
	Total	**385**	**100.0**
Diagnosed with Glaucoma	Yes	150	38.96
	No	235	61.04
	Total	**385**	**100.0**
Diagnosed with Diabetes	Yes	129	33.5
	No	256	66.5
	Total	**385**	**100.0**
Smokers (Lung Infections)	Yes	147	38.2
	No	238	61.8
	Total	**385**	**100.0**

4.2.6 Association between Risk Factors and Blindness

4.2.6.1 Association between Hypertension and Blindness

The study examined if there was association between having hypertension and blindness. The results show that $\chi(1) = 3.2194$, $p = 0.073$. These data show that there is no statistically significant link between hypertension and blindness; in other words, having high blood pressure does not cause someone to become visually impaired or blind.

Table 4. 5: Association between Hypertension and Blindness

		Visually Blind	**Totally Blind**	**Total**
Diagnosed with Hypertension	**Yes**	237	0	237
	No	146	2	148
	Total	**383**	**2**	**385**

Pearson chi2(1) = 3.2194 Pr = 0.073

4.2.6.2 Association between Glaucoma and Blindness

Consequently, the study examined if there was association between having glaucoma and blindness. To achieve this, chi square test was conducted. The results show that $\chi(1) = 4.1030$, $p = 0.038$. These data imply that glaucoma and blindness have a statistically significant relationship; that is, glaucoma can cause someone to become visually impaired or blind.

Table 4. 6: Association between Glaucoma and Blindness

		Visually Blind	**Totally Blind**	**Total**
Diagnosed with Glaucoma	**Yes**	149	1	150
	No	234	1	235
	Total	**383**	**2**	**385**

Pearson chi2(1) = 4.1030 Pr = 0.038

4.2.6.3 Association between Diabetics and Blindness

Additionally, the study sought to establish if there was association between having diabetics and blindness. The results show that $\chi(1) = 3.9897, p = 0.046$. These data reveal a statistically significant link between diabetes and blindness, implying that having diabetes can cause someone to become visually impaired or blind.

Table 4. 7: Association between Diabetes and Blindness

		Visually Blind	**Totally Blind**	**Total**
Diagnosed with Diabetes	**Yes**	127	2	129
	No	256	0	256
	Total	**383**	**2**	**385**

Pearson chi2(1) = 3.9897 Pr = 0.046

4.2.6.4 Association between Smoking and Blindness

The study examined if there was association between smoking and blindness. The results show that $\chi(1) = 0.1190, p = 0.730$. These data show that there is no statistically significant link between smoking and blindness; in other words, smoking does not cause people to become visually impaired or blind.

Table 4. 8: Association between Smoking and Blindness

		Visually Blind	**Totally Blind**	**Total**
Smoker (Lung Infections)	**Yes**	146	1	147
	No	237	1	238
	Total	**383**	**2**	**385**

Pearson chi2(1) = 0.1190 Pr = 0.730

4.2.7 Barriers to Health Services

The findings show that "too expensive" and "other family priorities" were the commonly cited barriers. Less than 10% of the respondents indicated that they did not have anyone to accompany them as the barrier to accessing health care services See table 4.11 below.

Table 4. 9: Barrier to health care services utilization

Barriers to Service Access	Frequency	Percent (%)
Too expensive	137	35.6
Other family priorities	121	31.4
No one to accompany	24	6.2
Did not know treatment possible	103	26.8
Total	**385**	**100**

4.3 Econometric Results

4.3.1 Multicollinearity

Multicollinearity is a state of intercorrelations among the independent variables. It creates a disturbance in the data, and if present, it causes the statistical inferences from the data to be unreliable Mansfield et al., (1982). One way to test for multicollinearity in the data is by running a correlation matrix of all the independents variables used in the study. If the correlation between two variables is 0.8 or above, then there exists severe multicollinearity and one of the independent variables will be dropped Farrar et al., (1967). Alternatively, multicollinearity can be detected using the tolerance and its reciprocity, which is called the rate of variance inflation

(VIF). If the tolerance value is less than 0.2 or 0.1 and at the same time the VIF value is 10 and more, then multicollinearity is problematic. Eliminating multicollinearity ensures the test statistics are reliable and not biasness that was introduced Farrar & Glauber et al., (1967). The variance inflation factor for all the variables from the table below are less than 10. The tolerance level for all the variables is less than 1. This indicates absence of multicollinearity.

