AN EVALUATION OF THE INFLUENCE OF HEALTH EXPENDITURE ON THE LIFE EXPECTANCY IN THE SADC REGION (2010-2015)

BY

FLOYD BIGGIE HWENDE

B1439419

SUPERVISOR: L MUCHABAIWA

A DISSERTATION SUBMITTED IN PARTIAL FULFILMENT OF THE REQUIREMENTS FOR THE MASTER OF SCIENCE DEGREE IN HEALTH ECONOMICS OF BINDURA UNIVERSITY OF SCIENCE EDUCATION.

FACULTY OF COMMERCE

MAY 2019
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APPROVAL FORM

The undersigned certify that they have read and recommended to the Department of Economics, Faculty of Commerce, Bindura University of Science Education, for acceptancy; project titled, “AN EVALUATION OF THE INFLUENCE OF HEALTH EXPENDITURE ON THE LIFE EXPECTANCY (2010-2015) IN THE SADC REGION”, submitted by FLOYD BIGGIE HWENDE B1439419 in partial fulfilment of the requirements for the Master of Science Degree in Health Economics.

L. MUCHABAIWA

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DEDICATION
This work I dedicate in firstly to the Almighty God without his grace and his everlasting love I would not have been here. He has been with me throughout the journey of my academic adventure watching over His word. He is surely the promise keeper and I have witnessed his faithfulness.

Secondly, I dedicate it to my parents for their love and confidence in me. I am here because of them. They have been my strength.

Lastly, I will dedicate it to myself in the present and in the future, as a memorial for what I possible. This will be reminder that dreams can be reached, walls can be broken and the limit is only what we make it to be.
Abstract

The recent adoption of the Sustainable development goals requires a radical approach towards health. The SADC region faces a number of challenges in providing health services. The region has been experiencing very low life expectancy rates and failing to reach the Abuja declaration which requires that at least 15% of the national budget should be allocated towards health. Despite that the trends in health expenditure a have not been consistent with the generally accepted assumption that there is a positive relationship between health expenditure and life expectancy. Therefore, this seeks to evaluated the impact of health expenditure on life expectancy in the SADC region. The research makes reference to the Grossman model (1972) in modelling the methodology used. Data of 5 countries from the SADC region obtained from the World Bank website, WHO website and the ZimStates website was used. The data covered a period of six years for life expectancy, Literacy rate, current health expenditure, nurses and midwifery, physicians and hospital beds per 1000. The data was analysed using an econometric model with the aid of STATA. The researcher found that factor inputs were insignificant in determining life expectancy. However, health expenditure had a significant impact being associated with 1.2% of the changes in life expectancy. Literacy Rate also had a significant association with life expectancy with each additional year in school was associated with 17.37%. The researcher concluded that life expectancy was influence by health expenditure, literacy rate and physicians to a greater extent. Therefore, recommendations where made that increase in health expenditure and there should be drive towards increasing literacy rate.
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CHAPTER ONE
INTRODUCTION

1.0 Introduction
The Sustainable Development Goals (SDGs) put health at the fore-front and as one of the key result areas of the SDGs. SDG number 3 talks about health and stresses on health for all. This will have a major impact on the health expenditure of different economies and consequently on the health outcomes. The paper tries to establish the link between health expenditure and determine the type of relationship that exist. The research will basically analyse secondary data from the past decade using a number of qualitative and quantitative methods. This chapter will give an introduction to the study, starting with the background of the study, problem statement, research objectives and questions, limitations and the significance of the study mainly.

1.1 Background of the study
The SADC region faces a number of challenges in proving health services, attributed to lack of financial resources and human resources. Hence poor health poor health services particularly in public and rural settings (Shivani Ranchod, et al 2016). The health status of the regions has remained low as measured by life expectancy. However, there has been an increase in life expectancy from 40.4 years in the 1960s to 54.16 years in 2010 on average in the Sub-Saharan Africa (World Bank, 2010). The disease burden as continued to be high with the major challenges being HIV/AIDs Malaria and cholera recently in Zimbabwe and Mozambique. The SADC region is composed of 16 countries which include Zimbabwe, Malawi, Tanzania and Zambia among others. SADC countries are members of the United Nation and ascribe to the Sustainable Development Goals (SDG).

SDGs put health as a priority and is considered as more articulate as to how Goal number three which deal with Universal Health coverage would be attained. The new global goals are a build up from the Millennium Development Goals (MDGs) which ran from the year 2000 to 2015. MDGs were a considered as vogue on how they were to how they were to be archived. Apart from these two there are a number of Global policies and declaration that have been made in the past in pursuit of improved health delivery around the world. On in particular is the Abuja declaration which required countries to allocate at least 15% of their national budget towards health. This a has remained a notion and an ambition among the SADC countries. World health organization (WHO) reports that there has been an increase in health expenditure of low-income countries from an average of 1.7% to 2.6% in the period 1995 to 2013. The mobilization
of the government resources towards health in Africa have remained below 5% according to research done in 185 countries (WHO Africa, 2014). Only Three countries managed to reach the Abuja target of at least 15%. Malawi had a 9% budgeted for health in its 2016/17 which was a nominal increase of 24% and a real increase of 4% from the previous year’s allocation (Unicef 2017) Just like Zimbabwe most of the countries in the SADC have been following similar trends. The life expectancy of 9 countries in the SADC including Zimbabwe showed that the health outcomes were generally poor. Graph below shows the Life expectancy in 2015;

![Life expectancy](image)

**Figure 1.1 Life expectancy by country**

Source; World development indicators (2015)

The average life expectancy for the 9 countries was 60.90 years with the highest being Botswana 65.85 years and the Lesotho having the lowest of 53.75 years. The shows a great need for improvement in the health services. Compared to the corresponding health expenditure questions arise. The major question will be to what extent doe health expenditure influence health outcomes. The graph below shows health expenditure for the same countries in the year 2015.
South Africa spent the most on health expenditure as compared to others while Madagascar spent the least on health expenditure. This offers contradiction to the generally accepted norm.

