EFFECT OF RESIDENTS' HEALTH INDICATORS ON ECONOMIC GROWTH IN KENYA

BY

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DECLARATION

Declaration by Candidate

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DEDICATION

This thesis is dedicated to my dear parents, family and colleagues who have been very supportive and have encouraged me to reach this far.

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First, I would like to acknowledge the Almighty God for helping me reach this far. I also acknowledge my supervisors, Dr. Richard Siele and Dr. Kipruto Kemboi, for their contributions and advice which brought me to the completion of this study.

ABSTRACT

Economic growth is important as it measures the prosperity of a nation which indeed increases the output per person and factors like human capital, physical capital and technological change, which are the main drivers towards achieving economic growth. Kenya's Vision projected an economic growth rate of 10 per cent per annum from 2008 to 2030, which is yet to be achieved to date. The purpose of this study was to establish effect of residents' health indicators on economic growth in Kenya. The specific objectives of the study were to determine the effect of: healthcare expenditure, life expectancy, nutrition status and access to health services on economic growth in Kenya. The study adopted the endogenous growth theory and incorporated key health indicators into the model as a function of human capital. Research design employed was explanatory research design and it relied on secondary data from World Bank from 1987 to 2018. The study employed Johnsen co-integration test, Error Correction and multiple regression models. The results indicated that the coefficient of nutrition status was -5.6256, $p = 0.042 < 0.05$, which was negative and significant at 5 percent level of significance. This implied that in the long run, an increase by one percent of coefficient nutrition status would result in a reduction of GDP growth rate by 5.6256 percent. Applying regression model, the results revealed that coefficient of life expectancy was 1.3292, $p = 0.017 < 0.05$ which was positive and significant at 5 percent level. This implied that for every one percent increase in coefficient of life expectancy, GDP growth rate could increase by 1.3292 percent. Coefficient of nutrition status was -2.072, $p = 0.019 < 0.05$ which was negative and significant at 5 percent level. This implied that for every one percent increase in coefficient of nutrition status, GDP growth rate would fall by 2.072 percent. Considering that increased life expectancy had direct effect on increase in economic growth rate, Kenyan government could put in place policies promoting citizen's health. Suitable social sector policies and government interventions are required to increase life expectancy and consequently, the economic growth rate. Furthermore, there is also a need to involve health human force in macro and micro policy-makings and critically examine other determinant of health care expenditure.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

ABBREVIATIONS AND ACRONYMS

ADF	Augmented Dickey Fuller
AR	Autoregressive model
FAO	Food and Agriculture Organization
GDP	Gross Domestic Product
HIV/AIDS	Human Immune Deficiency Virus/Acquired Immune Deficiency Syndrome
IMF	International Monetary Fund
KAIS	Kenya Aids Indicator Survey
KDHS	Kenya Demographics Health Services
KHHEUS	Kenya Household Health Expenditure Utilization Survey
KIPPRA	Kenya Institute for Public Policy Research and Analysis
KNBS	Kenya National Bureau of Statistics
MOH	Ministry of Health
NACC	National Aids Control Council
NASCOP	National Aids and STI'S Control Programme
OECD	Organization for Economic Cooperation and Development
OLS	Ordinary Least Square
PEPFAR	The President Emergency plan for Aids Relief
SDG	Sustainable Development Goals

SHC	Social Health Services
SHIF	Social Health Insurance Fund
UHC	Universal Health Services
UNAIDS	United Nation Programme for AIDS
UNDP	United Nation Development Programme
WHO	World Health Organization

OPERATIONAL DEFINITION OF TERMS

Access to Health Services: It means that the population has access to the health services that they need, without financial hardship as a share of current health expenditure. It is under the SDG 3.8 of achieving universal health coverage, access to quality essential healthcare services in order to end poverty by 2030 (proxy for social health insurance).

Economic Growth- It is an increase in the production of goods and services over a specified period of time. GDP is the best way to express economic growth. Economic growth is measured as the annual percent change of gross domestic product of the total value of goods and services at current prices.

Healthcare Expenditure- It is the sum of public and private health expenditure. It covers the provision of health services (preventive and curative), family planning activities, nutrition activities and emergency. Proxy for domestic government health expenditure as percentage of GDP.

Life Expectancy- It is the Number of years an individual is expected to live from Birth to Death. It is an important human capital in determining the GDP of a country (WHO 2019).

Nutrition Status- It is the intake of food to the body's dietary needs, nutrients, enough energy with a well- balanced diet which leads to optimal health. Prevalence of under nourishment (Calories per capita/day) will be used as a proxy for Nutrition Status.

Malnutrition leads to morbidity and mortality which hinders productivity and loss in human capital eventually leading to slow Economic growth.

CHAPTER ONE

INTRODUCTION

1.1 Overview

This chapter presents the background to the study, statement of the problem, objectives of the study, research hypothesis, significance of the study and scope of the study.

1.2 Background to the Study

Globally, economic growth measures the population living standard which relates to an increase in output in a nation. Salai-Martin et al (2005), distinguished the determinants for economic growth and these factors were; Development of human capital, physical capital, technology, education and training and foreign Investment. These factors were utilized in some countries, while in other countries they were not utilized, which led to differences in growth between poor countries and rich countries in terms of development according to Rostow (1959). Economic growth differs amongst nations, in which we have developed nations and developing nations due to their GDP growth. According to Lewis, economic growth means an increase in the country's national output to raise the standard of living in the country's economy. The concept of economic growth is influenced by various factors in the economy like increased investment, increase in tax revenue and increased consumption which is aim at meeting certain macroeconomic objective. The macroeconomic objective set to be achieved with a stable economic growth would be to reduce unemployment, reduce poverty, low inflation and improved tax revenues for the economy. According to Romer P., (2007) economic growth should not only capture the increase in countries output but improvement in technology and also technological change in production. Countries which have embraced improvement in technology have seen mass production and increased GDP especially in the developed nations, unlike the developing nations.

Economic growth can be measured in terms of nominal GDP which means factoring inflation or real GDP which has adjusted inflation. Economic growth can be categorized as positive growth, negative growth and constant growth. For a country to exhibit economic growth, such factors as accessibility to education, technology, food, housing and health must play a big role in accelerating the growth of a Nation. Human capital plays a major role in influencing economic growth through health, training and education as a means of improving productivity Becker (2012). A nation which has invested in human capital will experience a productive population because the population is trained and healthy. A country that does not put much emphasis on human capital will not experience the needed economic growth because the productivity would have been affected. Health would be affected by high mortality and morbidity rate which indeed affects the economic growth of a nation. Furthermore, prerequisite education and skills of an economy with low skills and education needed to drive the economy will inhibit economic growth. Human capital is put on more focus by many countries and huge investment done on human capital because it's one of the major components that drive economic growth.

Globally, economies have experienced different economic growth with others developing faster and others having a sluggish economic growth rate. In America, there was a 4.2% annual GDP growth in 1985 compared with a slow growth rate of 2.3% in 2017. In Europe countries, the growth rate was 2.6% in 1985 and in 2017 there was a slight drop to 2.5%. In Asian countries, the growth rate was at 5.3% in 1985 higher than most continents and in 2017 it improved to 6.9% in 2017 (World Bank, 2017). In Africa, economic growth has seen a tremendous improvement in terms of GDP growth rate and factors such as human capital have played a major role with the continent trying to embrace technology to double its economic growth. Africa has also exhibited economic

growth but with a slight improvement (IMF, Africa Economic Outlook Update, 2017). In 1985, the annual economic growth rate was 1.76 per cent with an improvement to 2.53 per cent in 2017. Mc Donald et al (2004) conducted a study about economic growth in Africa, using a panel data of 41 African countries on the factors that inhibit economic growth. They found out that African countries had indeed potential in growth rate, but due to poverty, HIV and corruption it may inhibit in a slow growth rate.