Table 4.10: Variance Inflation Factor

Variable	VIF	1/VIF (Tolerance)
Age Categories		
31 – 40 Years Old	1.51	0.662773
41 – 50 Years Old	1.58	0.631093
51 – 60 Years Old	1.54	0.647529
Gender	1.16	0.859321
Education		
Primary	1.92	0.521425
Secondary	2.26	0.441542
College	1.84	0.544002
University	1.17	0.854439
Marital Status		
Married	1.46	0.685769
Widowed/Widower	1.39	0.71832
Separated/Divorced	1.38	0.723399
Income Status		
10,000 – 20,000	2.38	0.419828
20,001 – 30,000	1.94	0.516126
30,001 – 40,000	2.35	0.425576
Over 40,000	2.28	0.439003
Employment Status	1.13	0.885398
Spectacle Use	1.29	0.773932
Hypertension	1.14	0.874982
Glaucoma	1.21	0.827042
Smoke	1.23	0.809734
Diabetics	1.22	0.818813
Mean VIF	**1.59**	

4.3.2 Heteroskedasticity Test

OLS heteroskedasticity test(s) using levels of IVs only

Ho: Disturbance is homoskedastic

White/Koenker nR2 test statistic: 17.256 Chi-sq (21) P-value = 0.6955

Due to the lack of heteroscedasticity and the supported hypothesis that the regression error is normally distributed, this statistic is distributed as chi-square below zero. All of these chi-square tests include degrees of freedom that match to the number of variable indicators. The relationship between these independent variables was statistically insignificant with Chi-Square ($X^2_{(21)}$ = 17.256, $p>0.05$) indicating that heteroskedasticity was absent.

4.4 Regression Analysis

The study conducted a regression analysis using Generalized Linear Model equation. Majority of the coefficients were statistically significant at 5% suggesting that the independent variables jointly influenced economic burden. To prevent multicollinearity in the regression model, the study generated dummy variables. This was achieved by use of factor notations in STATA 13.0, where dummy variables for age (18-30 Years Old), gender (male), education (none), marital status (single), income status (0-10,000), employment status (employed), spectacle use (yes), hypertension (yes), glaucoma (yes), smoke(yes), and diabetes (yes) were generated. These were the base variables when all other independent variables were zero. The variable age (31-40 Years Old), for instance, took the values 1 for individuals who were aged between 31 – 40 years old and 0 otherwise. Similarly, the other variables were constructed. **See section 3.7.2**

The individual predictors were examined and results showed that age (31-40) ($\beta_1 = -6{,}537.19, p = 0.0337; p < 0.05$) and gender (female) ($\beta_2 = -4{,}183.50, p = 0.0451; p < 0.05$) were statistically significant at 5%. Consequently, the cost of illness for male respondents was high by Kes 4,183.50 as compared to the female respondents. On Education, the results show that college ($\beta_3 = 6{,}694.02, p = 0.0493; p < 0.05$), secondary school ($\beta_3 = 9{,}554.27, p = 0.0370; p < 0.05$), as well as primary school $\beta_3 = 4{,}831.74, p = 0.0488; p < 0.05$) were statistically significant at 5%. This indicated that education level was significant at 5% level of significance. On marital status, widower/widowed ($\beta_4 = 13{,}740.08, p = 0.0403; p < 0.05$) and married ($\beta_4 = 12{,}166.37, p = 0.0854; p < 0.1$) were statistically significant at 5% and 10% respectively. Additionally, the cost of illness for those who were widowed/widower was Kes 13,740.08 while those who were married was Kes 12,166.37. The results further showed that those who earned between an income of between 20,001-30,000 ($\beta_5 = -4{,}117.32, p = 0.0416; p < 0.05$) had a statistically significant influence on visual impairment and blindness at 5% significance level.