In the case of Zimbabwe, during the summit held in 2000 members of the United Nations, including Zimbabwe committed to improve the health and welfare by 2015. Now with the establishment of the Sustainable Development Goals the thrust on health has been to ensure healthy lives for all. This agrees with the duties of the government of Zimbabwe as stipulated in the constitution under section 29 and section 76, which emphasize on the responsibility of the government to make sure that there is accessible basic and adequate health services in Zimbabwe. Therefore, the debate on Universal Health Coverage has grown within Zimbabwe and beyond. Initially the Zimbabwean government made a commitment to universal health in 1986 with emphasis on development of health services owned by the government and largely financed by tax revenue. Now in its effort to move towards Universal Health Coverage (UHC) health financing policy and health financing strategy have been crafted. These documents are aimed at improving health service delivery and also affecting the way health expenditure is incurred in Zimbabwe.

The economic situation has been dire for some time, the Zimbabwe health Financing strategy 2017 estimated that 2.8 million Zimbabweans lived in extreme poverty from 2.3 million in 2014. The government reported a marginal increase in unemployment (to 11.3% in 2014 from 10.7% in 2011), however there is a rise in the number of those employed in the informal sector. 84% of the employed people were in the informal
sector in 2011, in 2014 the percentage had risen to 94.5%. These factors have impacted negatively on the performance of the economy resulting in low Gross Domestic product (GDP). GDP for Zimbabwe in 2016 was estimated to be US$ 16 Billion, while GDP per capita was US$1,005.

Consequently, government of Zimbabwe has failed to adequately finance the Health sector, with only 8.9% of the budget being channelled toward health. This fails to meet the recommended 15% of the Abuja declaration. The trend initially started during the ESAP period, when the government allocation to health fell from 2.6% in 1980 to 2.2% of GDP in 1997 (Doro, at al., 2011). This has left most institutions and programmes staved off funding as most of the budget, about 80% percent is consumed by the labour costs. Leaving the ministry to depend on out of pocket funding in form of service fees, external funding and donations for its operations. However, World Health Organisation reports that there has been an increase in the government health expenditure of Low-income countries from 1.7% to 2.6% in the period 1995 to 2013. The issue of health care expenditure has attracted a lot of interest since the seminal work of Baumol (1967).

### Table 1.1  Health expenditure by category

<table>
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<tr>
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<th>2011</th>
<th>2012</th>
<th>2013</th>
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<tr>
<td>Current health expenditure (% of GDP)</td>
<td>9.3</td>
<td>8.3</td>
<td>7.7</td>
<td>8.9</td>
<td>10.3</td>
</tr>
<tr>
<td>Current health expenditure per capita (US$)</td>
<td>71.1</td>
<td>70.0</td>
<td>68.8</td>
<td>81.9</td>
<td>94.3</td>
</tr>
<tr>
<td>Domestic general government expenditure (% of current health expenditure)</td>
<td>23.2</td>
<td>25.5</td>
<td>30.7</td>
<td>20.6</td>
<td>20.8</td>
</tr>
<tr>
<td>Out-of-pocket expenditure (% of current health expenditure)</td>
<td>38.0</td>
<td>33.3</td>
<td>28.7</td>
<td>27.0</td>
<td>25.8</td>
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The table above shows recent trends in the health expenditure in Zimbabwe. It is evident that the health expenditure in Zimbabwe during the period 2011 to 2015 failed to reach 15% of
GDP the highest recorded during the period being 10.3%. The out-of-pocket health expenditure has been also exceeding the government expenditure as a percentage of health expenditure.

In sight of this failure by governments, there has been an argument as to the appropriate financing strategy or mix that will lead to higher health outcomes particularly higher life expectancy. According to ZIMSTATS the life expectancy has been rising in the recent years from 2012 to 2016 showing an upward trend from 56.5 to 61.2 respectively. The female population having the highest that is 62.9 years at birth as compared to 59.3 years for males at birth. The table below shows life expectancies for both males and females during the period 2012 to 2016, also include the general life expectancy for the Zimbabwean population for the same period;

<table>
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<td>Life expectancy at birth, total (years)</td>
</tr>
<tr>
<td>Male</td>
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<td>Female</td>
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Source; ZIMSTATS website.

This appear to be supported with an increase in health expenditure during the same period. This has not only been exclusive to Zimbabwe but also a number of developing countries. However, an in-depth analysis of the components and mix of the health expenditure has not yet been looked at in the Zimbabwe context.

Therefore, the purpose of this study is to deductively evaluate the impact of health expenditure on life expectancy from the SADC to Zimbabwe. This is a crucial topic as the world is trying to improve quality of life around the world and this will improve the policy development especially in the Southern African region. This study will also consider some factor inputs of health outcome.

1.2 Problem statement
A country’s health system is better performing if it is using the same level of resources to produce the same level of health or better level health (Elola et al., 1995). Despite this economic principle of efficiency stress has continued to be put on increasing expenditure on health without proper evaluation of the contribution of health expenditure to health outcomes.
especially in countries that are still developing. The association between life expectancy and health expenditure need to be evaluated especially in the case of Africa and developing countries.

1.3 Objective
- To evaluate the impact of health expenditure on life expectancy in the SADC Region
- To assess the impact of education to life expectancy in the SADC Region
- To explain the relationship between factor inputs and life expectancy in the SADC Region

1.4 Research questions
- To what extent does health expenditure impact life expectancy in the SADC region?
- What are the major contributors to health outcomes in the SADC?
- Does trends in literacy rate directly impact life expectancy?

1.5 Significance of the study
The study aims to shade light on the association between health expenditure and life expectancy. This will help the governments of developing countries in knowing where to target its efforts in trying to improve life expectancy.

- Policy Maker

The research will act a suggestion to how evidenced based policy making in the health sector can be done especially relating to health expenditure. It will also health to identify areas that need policy intervention.