The sub-Saharan countries which mostly are poor have been experiencing low economic growth due to drought, war, lack of favorable political governments and poor health which has affected the economic growth of that region. Sub-Saharan Africa economic growth has not reached the projected economic growth annually due to poverty, poor health and corruption. Basu (2006) suggested these countries must increase their output to realize their economic growth rate. One health problem which has led to slow economic growth is HIV prevalence for many sub-Saharan countries. Lovasp and Schipp (2009) conducted a study on why there is a decrease in economic growth in Sub-Saharan countries factoring in human capital factors. The study found that the health indicators were worsening which affected economic growth in the Sub-Saharan region and also leading to a negative growth rate. In the study, the augmented Solow growth model was captured with physical, health, education and the health capital as the major contributor to decrease economic growth.

Since independence, Kenya has been experiencing an inconsistent growth rate. In 1965 the growth rate was 2 per cent, in 1980 the growth rate had an increase to 5.592 per cent with a decline in 1985, where it recorded 4.301 per cent. In 1995 the growth rate was 4.406 per cent with a decline in 2000 which was 0.6 per cent. Towards 2005, there was a rise in economic growth due to stable macroeconomic conditions and policies of about

5.907 per cent with the highest in 2010 of about 8.406 per cent. In 2018, Kenya recorded a growth rate of 6.32 from 4.86 per cent in 2017, due to political turmoil on the presidential election in 2017. It is projected by vision 2030, it would be recording an annual growth rate of 10 per cent.

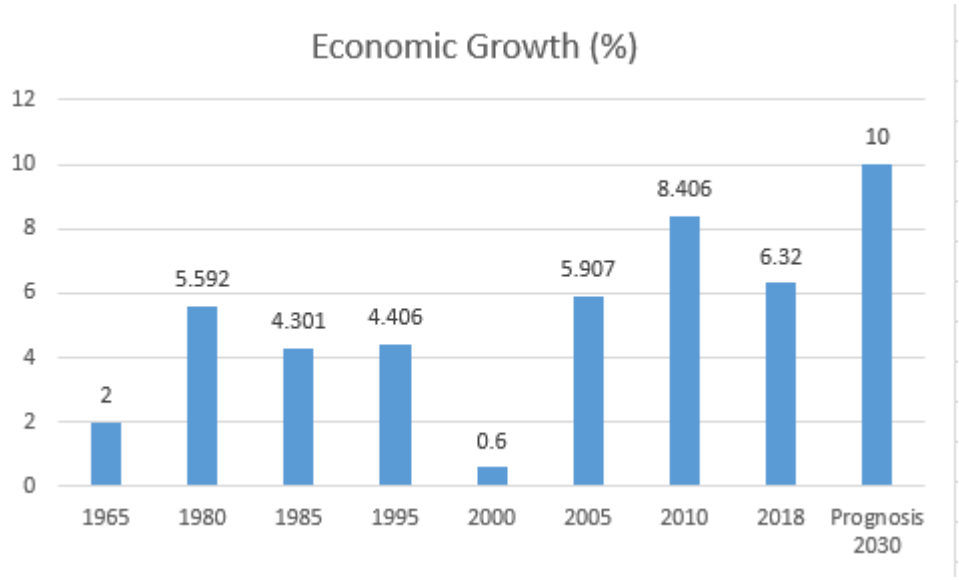

Figure 1.1: Annual GDP growth rate (%)

Source: World Bank (2018)

According to Nyandemo (2016) the improvement have been attributed to improved infrastructure, social conditions services, education and better health care over the years towards economic development. To achieve the proposed document of vision 2030 of economic growth some factors have to be considered in the form of human capital (health) in attaining a strong economic growth. Oleche (2005) analyzed health indicators in Kenya and found out a negative trend on health indicators in Kenya and proposed there is need for health indicators to be considered as it is left behind as a form of human capital. The study found out that under-five mortality and life expectancy have been having a great variation trend on declining health indictors and it will inhibit growth rate toward achieving vision 2030.

As with the variation trend on health indicators in Kenya which could affect economic growth, the paper examined the impact of resident health indicator on economic growth.

1.3 Health Indicators in Kenya

A healthy population transforms into greater progress in economic development because the population is productive (KIPPRA, 2018). A healthy workforce is a prerequisite for social and economic development in terms of employment, decent working conditions to a working population (WHO, 2018). Health indicators are a measure to tell the population of the advancing sustainable development. The right indicators for healthy development is important in measuring the progress of a human being (WHO, 2018). Health indicators are the measure of physical and emotional well -being of an individual or population (Thompson, 2000).

To have a healthy population, the government of Kenya spearheaded a strategic plan in the health sector. The National Health Sector Strategic Plan (NHSSP) was introduced to lead the reforms in the health sector for the period 1999-2004. The new constitution of 2010, lead to the facilitation of new health policy to foresee the policy from 2014 to 2030. The Kenya health policy was introduced to provide guidelines in the health sector and align it to the provision of vision 2030 and Sustainable Development Goals (SDG) as a guideline to the health sector. Under the Kenya health policy, a medium-term plan was developed to facilitate and drive the key agenda from 2012-2017 to meet the government agenda. The policy objectives were: reduction of Maternal mortality rate from 488/100,000 to 150/100,000, reduction of under-five mortality rate from 74/1000 to 35/1000, reduction of infant mortality rate from 52/1000 to 30/1000, reduction percentage of HIV/AIDS prevalence from 5.6 per cent to 4 per cent, improve under one

immunization cover from 83 per cent to 90 per cent and reduce malaria inpatient case fatality from 15 per cent to 5 per cent according to KHSSPI July 2013- June 2017.

In Kenya, the major health indicators are HIV/AIDS, fertility, maternal and child health, childhood and maternal mortality, sexual activity, nutrition status (KDHS, 2014). The study determined the impact healthcare expenditure, life expectancy, nutrition status and access to health services as key health indicators that influenced changes in economic growth.

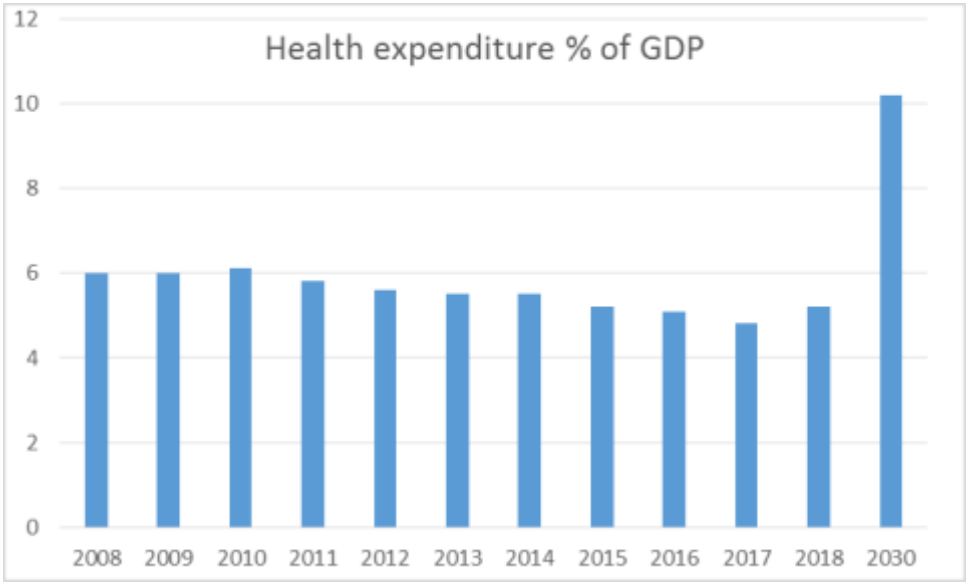

Figure 1.2: Healthcare Expenditure

Source: World Bank (2018)

Healthcare expenditure shows the total of public and private health expenditure to cover the provision of health services. In 2008 the healthcare expenditure as a percentage of GDP was 6 percent and declined to 5.8 percent in 2011. Since then it has been constant in 2013 and 2014 at 5.5 percent to a further decline of 4.8 percent in 2017. The government in its commitment to focus on provision of healthcare services by 2030 saw a slight increase of 5.2 percent in 2018.