The research further intended to evaluate the effect spectacle use on Visual impairment and blindness. The results showed that the respondents who did not wear spectacles (No) ($\beta_6 = -8{,}293.75\ , p = 0.0437; p < 0.05$) had a statistically significant influence on visual impairment and blindness 5% level of significance. The results show that their cost of illness was Kes 8,293.75 less than compared to those who wore spectacles. The results indicated that glaucoma ($\beta_7 = -14{,}189.88, p = 0.0469; p < 0.05$) had a statistically significant influence on visual impairment and blindness 5% level of significance. The results showed that not having diabetes ($\beta_9 = 6{,}096.39\ , p = 0.0490; p < 0.05$) was statistically significant at 5%. This implied that

diabetics did not have an influence on visual impairment and blindness. Consequently, not smoking ($\beta_8 = -7{,}465.53, p = 0.0487; p < 0.05$) was statistically significant at 5%. Smoking did not have an influence on visual impairment and blindness. These variables were significant predictors in the model.

Table 4. 11: Regression Results

Variables		**Coefficients**	**Std Error**	**P-Value**
Age	31-40 Years Old	-6,537.19**	-77.83	0.0337
	41-50 Years Old	5,446.99*	-76.06	0.0647
	51-60 Years Old	6,732.06*	-81.63	0.0915
Gender	Female	-4,183.50**	-66.25	0.0451
Education	Primary	4,831.74**	-88.57	0.0488
	Secondary	9,554.27**	-80.22	0.0370
	College	6,694.02**	-94.55	0.0493
	University	37,055.11	-205.48	0.1933
Marital Status	Married	12,166.37*	-66.83	0.0854
	Widower/Widowed	13,740.08**	-102.21	0.0403

	Divorced/Separated	-2,715.65*	-84.04	0.0657
Income Status (Kshs)	10,001-20,000	-10,659.30*	-97.42	0.0650
	20,001 – 30,000	-4,117.32**	-105.41	0.0416
	30,001 – 40,000	-12,090.65	-100.76	0.1995
Employment Status	Not Employed	1,434.48	-64.2	0.1903
Spectacles Use	No	-8,293.75**	-68.41	0.0437
Hypertension	No	2,496.39*	-59.84	0.0640
Glaucoma	No	-14,189.88**	-61.39	0.0469
Smoke	No	-7,465.53**	-62.44	0.0487
Diabetes	No	6,096.39**	-65.6	0.0490
Constant		112,765.84***	-154.31	0.0050
Observations		**385**		

***, ** and* significant at 1 %, 5% and 10% level.

CHAPTER FIVE

DISCUSSION, CONCLUSIONS AND RECOMMENDATIONS

5.1 Introduction

This chapter summarizes the study, discusses the summary of the findings and provides the conclusions and recommendations of the research.

5.2 Discussion

The economic burden of adult eye patients visiting P.C.E.A Kikuyu hospital was investigated in this study. This was important for both policy makers and academics as limited research has been done around it. The average consultation fees charged at the hospital was Kshs. 636.10. These results were in agreement with the study by Jane et al., (2015) whose findings showed that average consultations fee was Kshs 640.23 for patients seeking malaria treatment. The cost of treatment of glaucoma, cataract and ophthalmology differed from the results by Schakel (2018) who found that the costs were relatively higher across all age groups by $184.33.