- Other researchers

The study will suggest a new way of looking at health expenditure. Evaluating their contribution to the general outcome. Most studies done on the relationship between health expenditure and health outcomes have focused on health expenditure as a whole on by their categories.

1.6 Assumptions
The study is done on the following assumptions.

- Data received is complete

The researcher will assume that the data collected from secondary sources is complete and comprises of all the necessary data relating to the subject matter.
The data received is reliable.

Due to time constraints and limited means to verify secondary data. The researcher will assume
the data collected from secondary sources, especially from government agents to be reliable
and free from manipulation. Unless the is reasonable grounds to doubt and discard this assumption.

1.7 Delimitations of the study
The study will be done covering 9 SADC countries among the 16 member states. The countries
where conveniently selected based on their location. The data used was obtained from the
World bank website. Focus was put on a time period of 6 years due to data restrictions. Further
than six year the researcher found it difficult to find the requisite data.

1.8 Limitation
- Time constrains, the researcher is depended on the evenings to collate and dedicate
evening for the study. Despite the fact that the study had to be done by a specified date.
- Financial constraints are the greatest limitation as the research is self-financed by the
researcher. The research is working under a less than minimum budget.
- The researcher faced challenges in obtaining the requisite data in the format needed.
The researcher could not visit the countries to collect the required data and hence was
restricted to going through international organisations website to obtain secondary data.
The data used was obtained from the world bank indicators.

1.9 Summary
The chapter gave a background of the study and outline major boundaries that will give
guidance in the study. These include delimitations of the study, problem statement, objectives
and research questions. Chapter two will provide literature review, both empirical and
theoretical literature review.
CHAPTER TWO
LITERATURE REVIEW

2.0 Introduction
The chapter will analyse literature relating to the subject of the study. The literature review will contain both literature and empirical review. Empirical literature review will cover studies that were done in the past and discuss the findings of other researchers.

2.1 literature review
This section will discuss theories that relate to the subject of this study. Due to the fact that the research will be deducted to the Zimbabwean situation the literature will basically relate mostly to Zimbabwe. The conceptual framework presented below basically relates to the Zimbabwe.

2.1.1 Conceptual framework
The second half of the last century saw an increase in the life expectancy in Sub-Saharan Africa from 40.4 years in 1960 to 54.16 years in 2010 (World Bank, 2010). The questions have continued to rise as to how there can be increase in life expectancy and decline in the mortality rates. Many studies have been done to determine how life expectancy can be increased (Stolnitz, 1975). Other authors have attributed the improvements in life expectancy in economic improvements and elimination of famines (Krishnan, 1975). Zimbabwean health system is made up of 1,848 institutions, which are composed of 214 hospital and 1,634 primary health care facilities (National Health Strategy for Zimbabwe 2016 -2020). The ministry is one of the priority ministries coming out among the top 3 in the National Budget allocation. However, the government of Zimbabwe have been falling short of the of the Abuja declaration which Zimbabwe is a signatory to. The Abuja declaration requires that Health be allocated with at least 15% of the total government expenditure (Doro, chodoko, Sakuhuni and Gwaindepi, 2011). This however, may not necessarily mean that the health system has been underperforming. Elola et al., (1995), argues that a better health system is one that for the same level of resources, it produces higher outcomes, or generates the same level of outcomes while utilizing less resources.

The resources for health systems are measured mainly as health expenditure (that is, Total health expenditure per capita, health expenditure as a percentage of GDP, proportion of government health expenditure in the total health expenditure), number of hospital beds, number of physicians and number of computed tomography scanners (Or, 2000: Ramesh and Mirmirani, 200, Baltagi and Moscone, 2010). This study will consider health expenditure as an indicator for health input.
Health system output are generally expressed in terms of life expectancy or by mortality indicator, these indicators are considered to be good proxies for measuring health status of a population (Show et al, 2002; Cutler et al., 2006; Or, 2000; Pocas and Soukiazis, 2010). This study will take life expectancy for the total population as a proxy for health outcomes.

**Grossman Model (1972)**

Grossman (1972) focusing on individuals, modelled how individual behaviours impact individuals’ level of health and life span. This way Grossman modelled a miniature health system which takes into account other factors that contributed to better health status. He argued that an individual will initially have a certain stock of health, which can deplete or can be replenished over time by an individual behaviour for example medical care, diet, exercise and many others. This shows that health is not an independent variable but rather a dependent variable of a number of contributing factors and individuals can actually incur expenditure that will contribute to their health status. These choices would not only affect the person health stock but also the life span of the individual (Jacobson, 2000). The stock of health kept in balance or increased through purposeful investment in health (Grossman 1972). The diagram below depicts this concept;

![Figure 2.1 Grossman model Adopted from Grossman 1972](image)

**Figure 2.1 Grossman model Adopted from Grossman 1972**

This model can be adopted for a nation and used to analyse the life expectancy based on the inputs into the health system.

**Social Model of Health**

The work of Dahlgre and Whitehead (1991) further simplifies the work of Grossman (1972) by developing the Social Model of health. This model goes further to allow the inclusion of macroeconomic variables, the availability of public goods such as sanitation and the provision
of goods and services that are essential such as water, food and health care. The theory of social justice concentrates on fairness and equitable treatment for all which may determine the spending philosophy of the nations (Ruger 2004) This allows the inclusion of the government as a major contributor to health status at a societal level. McDavid Harrison and Dean (2011) argues that the ability of the Social model for health to depict essential variables that contribute to higher quality health makes it a much more suitable theory and model to explain the health care system. Braveman P, Egerter S, and Williams (2011) concurs that the model is useful in shaping Public Health Programs and National policies that level up access to key variables to higher quality health. This model is in line with the current Global health goals which were adopted by the united nations which advocate for health in all policy.