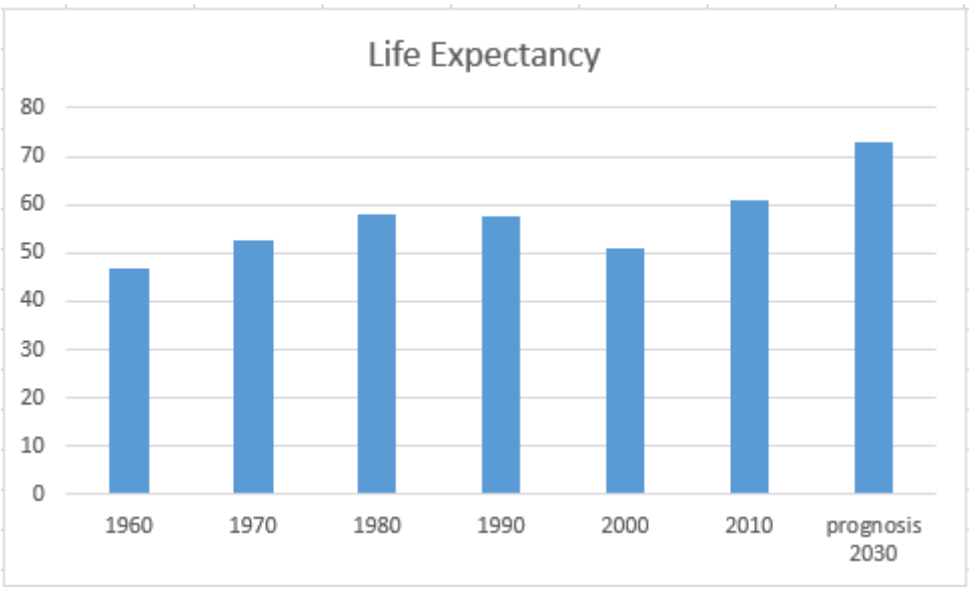

Figure 1.3: Life expectancy

Source: World Bank (2018)

Kenya's life expectancy has improved since independence and currently 2019 the life expectancy is at 66.44 years. In 1960 the life expectancy was at 46.76 years, it grew until 1985 at 59.12 years. Then it started to decline from 1985 until the year 2000 at 50.92 years. Since then it has been on the rise until 2010 at 60.95 years. Life expectancy by 2019 was at 66.44 years and by 2030 it is expected to be at 73 years. The relationship between life expectancy and economic growth is compared between rich countries and poor countries. People born in a wealthy nation which have greater economic growth live longer compared to those nations which experience low economic growth and are poor.

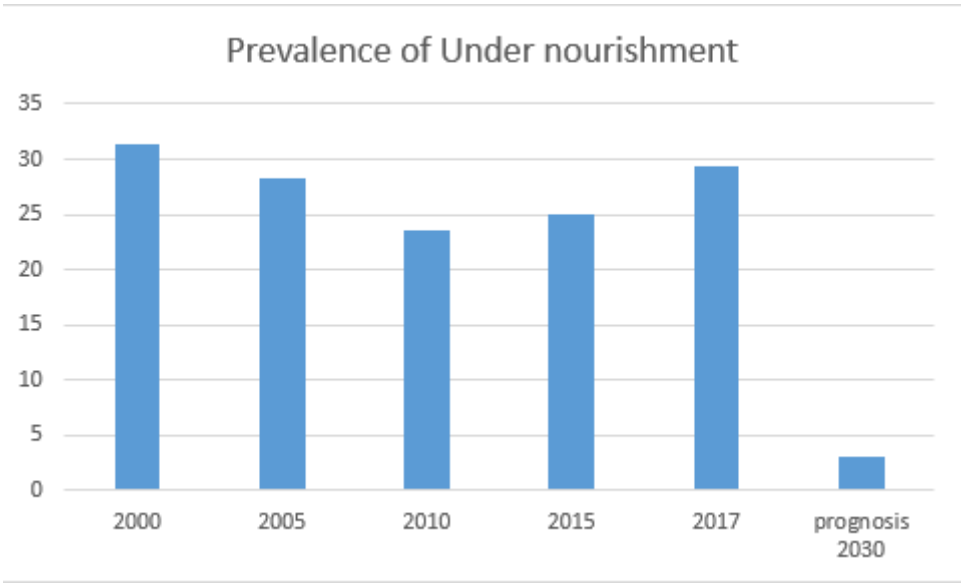

Figure 1.4: Prevalence of Undernourishment

Source: World Bank (2018)

Prevalence of undernourishment shows the population under the minimum level of dietary energy consumption. Prevalence of undernourishment in 2000 was 31.3 per cent of the total population, then there was a decline in 2005 at 28.2 per cent, it declined in 2010 at 23.5 per cent. Since then due to food insecurity, the prevalence has been on the rise at 29.4 per cent in 2017 due to undernourished and it is expected by 2030 to be reduced by 3 per cent of the total population. Malnutrition makes the economy not to achieve their goal as the children do poorly in school and reduce school attainment at an early stage. The adults experience low skill workforce who are not able to work and provide for their families hence economic growth is affected by malnutrition.

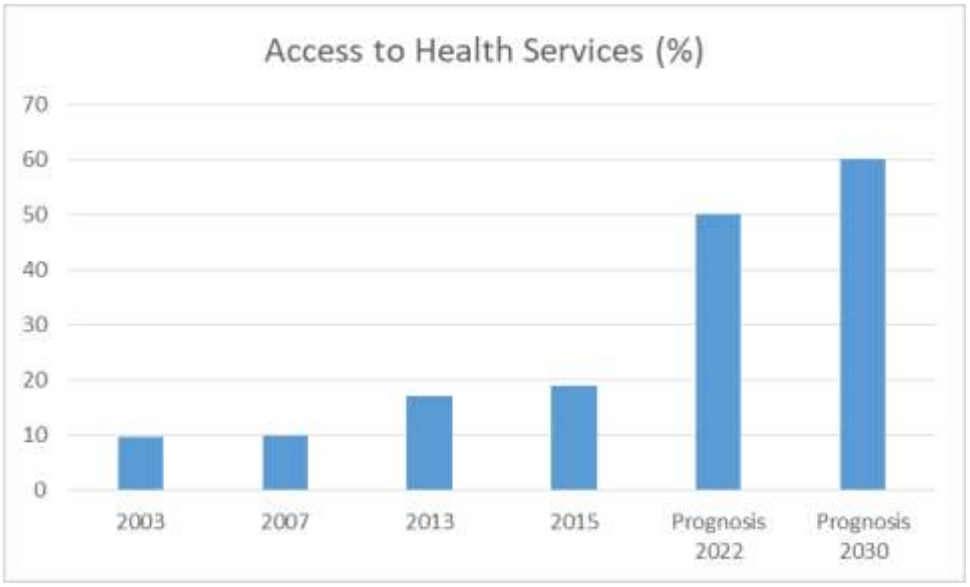

Figure 1.5: Access to Health Services

Source: World Bank (2018)