In addition, the potential economic wellbeing of VI&B patients and their families is impacted by the loss of income. This is evident as the findings show that 39% of the respondents had only attained education up to secondary school while only less than 10% had only reached up to university. The results showed that the respondents who did not wear spectacles (No) ($\beta_6 = -8{,}293.75\ , p = 0.0437; p < 0.05$) had a statistically significant influence on visual impairment and blindness 5% level of significance. The results show that their cost of illness was Kes 8,293.75 less than compared to those who wore spectacles. In comparison to individuals who did not have VI&B, these respondents had substantial direct and indirect costs. These results were

also similar among the respondents who did not use spectacles. According to Yu & Dong., (2014), there is a greater chance of cataracts in people with extreme hypertension than in those with moderate hypertension. Several studies have shown a linear positive association, between blood pressure and risk of cataracts. Hypertension duration is also a significant factor, suggesting a link between longer duration and increased risk of cataracts. According to Wittenborn (2013), the medical cost significantly increased if VI&B persons had chronic diseases, hypertension and diabetes. This indicates that the results of these studies agreed. Treating both health challenges can be draining to families that are not financially stable. This means that in the end money borrowing and sale of property may be the only option left for them.

The coefficients of Income status, age, education, diagnosed with glaucoma, diagnosed with hypertension and diagnosed with diabetes were statistically significant at 5% an indication that they were significant predictor of the model. These results were in agreement with the findings by Roberts (2015). The VI&B people's quality of life is expected to be lowered as a result of the economic strain. When money for other important family expenditures and investments becomes tight, worry becomes a way of life for them. The highest burden was correlated with travel expenses for hospital visits, followed by drug purchase expenses, cost of surgery, cost of buying spectacles as well as other health conditions such as being diagnosed with diabetes, hypertension and glaucoma.

5.3 Conclusion

Even though medicines are fully subsidized with the introduction of an insurance system that covers medical challenges, people with VI and B still face significant medical costs (relative to their income). This substantial financial load has the potential to create a vicious cycle of

poverty, poor mental health, and limited educational possibilities for the younger generation. As a result, more research into the financial support provided to families caring for people with VI and B is recommended in order to ensure the long-term health of those afflicted and, as a result, strengthen the economic development of productive communities and households. Similarly, it is suggested that a longitudinal study be done to compare various areas under review for VI&B costs and their wellbeing, including a control group.

5.4 Recommendation

It should be noted that the Kenyan government provides Basic Orphans and Children in Need (OVC) with a monthly cash payment of SEK 2,000 (US$ 20). This program was created to provide a financial buffer for OVC caregivers Huang & Huanda et al., (2017). Majority of the households earn an income of between Kshs 10,001 - 20,000. The government should subsidize some service to ensure that all family income is not channeled towards buying medicine and providing care for the VI&B persons.

During the preparation of the health care policy, the Ministry of Health should also create eye units in the level 3 and level 4 hospitals which are scattered across the country. There is a need to bring eye care closer to the community. This would help patients and their families save money on travel expenses. Second, all suitable treatment plans/medications should be easily available in order to minimize the cost of medicine purchases. While doing this, the government will be empowering the VI&B persons together with their families and rescuing them from diving into poverty because of extensive borrowing and sale of family assets. For the patients who have additional health complications, for example, hypertension, the Ministry of Health should device strategies such as encouraging the VI&B persons to undertake insurance covers other than NHIF

which would reduce the Out-of-Pocket expenditure on health care. Though paying of premiums could also contribute to direct cost towards health care, but in long run it will prevent sell of property and intense borrowing hence securing the family's assets.

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APPENDIX 1: SCHOOL OF ECONOMICS INTRODUCTORY LETTER

UNIVERSITY OF NAIROBI
SCHOOL OF ECONOMICS

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NAIROBI, KENYA

28th August, 2020

The Executive Director
Kenya Society for the Blind
P. O Box 46656 - 00100
Nairobi.

RE: KIRONGO DAVID KIHARA - REG. NO. X53/79355/2015

This is to confirm that the above named is a Master of Science in Health Economics and Policy student n School of Economics, University of Nairobi.