**Health Production Model**

The health production function by Wibowo and Tisdell (1992) then adds that the non-medical inputs to health have not been given adequate attention. They developed a model for preventive health programs which incorporate health promotion, nutrition and investment in water supply and sanitation among others. In summary the suggested that a health production function must describe the relationship between health inputs which include medical and non-medical and the resulting health outcomes. The function must show the interaction of inputs in order to produce a particular level of health and changes in health status if health inputs change or their combination change. Also, Fayissa and Gutema (2005) developed the health production function for Sub-Saharan Africa borrowing from the Grossman (1972) theoretical model. The model treats environmental, economic, and social factors as inputs to the health production function. Environmental and socio-economic factors such as income per capita, illiteracy rate, food availability, ratio of health expenditure to GDP, urbanization rate, and carbon dioxide emission per worker are specified as determinants of health status.

**Sources of health Expenditure**

The relationship between health expenditure and life expectancy in not one that which can be observed instantaneously and tends to be bidirectional. There is some reverse causality in the relationship (kunze, 2014). The phenomenon of health care expenditure has attracted a significant amount of interest over the years since the seminal work of Baumol (1967). The Zimbabwe National Health Financing Policy 2016 classify health expenditure in three categories mainly, Government health expenditure, Private health expenditure and external health expenditure.
Health expenditure (HE) = \( f (\text{government health expenditure (GHE)}, \text{Private health expenditure (PHE)}, \text{External health expenditure (EHE)}) \)

The major cost categories that are incurred by the government are Medicines and commodities, Human Resources, Programme management, Infrastructure, Logistics and Governance (HSRM Report 2018). These expenditures are coordinated to ensure that the health status of the nation is improved.

\[ \text{Health expenditure (HE)} = f (\text{Medicines and Commodities (MC), Human resources (HR), Programme Management (PM), Infrastructure (I), Logistics (L), Governance (G)}) \]

**Government health expenditure**

According to the Zimbabwe health financing strategy (ZHFS) 2017, Government health expenditure in three major ways which are the central general revenue, local government revenue and earmarked tax revenue. The health sector resource mapping report of 2017 argues that 78% of the government expenditure on health comes from the central government, 16% is contributed by the local authorities and the remainder comes from earmarked taxes especially through National Aids Council. A greater proportion of the government expenditure on health is mostly on Labour costs leaving very little on non-wage inputs (ZHFS, 2017). The health sector resource mapping reports notes that there a large variance between budget allocation and actual expenditures.

Government’s uses a number of mechanisms to carry out their functions these can be financial on nonfinancial comprising of financing, direct provision, regulation and providing information (Musgrove, 1996). According to the ZHFS (2017), government health expenditure is generated through public expenditure generated through taxes (that is, general taxes and earmarked taxes) and government contribution as an employer to civil servant’s private health insurance. The national health counts 2015 suggested that the government contributed 34.7% of the total health expenditure, that is, 13.3% as an employer and 21.4% from the government budget allocation.

**Private health expenditure**

Private health expenditure represents individuals and the private sectors investment in health to augment the existing stock of health as described by Grossman (1972). The ZHFS (2017) states that private Health expenditure have four major components which are private
employer’s contributions to employer’s health insurance, household out of pocket payments, household contributions to health insurance and non-profit institutions. These contribute approximately 15.1%, 23.8%, 1.3% and 0.3% respectively according to the National Health Accounts 2015. The Zimbabwean economy is highly informal therefore a greater proportion of the population have not been able to purchase health insurance. Approximately 10% of the population is covered by the private insurers which are in excess of 30 (ZNHFP 2016).

**External funding**

In some cases, funds allocated to the health sector may not be adequate to fund the entire health expenditure prompting the aid to come from international development partners. These international development partners in Zimbabwe include Unicef, Global fund, USAID and many others (HSRMP 2018). The funds are mostly targeted to programs such as HIV/AIDS, malaria, reproductive, maternal and neonatal child health (RMNCH) and tuberculosis (TB). With a large chunk of the donation going towards drugs, medical supply and other medical commodities, while the other expenditure goes towards other expenditure categories (HSRMP 2018).

**Life expectancy**

According to the OECD (2011) life expectancy is the average number of healthy years that a person is expected to live given the prevailing mortality rate remain constant. The calculation of life expectancy differs from country to country. Life expectancy is affected many variables that include investment in good health (Grossman 1972). Becker (2007), adds that analysis of health as human capital helps to link health to education and other categories of human capital. This also agrees with Grossman (1972) who argued that the stock of health which determine the life span of an individual is affected by one’s behaviour and environment among other factors. Therefore, the expenditure on health can be evaluated to determine its impact on the nation’s health status using average life expectancy.

**Education**

Grossman (1972), among his variable education was included as one of the most important variables that had an impact on an individual’s stock of health. Education directly and indirectly play a role for better health outcomes. Education's direct role is that it gives awareness to the best practices of health care, sanitation and hygiene which an individual can adopt (Caldwell,
1979). In directly education improves one’s economic status, which means this mean one would be able to afford, therefore, will invest in health care. Economic resources become one of the many links between health and education (Ross and Wu., 1995), one may the argue that disparities in income and working conditions resulting education may cause increasing health disparities.

### 2.2 Empirical literature review

This section presence the empirical literature from the works of other researchers. The empirical literature is discussed based on the objectives of the study.

**Impact of Health expenditure on life expectancy**

In similar studies done by various authors a number of outcomes where observed with the majority agreeing that health expenditure has an impact on life expectancy. In a study done by Berger and Messer (2002) which they wanted to determine the health outcomes in 20 countries during the period 1960 to 1992 making use of OECD data. They employed the Health Production Model to analyse the data. It was found that public health finance share of total health expenditure was associated with mortality rate which was high. Also, health care expenditures were associated with low mortality rate in developed countries. Breyer and felder (2006) also supported the same notion that government expenditure had a bearing on life expectancy. However, they did use the cost of dying in their study instead of just using the general health expenditure. They also argued that health expenditure increases as the one approaches death. Bjorner, Arnberg (2012) also studied the impact health expenditure focusing on terminal costs in Denmark. Using data from period 2000 to 2009, which covered a random sample of 10% of the population in Denmark. 80% of the health expenditure included treatment in hospitals, healthcare provided by specialists and subsidies to prescribed medication. Results of the study showed that terminal costs where postponed by an increase in life expectancy.