Access to health services has been one of the pillars for Kenya in achieving universal health coverage by 2030. There has been an improvement in the percentage for insurance coverage where in 2003 it was 9.7 percent and in 2007 it rose to 10 percent. In 2013 and 2015 it showed that 17.1 percent and 19 .1 percent had some form of health insurance coverage indicating that one in every five Kenyans had access to health insurance. Under the second medium term plan (2013-2017) for vision 2030, it targeted the health insurance to be 36 percent and third medium term (2018- 2022) should be 50 percent in order to achieve universal health insurance coverage (KHHUES, 2013). The Global Burden of Disease predicts Kenya universal health coverage by 2030 will be 60 percent.

1.4 Statement of the Problem

In line with the SDG, a new blueprint in 2008 was enacted in Kenya vision 2030, to be aligned with global development goals until vision 2030. The new agenda was adopted as an economic pillar to see economic development programme from 2008 to 2030. The document projected an economic growth rate of 10 per cent per annum from 2008

to 2030. To realize the strong economic growth rate, macroeconomic stability needs to be put in place each year to realize the targeted 10 per cent growth rate. The projected GDP is expected by 2020 to be 6 per cent (World Bank, 2019) which according to the blueprint should be a target of 10 per cent per year. To achieve the projected growth rate by 2030, Kenya has put in place three key strategies and they include the economic, social and political strategy to meet the projected economic growth rate.

The country needs to provide a high-quality health system covering health indicators. The country is spending approximately 5.4 per cent of its GDP on health, that is 42.2 US$ per capita and the government health care expenditure is approximately 4.6 per cent of the total government expenditure. The spending on health expenditure is below the targeted Abuja declaration of 15 per cent of total government spending which should be allocated to the health sector (NHSSP 2013-2017). The government spends 6.5 percent of the total budget to health care which is the lowest in EAC and the entire region. In Rwanda, health expenditure takes 22.6 percent, Tanzania takes 14 percent, Uganda takes 10.4 percent, Ghana takes 13 percent, South Africa takes 12 percent and Botswana takes 10 percent (Kenya Public Expenditure Review, 2014).

In the current state, the GDP growth rate was at 4.86, 6.32 and 5.6 per cent in 2017, 2018 and 2019 respectively. The country gained stability and its working towards attaining 10 per cent growth rate by 2030. Some factors that may lead to slow economic growth are the health indicators which have affected economic growth rate towards achieving the targeted growth rate. Life expectancy in 2017, 2018 and 2019 was 65.53 years, 66.18 years and 66.44 years respectively, which has seen an improvement in life expectancy but below the targeted life expectancy of 72 years of the SDG goals by 2020. Malnutrition prevalence on the percentage of the population in 2015, 2016 and

2017 was 25, 27.4 and 29.4 per cent respectively, of which the dietary energy consumption needs to be improved to prevent undernourishment towards a target of 5 per cent in 2020 and 3 per cent by 2030 (World Bank,2018). The universal health coverage in 2013, 2015 was 17.1 percent and 19 percent which was below the target of 36 percent according to MOH medium term plan 2013-2017. Kenya health indicators are improving, but remain poor to the global performance of SDG targets which have affected economic growth rate in Kenya to be achieved at the set year due to slow economic growth attributed to the health outcomes (World Bank, 2018).

Kashif et al (2013) analyzed the impact of health indicators on economic growth in Pakistan using the health indicators: life expectancy, Infant mortality rate, fertility rate and health expenditures. The results showed that Life expectancy, fertility rate and health expenditure have a positive relation with economic growth while infant mortality hurts economic growth. In Kenya, Oleche (2005) analyzed the impact of health expenditure on key health indicators, in which the variables included were health expenditure, under-five mortality rate, access to safe water and life expectancy. The study found out a variation trend in health indicators due to insufficient spending by the government to the health sector.

Despite studies been conducted on the impact of health indicators on economic growth. The results have some indicating a positive impact while other studies indicate a negative impact on economic growth depending on the methodology employed with different countries. In Kenya, few studies have been done on the impact of health indicators on economic growth. Due to the variation trend on health indicators and slow growth rate, the study evaluated the impact of residents' health indicators on economic growth in Kenya.

The studies done have different time periods, different estimation technique with different measurement technique which yield different results. Each study had its own merits which clearly shows that the impact of resident health indicators on economic growth suffers from heterogeneity results.

Thus from the above contradicting studies output, the study evaluated the impact of residents' health indicator on economic growth to fill the knowledge gap on the output. This with a view of finding whether health indicators enhance or promote economic growth in Kenya over a period of time. Most of the studies done have focused on HIV/AIDS, life expectancy and under-five mortality rate and few studies have used nutritional status and access to health services on economic growth. It is clearly apparent from the literature review that nutritional status and access to health services is a crucial factor that could influence economic growth, as this study will differ from other studies because it will incorporate nutritional status and access to health services as a variable on economic growth in Kenya.

1.5 Objective of the Study

1.5.1 General Objective

The general objective of the study was to analyze the effect of residents' health indicators on economic growth in Kenya.

1.5.2 Specific Objectives

Specifically, the study sought to achieve the following objectives:

i) To evaluate the effect of healthcare expenditure on economic growth in Kenya.

ii) To evaluate the effect of life expectancy on economic growth in Kenya.

iii) To evaluate the effect of nutrition status on economic growth in Kenya.

iv) To evaluate the effect of access to health services on economic growth in Kenya.

1.6 Research Hypotheses

The study postulated the following hypotheses:

Ho_1: Healthcare expenditure does not significantly affect economic growth in Kenya.

Ho_2: Life expectancy does not significantly affect economic growth in Kenya.

Ho_3: Nutrition status does not significantly affect economic growth in Kenya.

Ho_4: Access to health services does not significantly affect economic growth in Kenya.

1.7 Significance of the Study

A healthy population with no ill threatening disease is a healthy nation that would realize GDP growth due to high labor productivity. This would then lead to economic growth that will translate to economic development. The study would add value to understanding the significant relationship between gross domestic Product, healthcare expenditure, life expectancy, nutrition status and access to health services.

The study would help the national government, county government, and other stakeholders like International donors to put measures and improvement of health indicators. Furthermore, the study would be expected to benefit scholars and academicians who would want to use it as a reference, to the findings of this study for further research and also fill the knowledge gap of this study.

1.8 Scope of the Study

The research examined the extent to which the Health Indicators will affect economic growth from 1987 to 2018 in Kenya. The study will investigate the long-run relationship of a period of 31 years between the gross domestic product as a dependent

variable and healthcare expenditure, life expectancy, nutrition status and access to health services as an independent variable.

CHAPTER TWO

LITERATURE REVIEW

2.1 Overview

In this chapter, the study focused on the concept of the study, review theoretical literature, empirical literature and concludes with conceptual framework.