He has completed his coursework and currently working on his project titled: *"Economic Burden of Visual Impairment and Blindness Among Adult Eye Patients Visiting PCEA Kikuyu Hospital in Kiambu County"*. He needs to collect secondary and primary data for the project to be satisfactorily completed.

We therefore request your kind consideration in providing him with any assistance he may require.

Prof. Anthony Wambugu
Director,
School of Economics

AW/fmm

APPENDIX 2: THE REGULATION OF WAGES AND CONDITIONS OF EMPLOYMENT ACT (THE LABOUR INSTITUTIONS ACT (No. 12 of 2007-2020)

		PLWD		PLWD		PLWD
JOB TYPE / GRADE	**Per hour**	**Per hour**	**Per day**	**Per day**	**Per month**	**Per month**
Cleaner, Gardener, General Worker, House servant, Children's ayah, Sweeper, Day watchmen, Messenger	KSh121.3	KSh226.3	KSh653.1	KSh763.1	KSh13,572.9	Ksh13,787.90
Cook, Waiter, Miner, Stone cutter, Turn boy, Logger line cutter	KSh132.1	KSh237.1	KSh704.6	KSh814.6	KSh14,658.85	Ksh14,873.85
Night watchmen	KSh136.55	KSh241.55	KSh726.55	KSh836.55	KSh15,141.95	Ksh15,356.95
Machine attendant, Sawmill sawyer, Machine assistant, Mass production machinist, Shoe cutter, Bakery worker, Bakery assistant, Tailor's assistant	KSh141.75	KSh246.75	KSh739.05	KSh849.05	KSh15,383.45	Ksh15,598.45
Machinist (made-to-measure), Shoe upper preparer, Chaplis maker, Vehicle service worker (petrol and service stations), Bakery plant hand, laundry operator, Junior clerk, Wheeled tractor driver (light)	KSh157.6	KSh262.6	KSh846.25	KSh956.25	KSh17.561	Ksh17,776.00
Car driver, Printing machine operator, Bakery machine operator, Plywood machine operator, Sawmill dresser, Shop assistant, Machine tool operator, Dough maker, Table hand baker, Table hand confectioner, Copy-typist, Light van driver	KSh164.9	KSh269.9	KSh880.3	KSh990.3	KSh18,319.5	Ksh18,534.50
Clerk, Pattern designer (draughts men), Garment and dress cutter, Single hand oven men, Charge-hand baker, Telephone operator, Receptionist, Storekeeper	KSh188.3	KSh293.3	KSh1055.1	KSh1165.1	KSh20,904.9	Ksh21,119.90
Tailor, Medium-sized vehicle driver	KSh205.1	KSh310.1	KSh1108.8	KSh1218.8	KSh23,039.4	Ksh23,254.40
Dyer, Crawler tractor driver, Salesmen	KSh228.6	KSh333.6	KSh1219.8	KSh1329.8	KSh25,435.2	Ksh25,650.20
Saw doctor, Caretaker (buildings)	KSh253.25	KSh358.25	KSh1355.45	KSh1465.45	KSh28,147.6	Ksh28,362.60
Cashier, Heavy commercial vehicle driver, Salesmen-driver	KSh275.95	KSh380.95	KSh1474.5	KSh1584.5	KSh30,627.45	Ksh30,842.45
Artisan - Ungraded	KSh164.9	KSh269.9	KSh880.95	KSh990.95	KSh18,319.5	Ksh18,534.50
Artisan - Grade III	KSh205.05	KSh310.05	KSh1108.8	KSh1218.8	KSh23,039.45	Ksh23,254.45
Artisan - Grade II	KSh228.6	KSh333.6	KSh1219.8	KSh1329.8	KSh24,884.05	Ksh25,099.05
Artisan - Grade I	KSh275.95	KSh380.95	KSh1474.5	KSh1584.5	KSh30,627.45	Ksh30,842.45