In a study done in Nigeria by Sanya and Yemisi (2017) where they analysed the relationship between the health expenditure distribution and life expectancy. Employing the Vector Autoregressive Distributive Model for estimation, they observed that higher shock was attributed to the changes in the share of the government expenditure. They therefore, concluded that government expenditure had a significant impact on life expectancy. Bokhari, Gai and Gottret (2007) in a study done using 127 observations obtained from World Bank and other international organisations, concluded that government health expenditure is just as important as economic growth in evaluating the implications on life expectancy.
Deshpande, Kumar and Ramaswami (2014) examined the relationship between health expenditure and national life expectancy to see if a relationship exists. Their aim was to have a perspective on how efficiently can quality of health be increased. Using single regression, they discovered that positive relationship indeed existed. Therefore, increasing health expenditure will indeed result in increased quality of health.

In a study done by John C. Anyanwu and Andrew E.O Erhijakpor (2006) on the relationship between health expenditures and health outcomes in Africa they found out that health expenditure had a significant impact on infant and under five mortality rates. They used a sample of 47 African countries between the period 1999 to 2004. Health expenditure significantly reduced infant mortality and under five mortality rates. This showed that health expenditure increased life expectancy at birth and of under five children.

Micah A. E., et al, studied the trends and drivers of government health spending in sub-Saharan Africa from 1995 to 2015. They studied data on domestic government expenditure of 46 countries in the sub-Saharan Africa. They examined factors that were associated with government health expenditure using a regression model and other factors were examined using Shapley decomposition. They discovered that health expenditure had a significant impact on life expectancy.

**Impact of education on life expectancy**

In recent times many researchers have changed their requirements in identifying the causal impact of schooling on health and mortality in the United States (Mazunder, 2008). Lleras-Muney (2005) using census data examined the impact of the changes done in the compulsory schooling laws between 1915 and 1939 in the United States that affected all students who were above 14 years of age. The study indicated that an additional year in school significantly reduced the probability of dying in the 10 years that followed. In another study done by Black et al. (2016) argues that the mortality rate is affected by a number factors that are not entirely estimated changing educational attainment.

**2.3 Summary**
The chapter covers theoretical and empirical literature relating to the topic of the study. The next chapter will cover methodology used to conduct the study.
CHAPTER THREE

METHODOLOGY

3.0 Introduction
This chapter presents the methodology the researcher used in analysing the data. The theoretical model is presented first then the empirical model. Other data analysis techniques are also discussed which the researcher used in treating the research data. The model used is for panel data as the researcher intends to deduct a conclusion for Zimbabwe from the results.

3.1 Research design
The research makes use of quantitative methods and the uses an econometric model to evaluate the association between Life expectancy and health expenditure in the SADC region. Data collected from secondary data which was primarily not collected for the purpose of the research.

3.2 Theoretical model
The study will employ the Grossman model. The Grossman model successfully captures how individuals invest in their health and consequently affecting their life span. The Grossman model simplifies the health system, at the same time taking a broader view as to the factors that affect the health outcomes. The dependent variable or the main health outcome of the model is depicted to be directly influenced by then such variables as health care, education, income, employment, nutrition and living conditions, as shown in the figure below;

![Grossman model](image)

Figure 3.1 Grossman model

Improvements in these variables will increase life expectancy for an individual. At a national level improvement in these variables will increase national life expectancy. The proxies for
these variables may also different for national level from those of an individual. Of interest to this study is health care which will be represented by health expenditure. a simple illustration of the model is shown by the equation below;

\[
\text{Health inputs + individual stock of health = life expectancy}
\]

Figure 3.1 shows health services, education, living conditions, income, employment and nutrition as inputs to the stock of health. For the purposes of this research the research will concentrate on health services and education due to unavailability of data for these factors. The empirical model that will be adopted for this study will however concentrate on health expenditure, physicians, nurses and midwifery and hospital beds to evaluate their contribution to life expectancy.

### 3.3 Empirical model

Simple regression model is one of the models used to analyse the relationship between variables. The simple regression model can be stated as below;

\[
y = \beta_0 + \beta_1 x + \mu
\]

where; \( y \) = represent the dependent variable

\( x \) = represents the independent variable

\( \mu \) = is the error term in the equation

The simple regression model can be used to analyse the relationship between only one variable. However, when the variables increase there is need to adjust the model in order to accommodate the other variables. In this case the multiple regression model is then used. The multiple regression model is stated below;

\[
y_i = \beta_0 + \beta_1 X_i + \ldots + \beta_k X_k + \mu
\]

in this case the variable reach to number \( k \), all the variables will be regressed against the dependent variable \( y \).

The model that will be used for this study will be adjusted simple regression model. The model will be stated as below;

\[
LE = \beta_0 + \beta_1 CHE + \beta_2 LR + \beta_3 NM + \beta_4 P + \beta_5 HB + \epsilon
\]

Where
LE is life expectancy, which is a proxy for Health Outcomes

Explanatory Variables

CHE – Capital expenditure

LR - literacy rate which is a proxy for education

PH – Physicians per 1000

NM – Nurses and Midwifery per 1000

B - hospital beds per 1000

3.4 Definition and justification of the variables in the model

3.4.1 The dependent variable

Life expectancy is the dependent variable measured at birth. The life expectancy is in number of years one is expected to live from birth in given country assuming the existing mortality rates remain constant (OECD 2011). Just as in the Grossman model (1972) life expectancy depends on the various inputs that are added in to the health system. Life expectancy represent the health outcome or health status obtained by a country after expending or investing in health. Life expectancy is the most appropriate measure of health status as it calculated using all mortality rates applicable in a given country.