2.1.1 Concept of Economic Growth

Economic growth is an increase in GDP which leads to an increase in the value of national output in an economy. Palmer (2012) refers economic growth as increase in productivity, in which the economy is capable of producing more goods and services. It is one of the macro- economic objective with the aim of increasing the standard of living, improving tax revenues and creation of jobs in an economy.

A key factor in enabling economic growth is productivity output of an economy in the long term period. Productivity which is channeled through enhanced and new technology, will improve the labor output per worker as the economy will be able to produce more and increase economic growth in the long run.

A positive economic growth will indicate that there is more production, more income for firms and workers, improved standard of living and increased tax revenues for the government. A negative economic growth which is caused by recession will indicate a fall in income, fall in production, lack of natural resources, lack of human resources and lack of employment in the economy.

2.1.2 Concept of Healthcare Expenditure

Health expenditure as a health indicator is used as gauge to the extent to which government is making investments in health and well -being of the citizens (WHO,

2019). Health financing is one of the objective of SDG goal number 3. Health care expenditure differs from developed countries and developing countries.

Developing countries depend on donor funds despite having their own budget for health expenditure. Most developing countries do not specify how they use their funding and accountability of funds has become difficult. Increased expenditure on health with good policies and accountability which are executed well, promote growth and if they are poorly managed leads to decline in growth in health sector. There are number of factors that lead to increased expenditure: HIV prevalence rate, high maternal mortality, cancer, malaria, TB and other factors.

2.1.3 Concept of Life Expectancy

Life expectancy is the average number of years that a newborn is expected to live if the current mortality rate continues or is the average number of additional years that a person of a given age can expect to live (WHO, 2010).

It a hypothetical measure and the most commonly used is life expectancy at birth. Life expectancy reflects the standard living condition of a country. In a less developed country, life expectancy is relatively low compared to a more developed country because of high infant mortality rate and poor health facilities. In a more developed country, life expectancy is higher because of improved health facilities and good standard living conditions. In any given country, life expectancy is affected by personal health, family medical history and risky lifestyle choices.

2.1.4 Concept of Nutrition Status

Nutrition status is the physiological state of an individual which results from the relationship between nutrient intake and the requirements from the body's ability to digest, absorb and use these nutrients (FAO, 2010).

One of the key measures is malnutrition resulting from inadequate nutrition. Malnutrition includes under nutrition and over nutrition of essential nutrients such as vitamins and minerals. Under nutrition is the outcome of insufficient food caused by an inadequate intake of dietary or food energy.

Under nutrition occurs to the low income developing countries affecting poor socio economic groups in less developed countries. Over nutrition occurs mostly in developed countries resulting in overweight or obesity and other chronic diseases in countries whose economic conditions are improved. Malnutrition can be caused by food security, poverty affecting livelihoods, lack of access to education and information, lack of clean water and basic services.

2.1.5 Concept of Access to Health Services

Access to health services is associated with the SDG goal number 3 of ensuring healthy lives and to promote the well- being of the population (WHO, 2019).

UHC is also an investment in human capital for sustainable economic growth and development in line with vision 2030. The target is to create a National Health Insurance Scheme to promote equity for the population, targeting the disadvantaged groups. Kenya intends to achieve 100 percent universal coverage through SHIF by 2022 with a target in enrollment of the poor and informal workers into the system in line with Big Four Agenda of 2018-2020.

High poverty level makes the achievement of UHC to be difficult and usually uses safety nets programs to enroll, by making the poor pay low premiums through subsidized methods (KHHEUS, 2013). Health insurance is seen to be associated with wealth status with the poorest quintile covering 2.9 percent and the richest covering

41.5 percent, which makes the population to access health care because of lack of adequate coverage in Kenya (MOH, 2018).

2.2 Theoretical Review

The study anchored on two theories that explain economic growth. They included Solow growth theory and Endogenous Growth Theory.

2.2.1 Solow Growth Model

As for the exogenous model, the Solow model argued that savings and capital accumulation affects growth in the evolution period and neglects human capital as an input in the model. It recognizes technology in the growth period that will lead to development as well as technology which is exogenous in the Solow model. The Solow model gave much importance to savings and population as key in determining per capita income in different countries and higher savings lead to higher income per capita. Solow exhibited that the saving rate is exogenous which is established outside the model. This model assumed that factors of production, capital and labour are a substitute for each other and households accumulate savings by reducing their consumption which indeed makes the economy to be in a stable state in the long run. In the exogenous model (Solow model, 1956) foreign direct investments through the inflow of capitals from a developed nation to poor countries should aid developing nations to catch up with the rich nation as the return to capital is high which will enhance Growth. The Solow model believed that a country which is developing will accumulate capital faster and try to narrow the gap between developing nations and with time both countries will reach the same steady state at convergence. Despite these, the Solow model did provide sufficient evidence of how growth occurs even when the model was expanded to include human capital as an exogenous variable to the

production function. The Solow model gave insufficient evidence on how economic growth occurs and it suggests it occurs by chance. Lucas (1990) argued that the inflow of capital should be from the developed nation but on the ground that is not happening, instead, capital is being channeled from developing countries to rich countries.

In the Solow model, (Mankiw, 1992; Andrew Essig, 2015) acknowledge the role of human capital in the neoclassical growth model. Dixon *et al* (2001) acknowledged both Human capital and educational capital as variables in the production function. Mc Donald and Roberts (2004) argued that health capital is exogenous in which HIV/AIDS is determined outside the model. This indicated that HIV/AIDS is a predetermined variable within a model, which is a determinant and a reduced form for health capital whereas HIV/AIDS is included to account for a major disease. (Cuddington, 1993) extended the Solow model and argued that AIDS is exogenous in the model and hence an increase in AIDS prevalence reduces labour productivity and savings rate in the output of an economy. (Haacker M., 2002a) , using the Solow growth model pointed out that HIV/AIDS affected economic growth and further suggested, that a fall in the returns to capital will fall out foreign direct investment which allows a decline in output per capita in different nations. Health indicators in the Solow model were determined outside the model as a form of human capital and the model was extended to include them.

2.2.2 Endogenous Growth Theory

The endogenous growth models, Lucas (1988) and (Romer P., 1989) were the key players in the development of the endogenous model. This theory assumed that the growth rate of a Nation was endogenous and was determined within the model and gave much emphasis on productivity, efficiency, and improvement in Technology. The

theory considers that if productivity increases, labor force will be provided with resources such as physical capital, human capital and technology. The school of thought of endogenous growth believed that the steady-state growth rate of a nation is affected or assumed by the rate of factors of production which are accumulated over time with the constant return to scale, in which steady-state will be influenced by the factors which are accumulated. The theory viewed that economic actors and government policy will be able to affect the growth rate in the long run. In this regard, the endogenous growth rate was seen among the differences in growth rate among countries that have a different level of savings rate and Investment in what was known as conditional convergence or divergence. The neo-classical Solow growth model does not give sufficient evidence on how economic growth occurs and highlights that it happens by chance. In the endogenous model, the technical change does not happen by chance but it is influenced policy decisions, which are included with labor and capital with government interventions like subsidies, tax policies to promote economic growth.

According to Kalecki (1956), emphasized that investments are the major contributor to economic growth to achieve a steady-state in the long run. Endogenous Growth theories viewed that the rate of technological growth is affected by resources allocated to research and development thus foreign direct investment inflows of a nation influences development and infrastructure level which promotes growth. Romer (1990) viewed that for a country to achieve economic growth, human capital is laid much emphasis through foreign direct investment most specifically through research and development which would increase productivity. Rana and Dowling (1988) argued that foreign investment inflows increases capital inflow and growth which enhances technology transfer in one country and eventually makes sustainable economic growth and performance. This has not always been the case. According to Krugman, most

developing countries may not experience the growth because more international companies have more capital than the local firms, hence privatization is always advocated. This indeed will reduce the multiplier effect in the host country since much profits are taken away from the host country as income reduces.