3.4.2 Control variables

Education

Education for the purpose of this study will be represented by literacy rate per each year under the study. Education tend to affect individual’s choices and health seeking behaviour. Therefore, it will be used as a control variable as it is not the focus of the study.

Factor inputs (Physicians, Hospital Beds and Nurses and Midwifery)

Factor inputs considered in this study are physicians, hospital beds and nurses and midwifery. These are the factors that the researcher considered as major contributors to the health system.

3.4.3 Interest variables

Health expenditure

Health expenditure represent health care in the Grossman model (1972), this will be our interest variable. However, the study aims to find the contribution of different expenditure categories
to health outcomes. Health expenditure will be expanded into many variable, which are Capital expenditure, Employment Expenditure, Medical Consumable Expenditure, Program Management expenditure and Other Health Sector expenditure.

3.5 Diagnostics tests
A range of diagnostics tests will be used to validate the data. These will be done with the aid of Data analysis package, STATA. The test will be done to ensure that none of the principles needed to be satisfied are left unsatisfied. The results of the diagnostics tests used will be discussed in detail in chapter four. Test which will be conducted include Multicolinearity test, Autocorrelation test and Heteroscedasticity tests.

3.6 Estimation procedure
The study will employ the Ordinary Least Squares (OLS) as an estimation procedure. This will also be by the aid of STATA.

3.7 Data sources and problems
Data used for this study was obtained from the ministry of health and child care, Zimstats, World Bank website and WHO website.

The data collected was not primary data therefore it requires to be formatted to suit the needs of the needs of the researcher. The data was also obtained under stringent conditions where the researcher was only supposed to use the data for the purposes of the research only as the data was considered confidential.
CHAPTER FOUR
DATA ANALYSIS, INTERPRETATION AND PRESENTATION

4.0 Introduction
This chapter presence the data analysis, interpretation and presentation of the results. Data used for this research was analysed using Stata and was obtained from World bank website. The chapter will give the descriptive data analysis, diagnostics test results, estimation results and finally results interpretation and discussion. This chapter will present, analyse and interpret the relationship between health expenditure and life expectancy. The results presented in this chapter will be used to arrive at a conclusion on the subject matter. Finally, the chapter will give a summary of the analysed data and presented results.

4.1 Descriptive Statistics
This section of the chapter will give descriptive or summary statistic of the data collected for the research. The data was collected for 9 countries in the southern Africa which are Zambia, Zimbabwe, South Africa, Botswana, Namibia, Lesotho, Mozambique, Madagascar and Malawi. Table 4.1 below presents the statistics of these countries.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Obs</th>
<th>Mean</th>
<th>Std. Dev</th>
<th>Min</th>
<th>Max</th>
</tr>
</thead>
<tbody>
<tr>
<td>CountryName</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Time</td>
<td>54</td>
<td>2012.5</td>
<td>1.72386</td>
<td>2010</td>
<td>2015</td>
</tr>
<tr>
<td>Life Expectancy</td>
<td>54</td>
<td>59.203</td>
<td>3.91323</td>
<td>50.826</td>
<td>65.846</td>
</tr>
<tr>
<td>literacy Rate</td>
<td>54</td>
<td>77.723</td>
<td>13.4947</td>
<td>44.8</td>
<td>94.36792</td>
</tr>
<tr>
<td>Current Health expenditure</td>
<td>54</td>
<td>197.4</td>
<td>206.888</td>
<td>16.8744</td>
<td>597.3594</td>
</tr>
<tr>
<td>Nurses and Midwifery</td>
<td>54</td>
<td>1.6931</td>
<td>1.79322</td>
<td>0.218</td>
<td>6.363</td>
</tr>
<tr>
<td>Physicians</td>
<td>54</td>
<td>0.2348</td>
<td>0.21715</td>
<td>0.019</td>
<td>0.767</td>
</tr>
<tr>
<td>Hospital beds</td>
<td>54</td>
<td>1.8667</td>
<td>1.00939</td>
<td>0.2</td>
<td>3.5</td>
</tr>
</tbody>
</table>

The table above was generated through the aid of STATA using the data collected from 9 countries. The table shows how the data is distributed in the data set. The mean, standard deviation, min and max values for each variable were calculated. The dependent variable, Life expectancy has a mean of 59.20 year and a standard deviation of 3.91 years with a minimum and maximum value of 50.83 and 65.85 respectively. Current Health expenditure has a mean of 197.4 and a standard deviation of 206.89 with a minimum value of 16.87 and maximum value of 597.36. Literacy rate which is a proxy for education has a standard deviation of 13.49 from a mean of 77.72, with a minimum value and maximum of 44.8 and 94.37 respectively. The number of Nurses and Midwives per 1000 had a minimum value of 0.218 and a maximum
value of 6.36 making up a mean of 1.69 with a standard deviation of 1.79. Physicians per 1000 had a standard deviation of 0.22 from a mean of 0.23 with minimum and maximum values of 0.019 and 0.767 respectively. Hospital beds per 1000 had a mean of 1.87 and a standard deviation of 1.009 with a minimum value of 0.2 and a maximum value of 3.5

4.2 Diagnostics tests
The researcher also conducted some diagnostics test for the data He obtained from the website. Below are the test conducted by the researcher.

Multicollinearity Test

The Table below presents results for Multicollinerity test done on the data.