In the endogenous model, the capital was not limited to physical capital only but also includes skills, knowledge, and experience as well as a labor input. Growth was considered as a human capital which included health and education, not only physical capital. The endogenous model explains that countries with a store of human capital will experience faster economic growth and explore international trade with other nations and those with low human capital will have low economic growth especially the developing nations (Shaw, 1992). (Schultz, 1961) articulated the model to include education, training, and health as human capital investments in economic growth. Arrow (1962) gave much emphasis on the relevance of human capital in economic growth. Furthermore, (Mushkin, 1962) indicated and argued health as a capital for human capital and Lucas (1988) viewed it as an input in the production function. It gained more momentum and (Grossman, 1972) extended the idea in which health was viewed as human capital and also a capital good. Madsen (2002), Salai-i- Martin et al (2005) considered health as a major contributor to economic growth and a component of human capital. Lopez-Casasnovas et al, (2005) suggested that due to increased human capital due to better education, learning processes and optimal health, it leads to sustainable growth.

Individual health stock improves the health status of a nation as a great part of human capital and indeed health was given much attention in economic growth. Improving health leads to higher labor productivity which encourages the government and the

people to invest in human capital (Madsen, 2012). Barro and Sala-i-martin (1992) introduced health as a major source of economic growth. Health status can lead to improvements in nutrition status and life expectancy as the stock of human capital through investment in health. More studies have been conducted using life expectancy and nutrition status to determine economic growth. Many researchers have shown that those countries with good nutrition usually their population have a long life expectancy. Hence better nutrition provides a better incentive to human capital accumulation. (Arcand, 2001) compared economic growth and nutrition status and argued that malnutrition is a humanitarian crisis for economic development. For any population with social investment in education and knowledge in the long run, it will improve the life expectancy of the nation.

2.3 Empirical Review

2.3.1 Healthcare Expenditure and Economic Growth

Amaresh Das & Frank Martin (2010) determined the aggregate health care expenditure for the US using a time series data. The study used cointegration data to support the view that per capita income is the major determinant of aggregate health care expenditure in US. The result of the study found out that age of the population, number of practicing doctors and share of public finance do not contribute significantly on health care spending. The study recommended that health expenditure policy should be increased in the supply of physicians or policies that promote competition but in the long run policies that promote human capital.

Narayan Sethi et al (2020) investigated the short term and the long term effect of health care expenditure, institutional quality, domestic and foreign investment on economic growth of South Asia countries during the period 1996-2018.The study used OLS

estimation with random effect model and co-integration to test the short term and long term relationship. The study found out that there runs a bidirectional causality from health expenditure to economic growth in the short run. The study recommends that South Asia nations require to strengthen the accessibility towards affordability and accountability of the health care services being provided by the population.

Nyamwage Mathew (2012) examined the effect of per capita GDP on public health care expenditure in Kenya using the OLS regression technique. The study used time series data and checked on co-integration on the long run relationship between PHCE and GDP per capita. The study revealed that public health care expenditure has a direct and negative impact on GDP per capita in the long run. The results showed that healthcare in Kenya is a necessary good and has an elasticity of 0.024% to GDP per capita. In every 1% increase in GDP per capita, PHCE should increase by 0.024%.

James Murunga et al (2019) investigated the effectiveness of public health spending on healthcare. The study used health production function in which infant mortality rate was used to measure the health outcome. The study used time series data running from 1984 to 2016 and error correction model to test for long run relationship. The results showed that public expenditure on average influences economic growth and found child immunization as another factor which is a determinant for health outcome. The study recommended the government should increase budgetary allocation to health sector and more resources to child immunization.

2.3.2 Life Expectancy and Economic Growth

According to (Mahumud et al 2013) determined the impact of life expectancy on economic growth and health expenditure in Bangladesh. They used multiple regression models to analyze annual time series data from 1995-2011. The results showed that life

expectancy for females was 0.0986 more than males with annual GDP per capita increasing by 0.4488 times during the period of study and indicated there is a positive change in life expectancy and increasing income. The study concluded that increased life expectancy has a direct impact on increased per capita real income and higher expenditure on health. The study recommended a policy intervention to increase income per capita and also increase expenditure on health for the benefit of social development and wellbeing.

(Waziri, 2016) examined the effect of HIV/AIDS and life expectancy on economic growth for 11 years (2002-2012) using a dynamic approach for 33 Sub-Saharan countries. From the study, they revealed that at a 1 percentage significant level, HIV/AIDS is negatively correlated with GDP with a coefficient of 0.014. The study further revealed that a 10 per cent increase in HIV/AIDS prevalence causes a decrease in GDP by 0.14% in the Sub-Saharan countries. One of the recommendations by the study is that the community should put more effort into educating school going children on the danger of HIV/AIDS in Sub-Saharan countries.

(Opeloyeru, 2015) examined the impact of life expectancy on economic growth from 1981 to 2014 using an ordinary least square. They did a pretest analysis on the variables of two different orders of integration and also a post-test to determine the correlation of variables. The results found a long-run positive relationship between GDP per capita and life expectancy. Further, they recommended that for a sustainable economic growth, the economy should invest in the health sector for better health outcomes.

(Ecevit, 2013) did a study on the impact of life expectancy at birth on economic growth for 21 OECD countries from a period of 1970-2010 using a panel data in the context of cointegration and causality relationship for 21 countries. The study found out that life

expectancy has a positive relationship with GDP and is statistically significant on real GDP per capita, providing a granger causality effect of life expectancy and GDP with an indication of unidirectional causality, running from life expectancy and GDP per capita.

Developing countries (Manfred, 2015) analyzed the impact of life expectancy on economic growth in developing countries over the period of 2000- 2013. The data covered over 141 developing countries using dynamic panel data according to their income level. They estimated the model using the generalized method of moments, causality test and adopted the descriptive and econometric approach. The results indicated that low income developing nations have a lower life expectancy at birth while high income developing nations have a strong performance. Hence there was a positive correlation between life expectancy at birth gross national income per capita and the effect is not significant in the middle-income nations.

2.3.3 Nutrition Status and Economic Growth

(Wang, 2003) investigated the impact of the nutritional status on real GDP per capita using a panel data of 114 countries over a period,1961-1999. They acquired their data from the world food survey taking into account the average daily calorie intake per capita in most countries measured in kcal/day. They used the human capital model which incorporates the nutrition index. They used econometric modelling between the short run population growth effect and long-run population growth effect in which nutrition is likely to occur in the short run than in the long run. Moreover, the short run is likely to be insignificant than the long run. The results indicated that on average the long-run real GDP per capita growth rate can be increased by 0.5 % if daily energy

supply is increased by 500 kcal/day, furthermore, they found a strong association between nutrition on growth and growth on nutrition.

(Shankar, 2008) investigated whether there is a causal relationship between calorie intake and economic growth over a period of 1965 to 2005 in Mauritius using a time series data. They used granger causality and co-integration to test the causal relationship between two variables. The calorie intake was expressed in calories/capita/ day which data was obtained from FAO. They found out that on short and long-run causality tests between daily per capita calorie intake and GDP is absence. Also, Dawson and Tiffin (2002) found a unidirectional or bidirectional granger causality between nutrition and GDP per capita. They recommended that the population should reduce the intake of saturated fats, cholesterol intake and intake of refined sugars.