Table 4.2 multicollinearity results

<table>
<thead>
<tr>
<th>Variables</th>
<th>VIF</th>
<th>1/VIF</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nurses and midwifery</td>
<td>18.25</td>
<td>0.0548</td>
</tr>
<tr>
<td>physicians</td>
<td>15.37</td>
<td>0.0651</td>
</tr>
<tr>
<td>current health expenditure</td>
<td>6.21</td>
<td>0.161</td>
</tr>
<tr>
<td>hospital beds</td>
<td>2.21</td>
<td>0.3431</td>
</tr>
<tr>
<td>literacy rate</td>
<td>2.25</td>
<td>0.444</td>
</tr>
<tr>
<td>Mean VIF</td>
<td>9.00</td>
<td></td>
</tr>
</tbody>
</table>

The mean VIF of 9 is between the acceptable rage of 5 to 10 proving that there is no multicollinerity problem between the variables under study. The explanatory variable therefore has negligible impact on the estimation of the model.

Heteroskedasticity Test

White Heteroskedasticity test was done using STATA the table below shows the results.

Table 4.0.3 Heteroskedastity test results

<table>
<thead>
<tr>
<th>Source</th>
<th>chi2</th>
<th>df</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Heteroskedasticity</td>
<td>32.07</td>
<td>20</td>
<td>0.0426</td>
</tr>
<tr>
<td>Skewness</td>
<td>10.04</td>
<td>5</td>
<td>0.0742</td>
</tr>
<tr>
<td>Kurtosis</td>
<td>0.02</td>
<td>1</td>
<td>0.889</td>
</tr>
<tr>
<td>Total</td>
<td>42.13</td>
<td>26</td>
<td>0.0238</td>
</tr>
</tbody>
</table>

chi2(20) = 32.07
Prob > chi2 = 0.0426
The results of the test show a P value probability of 0.0238 which is less than 0.05 therefore Ho can be rejected which implies existence of homoscedasticity. Ha is then accepted which implies the existence of heteroscedasticity. The researcher concluded that there is no systematic relationship existing between the squared residuals and the explanatory variables hence the assumption of heteroscedasticity is verified to exist in the model.

4.3 Estimation results
Linear regression is employed to analyse the relationship that exist between a dependent variable and an independent variable. For the estimation of the results Ordinary least squares method was used though STATA a statistical package. The table below presence the results from the regression analysis.

### Table 4.4 Regression Output

| Life expectancy | Coef.  | Std. Err. | t     | P>|t| | [95% Conf. Interval] |
|-----------------|--------|-----------|-------|-------|----------------------|
| literacy rate   | 0.17377| 0.0386    | 4.5   | 0.0000| 0.0961034 0.25144   |
| Current Health Expenditure | 0.01223 | 0.0042 | 2.92 | 0.0050| 0.0038177 0.02065 |
| Nurses and Midwifery | -0.89185 | 0.8276 | -1.08 | 0.2870| -2.555841 0.77214 |
| Physicians      | 8.29666 | 6.2704    | 1.32  | 0.1920| -4.310825 20.9041  |
| Hospital beds   | -4.55857 | 0.5875 | -7.76 | 0.0000| -5.739771 -3.3774  |
| _cons           | 51.3536 | 2.5392    | 20.22 | 0.0000| 46.24814 56.4591  |

### Regression Summary

<table>
<thead>
<tr>
<th>Source</th>
<th>SS</th>
<th>df</th>
<th>MS</th>
<th>Number of obs</th>
<th>54</th>
</tr>
</thead>
<tbody>
<tr>
<td>F( 5, 48)</td>
<td>15.78</td>
<td></td>
<td></td>
<td>Prob &gt; F</td>
<td>0</td>
</tr>
<tr>
<td>Model</td>
<td>504.662</td>
<td>5</td>
<td>100.932</td>
<td>R-squared</td>
<td>0.6218</td>
</tr>
<tr>
<td>Residual</td>
<td>306.945</td>
<td>48</td>
<td>6.39468</td>
<td>Adj R-squared</td>
<td>0.5824</td>
</tr>
<tr>
<td>Total</td>
<td>811.606</td>
<td>53</td>
<td>15.3133</td>
<td>Root MSE</td>
<td>2.5288</td>
</tr>
</tbody>
</table>

Model interpretation

Econometric model employed in the study is stated below

\[
LE = \beta_0 + \beta_1 CHE + \beta_2 LR + \beta_3 NM + \beta_4 P + \beta_5 HB + \varepsilon
\]

Therefore, when the calculated coefficients are substituted into the model it becomes:

\[
LE = 51.35 + 0.012 CHE + 0.174 LR + (-0.89)NM + 8.30 P + (-4.56) HB
\]
The model showed an R-Squared of 0.6218 and an adjusted 0.5824 this means that the model is fit to explain the relationship between the dependent variable and the independent variables. This therefore means the model can reliably estimate the impact of the independent variables on life expectancy. The Prob > F value of 0.0000 meaning that the model can estimate the results at 95% confidence interval.

### 4.4 Results interpretation

#### Health expenditure on life expectancy

Health Expenditure as represented by Current Health Expenditure contribute 1.2% to life expectancy at 99% significance level as shown by a P value of 0.005. This means a dollar spent on health will associated with a 1.2% on the Life expectancy of the general population. That is the change that will be attributed to health expenditure will only be 1.2%. This means that Life expectancy is affected to a less extent by the total and general expenditure on Health. This as a national level disregarding the source of the health expenditure.

#### Education on life expectancy

Literacy Rate is used as a proxy for education to assess the relationship that exist between life expectancy and education. The regression results show that Literacy rate has a coefficient of 17.38%. This means that for every extra year spent on education, life expectancy is associated with a proportional increase of 17.38% at a 99% confidence interval as shown by a P value of 0.000. A nation can therefore increase life expectancy by increasing literacy rate of the nation or improving the education system of its citizen.

#### Physicians per 1000 population

The number of physicians per each 1000 people has an insignificant contribution to the life expectancy. Although it was not the primary interest of the study the results proved that its not as significant as a contributor to life expectancy with a coefficient of 8.297 with a P value of 0.192 which approximately at 80% confidence interval.