(Ghosh, 2018) examined the direction of causality between economic growth and nutrition intake in India using a time series data over a period from 1961 to 2013. They used granger causality to test if there is a causal relationship between economic growth and nutrition intake. Nutrition was expressed in calories per capita/day obtained from national food balance sheets (FAO). The results indicated that economic growth causes granger causality with nutrition but nutrition intake does not cause granger causality with economic growth in India.

2.3.4 Access to Health Services and Economic Growth

Darmawan (2019) evaluated the willingness to pay for social Health insurance and their related factors to join the SHI among population particularly in Yogyakarta province, Indonesia. A cross sectional study design method was employed. Social demographics predictors of willing to pay were identified using logistic regression analysis. A total of 625 participated in the study. Majority of respondents 87.36 percent were willing to pay

for SHI however, 67.58 percent were not willing to enroll for SHI. The result of the study showed a positive correlation between family size, income, educational level, past experience, hospitalization and current health status were willing to pay for SHI.

(Aaron Alesane and Tetteh, 2018) investigated the factors associated with the uptake of health insurance products for policy in west district Ghana as case study. A logit model was used to analyze data from 178 respondents selected from two microfinance groups operating in the study area. The results indicate that insurance uptake is higher among the younger people but lower among women. Older women are likely to take health insurance compared to older men. In addition, the study revealed insurance uptake increases with level of education but decreases with household size. The study recommended adequate public sensitization on the benefit of the scheme and decreasing the statutory age for exemption from premium payment as some of the measures suggested to enhance health insurance uptake in Ghana and other developing countries.

(Doris Syombua Philip, 2018) analyzed the determinants of the uptake of health insurance with a focus on the role played by household income. The data was from Kenya national health accounts survey for 2005/06. The analytic sample consists of 8571 households and 35974 individuals drawn from 1260 cluster, 540 from urban areas. A logistic model was used to estimate the decision to take up health insurance. The results indicated that income, marital status, education, health status and awareness about insurance are the main determinants of health insurance in Kenya. The study recommended that health insurance is made compulsory for all citizens and subsidization of the premiums for the poor being undertaken by the government and there is need to sensitize the public on the types of health insurance schemes available.

(Orayo, 2014) conducted a study on the determinants of health insurance demand among the migrants in Kenya. KDHS survey was used to assess the pattern and estimate the determinants of health insurance. The study adopted the binary probit regression model. The study found out that age of the migrants, education levels, marital status, religion, access to information and language are statistically significant, which determined health insurance demand among the migrants in Kenya while employment status, duration of stay, place of current residence, wealth index and household size were found to be statistically insignificant. The study recommended that there is need to establish the right insurance product for migrants, that is recognized and acceptable by this population to enhance more consumption.

2.4 Overview of the Literature and Research Gap

The study reviewed the related Literature review and identified the knowledge gap. Many researchers have done their studies in the African region. (Kirigia JM, 2002) estimated the burden of HIV/AIDS on GDP in WHO African countries using a panel data and production function approach on 45 to 46 countries in the WHO region. Dixon, Jennifer Roberts, Scott McDonald (2004) studied the macroeconomic effects of HIV/AIDS in Africa. These studies have focused on the African region and there is a need to do research in Kenya, hence the study is designed to fill the knowledge gap by focusing on health indicators in Kenya.

Secondly, most of the studies on health indicators have been done on the households and Individuals level using descriptive studies. (Aaron Alesane and Tetteh, 2018) investigated the factors associated with the uptake of health insurance products for policy in west district Ghana as case study. Orayo (2014) examined the determinants for health insurance demand among the migrants using binary probit regression model.

The study used the demographic health survey data. These studies have focused on the household structure and surveys using primary data which mostly are not quantified. There is a need to carry out research using the econometric model as a whole hence the study is designed to fill the knowledge Gap by focusing on the health indicators in Kenya using secondary data.

Kashif Raza et al (2013) analyzed the impact of health indicators on economic growth in Pakistan using times series data from 1980 to 2012. The study focused on various Indicators like life Expectancy, fertility rate and health expenditures. As for this study, it incorporated Nutritional status and access to health services as an Independent variable. Andrew Essig et al (2015) analyzed the relationship between GDP per capita and HIV prevalence in African countries using data of 2005 GDP per capita. The study focused on various indicators like gross domestic product, life expectancy, foreign direct investment, and HIV prevalence rate using multiple regression method at a given time. A few studies have been done on health indicators on economic growth in Kenya. Nyamwage (2012) considered public health care expenditure on economic growth. The study by Nyamwage (2012) was not comprehensive because it did not consider other health indicators on the impact on economic growth. These are the main gaps that the review identifies in the literature.

In summary, the review of the literature identified; lack of sufficient studies on health indicators in Kenya, most studies considered GDP per capita on economic growth in Kenya and lack of most recent studies on health indicators in Kenya. This study addressed the gaps by incorporating nutritional status and access to health services as an independent variable. The study also used more recent data from 1987-2018 capturing the most recent dynamics and adopted the OLS regression technique for data

analysis and also tested for Integration, vector error correction and unit root test to fill this knowledge gap.

2.5 Conceptual Framework

The conceptual framework shows the relationship between the independent variable and the dependent variable. Economic growth as a dependent variable while the independent variables are: healthcare expenditure (proxy for domestic government health expenditure), life Expectancy at birth, nutrition Status (proxy for calories per capita) and access to health services (proxy for social health insurance). It shows the linkage between economic growth and indicators of health which affects GDP.

The Conceptual framework showing the relationship between independent variables and dependent variables is depicted in figure 2.1:

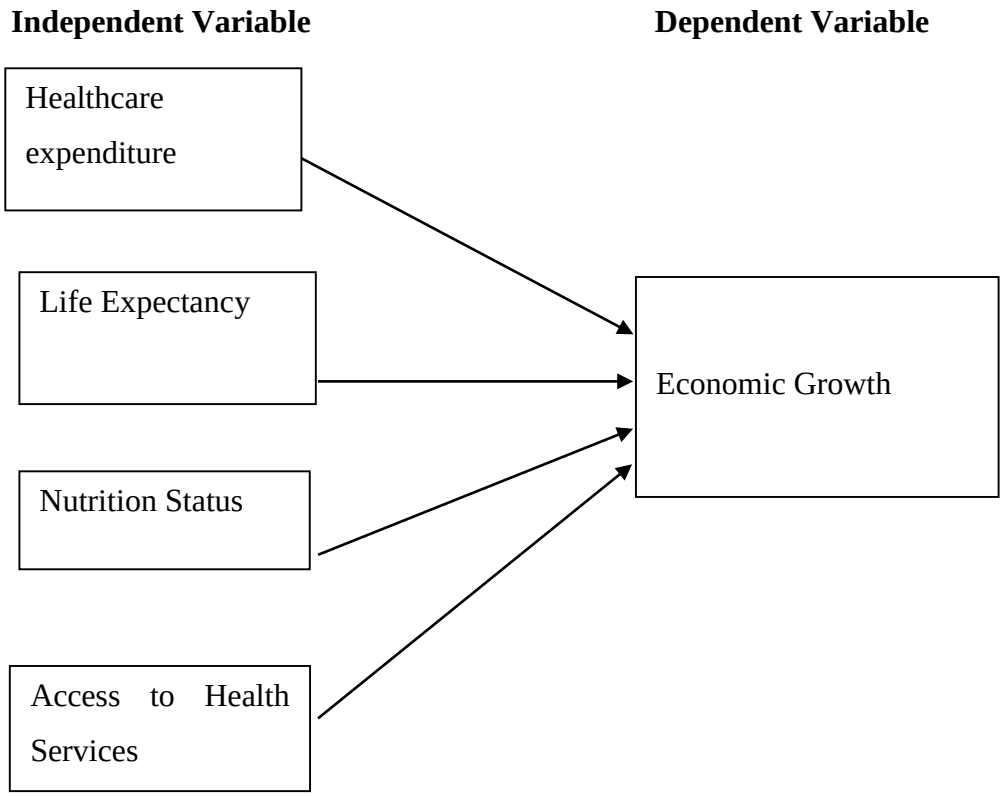

Figure 2.1: Conceptual Framework

Source: Author (2022)