#### Nurses and midwifery and Hospital bed on health expenditure.

Nurses and midwifery and Hospital bed have -0.892 and -4.559 respectively and also P values of 0.287 and 0.000 respectively. This means that nurses and midwifery they have insignificant impact on the dependent variable. Changes in their distribution is insignificantly associated
with life expectancy at 95% confidence interval. This means increase in these variables will have negative impact on life expectancy. On the other hand, hospital belts are a significant contributor to life expectancy at a 99% significant level.

4.5 Discussion
The results of the study basically say that there is significant relationship between life expectancy and health expenditure. Meaning increasing health expenditure will lead to improvement in life expectancy or health outcomes in general. This is in agreement with the studies done in the past, for example, the one done by Berger and Messer (2002) who did a similar study on 20 OECD countries. However, the researcher ended up considering current health expenditure alone due to data problems such as multicollinearity and homoscedasticity. This resulted in data relating to that being disregarded for the study. Past study established significant relationship between government expenditure and life expenditure (Berger and Messer, 2002; Breyer and felder, 2006; Gai and Gottret, 2007). They concluded that Health expenditure was as important as economic growth in determining life expectancy.

The impact of education per the study results is consistent with what other researcher have come to conclude. Mazunder (2008) and Lleras-Muney (2005) also found out that literacy rate had a positive relationship with life expectancy. This also is in agreement with the model developed by Grossman (1972). Which argued that education was an important input in to an individual’s stock of health to improve their life expectancy

Physicians also proved to be insignificant in improving a nations health status, while nurses and hospital beds had a negative relationship with health outcomes. The increase in physicians will definitely result in improvements in health status as measured by the life expectancy.

4.6 Chapter Summary
The chapter has presented and discussed results from the regression output. The study in this chapter established the relationship that exist between the dependent variable life expectancy and independent variables literacy rate and physicians as positive while a negative relationship exists with nurses and midwifery and hospital beds. The next chapter will give a summary and conclusions from the study.
CHAPTER FIVE

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

5.0 Introduction
This chapter gives a summary of the project, conclusions and recommendations. Project summary gives briefly the findings of the project and goes on to give conclusions and recommendations. The chapter marks the end of the project.

5.1 Summary
The research was aimed at primarily determining the relationship that exist between health expenditure and life expectancy. Life expectancy was representing the health status of a country. It is of paramount importance to establish this relationship and understand the extent to which the dependent variable life expectancy is influenced by the independent variable health expenditure. Other variables were also considered by the researcher as they have a bearing on life expectancy. With reference to the Grossman model (1972) the researcher also considered literacy rate as proxy for education, physicians per 1000, nurses and midwifery per 1000 and hospital beds per 1000 as factors that affect life expectancy.

The research established that there is a significant relationship between health expenditure and life expectancy. Expenditure on health which was incurred in the nine countries which were under study had a bearing on the life expectancy of the citizens within the region. On average of 1.2%. this in summary means though health expenditure has influence on life expectancy but the are other factors in the SADC region which have influence on life expectancy.

Education was also established to be a significant factor in improving life expectancy as it had a coefficient of 17.37%. This in summary means in the SADC region educations influences life expectancy.

On the other hand, Physicians distribution had a positive relationship with life expectancy however they were statistically insignificant. Similarly, nurses and midwives and hospital bed had a negative relationship with life expectancy and also statistically insignificant. The finding agrees with previous study done in other countries such as Nigeria (Sanya and Yemisi, 2017) and United States (Mazunder, 2008). Hospital bed had a negative association with life expectancy, while it was statistically significant at a 99% confidence interval.

5.2 Conclusion
The study found out that health expenditure has a significant impact on life expectancy however there are a number of other factors that contribute to life expectancy. This is shown
by a constant coefficient of 51.35. The contribution of other factors should be carefully considered in order to improve life expectancy in the SADC region. These factors that are beyond the model used by the researcher they are significant to improve health outcomes. Although there was emphasis on increasing health expenditure the researcher concluded that there are other factors which have greater influence on life expectancy other that health expectancy alone. This is indicated by a high coefficient figure for the constant. In the SADC region, deductively in Zimbabwe health expenditure is not the only most important factor that should be considered in improving the health status of the country. Factor inputs such as physicians should be considered an improved their numbers and their distribution as they are a major contributor to the health outcomes. The researcher concluded that higher literacy rates where associated with higher life expectancy this is possibly due to increase in the understanding of the need for healthy living. Higher literacy rate may also improve health seeking behaviour which may result in improved health status and increased life expectancy.

5.3 Recommendations

In the light of the above conclusion, it is recommended that countries in the SADC region strive to increase expenditure on health services and also aim to increase the number of physicians per 1000. While this is important expedition of Health In All Policy implementation will help to improve health outcomes as there would be a holistic approach towards improving the health of the region. Specifically, to Zimbabwe Health In All Policy will help the government to partner with the private sector in the providing some health services and also improving the environment for to facilitate health living.

Based on the results of the research, the researcher recommends that efforts be increased to continue educating the general public. Basic education should be made available to every citizen. This has a bearing on both the income and the health seeking behaviours of individuals. Increased literacy mean better employment opportunities and better income.

The researcher also recommends the governments especially that of Zimbabwe to improve the doctor patient ratio by reducing brain drain and skills flight. The government may do this by improving the working conditions and incentivise those that will be working in the remote areas. This will help the governments as it drives towards Universal Health Coverage.

Recommendation is also made for the government and other health institutions to make health data readily available for research purposes this will facilitate stakeholder to engage the
government when they feel there are areas that the government may need assistance. Data availability is also important for research based policies and decisions.

The study recommends that further researches be done on the components of health expenditure to determine the types of health expenditure that directly influences life expectancy.
Reference list


National health strategy for Zimbabwe 2016 -2020


Who Africa, Africa region expenditure atlas, November 2014


Zimbabwe national health financing policy 2016

**Data source**

WORLD BANK DEVELOPMENT INDICATORS
WORLD HEALTH ORGANISATION WEBSITE
ZIMSTATES WEBSITE