CHAPTER THREE

RESEARCH METHODOLOGY

3.1 Overview

This chapter contains methodology that was used in the study, they include; The research design, area of study, model specification, measurement and definition of variables, data sources, diagnostic tests, data analysis and presentation, estimation of parameters and ethical consideration.

3.2 Research Design

(Cooper, 2014) explained that a research design is a concept applied in fulfilling a certain objective about the study. According to (McNeill, 2005) reinstated that a research design is an outlined framework for selecting an idea, visiting research sites and doing data collection to answer a specific objective under research.

Mugenda (2003) defined a descriptive research design as a way of reporting the findings and evaluating the current results of the study as the way it is. (Kothari, 2004) indicated that a casual research design will occur when the independent variables results explains the variation of the dependent variable in a research.

The study used explanatory research design to establish if there exists a short term and long term relationship between the dependent variables and independent variables over a period of time. The study used the descriptive research design as a way of reporting the results as the way it is. The study used Macroeconomic data for the entire Kenya GDP growth on selected health indicators. It was created from government sources, journals, thesis, and online materials.

3.3 Area of Study

The study covered the entire country in which liaising with Kenya National Bureau of Statistics which collects data for the government, National Treasury, Central Bank of Kenya, Ministry of Health, World Bank Indicators and World Health Organization was done.

3.4 Model Specification

The econometric model used was based on the theoretical framework using the endogenous growth model. The study used GDP for economic growth for a dependent variable while healthcare expenditure, life expectancy, nutrition status, under five mortality and access to health services as independent variables. The model was specified from the theoretical framework as:

$$Y = \beta_0 + \beta_1 x_1 + \beta_2 x_2 + \beta_3 x_3 + \beta_4 x_4 \text{ ……..…….....3.1}$$

Where y is GDP; $x_1$is health care; x_2 is life expectancy; x_3 is nutritional status; x_4 is access to health services.

The estimated model was then transformed into log-linear models reducing the equation as natural logs to avoid the problem of multicollinearity among the variables in the model and helped to reduce the variability of data and enables direct estimation of elasticities.

$$lnGDP_t = \beta_0 + \beta_1 lnHE_t + \beta_2 lnLE_t + \beta_3 lnNS_t + \beta_5 lnAHS_t + \varepsilon_t \text{ …….3.2}$$

Where $lnGDP_t$ = Log of Gross Domestic Product (proxy for economic growth) in period t

$lnHE_t$= Log of Healthcare Expenditure (proxy for domestic government health expenditure) in period t; $lnLE_t$= Log of Life Expectancy at Birth in period t; $lnNS_t$= Log of Nutritional Status (proxy for Calories per capita/day) in period t; $lnAHS_t$= Log of Access to health services (proxy for SHI) in period t ; ε_t = Error Term, which captures all factors that affect GDP but are not taken into account (Gujarati, 2004); β_0= Intercept β_1, β_2, β_3, β_4 = Coefficient of the Independent Variables.

The model was adopted by Howitt (2005) and Idowu Daniel (2014). Hence in the study, the model was improved by the inclusion of nutrition status and access to health services in the model.

3.5 Data Processing and Analysis

3.5.1 Data Sources

The sample of the study used secondary annual time series data over a period (1987-2018) both the dependent variable and independent variable. The data was obtained from secondary data and extracted from various institutions including KNBS, World Bank Data, C.B.K and WHO, UNICEF and UNDP development indicators. The choice of data was based on the availability of data over the period covered in the study.

3.5.2 Data Analysis and Presentation

The annual time series data was plotted against time and also in a differenced form which showed an association between variables. The graphs explored the trends across variables in the study. The essence of graphical presentations is to show the presence or likelihood of non-stationary series where they are transformed in the differenced form to make it stationary. Graphical plots give us a trend about the nature of the time series.

3.6 Estimation of Parameters

The study employed the ordinary least square regression technique for the time series data over a period 1987-2018. In most studies, it is evident that most time series data are not stationary but rather non-stationary (Gujarati and Porter, 2009). That means that data is said to be non-stationary if the Mean, Variances and covariance are said to invariant or not constant over time. Non-stationary data will yield spurious results as a correlation between the variables even if we have large data sets according to Watson and Stock (1989). Therefore, a unit root test was performed on each variable using unit root test which includes Augmented Dickey-Fuller model.

If the variables are to be found to be non-stationary, then the variables can be integrated for cointegration to test if there is a long-run relationship between variables that exist. If the test shows us that at least there is one cointegration equation that exists, then the error correction model was used to test for the long run and short-run relationships between the variables.

3.6.1 Test of Stationary and Unit Root Test

It was necessary to test the data whether it was stationary or not stationary and the regression would not make sense if we do not test for stationary. Most time-series data is non-stationary (Gujarati and porter 2009). If the study is non-stationary, it leads to spurious results and can cause a problem in time series data set if not controlled (Otoro, 2008). The graphical presentation would enable us to detect if the data is stationary or not. However, the graphical method may not be formal because it cannot be determined by integration. Therefore, a unit root test will be conducted to transform non-stationary data to stationary through differencing to avoid non-stationary. Non-stationary series is

integrated of order ≥1 then it is differenced to obtain an integrated (0) series which is stationary.

The study sought to find out if the time series data (set of observations) over a period of time 1987-2018 is stationary using the autoregressive model (AR model). The study used Augmented Dickey-Fuller (Dickey and Fulley, 1979).

To be able to conduct a stationary test, a random walk test was used in the unit root test (Green, 2003). An economic variable like GDP assumes to follow a random walk without drift in the unit root process, if its value at a time t is expressed as the summation of its value at time t-1 and a random shock or zero mean and constant variance which is white noise (Gujarati and Porter, 2009). The variable assumed the same value as the previous period generated by the current period shocks. The current period was analyzed by the previous period and a random shock as indicated in Equation 1.

$$Y_t = Y_{t-1} + \varepsilon_t \text{ ……………………………………………………………3.3}$$

Where Y_t is the current period, Y_{t-1} is the previous period and ε_t is the random shock which is white noise. This implies that the equation is a random walk without drift.

For purposes of hypothesis testing, equation 1 is modified to include a constant α

$$Y_t = Y_{\alpha t-1} + \varepsilon_t \text{………………………………………………………………3.4}$$

Where α is the coefficient of previous values which was used to measure stationary with a random walk with a drift. α=1 is a random walk in a unit process.

The null hypothesis: H0: α>0 (presence of unit root, non-stationary)

Alternative hypothesis: H1: α<1 (absence of unit root, stationary)

If we reject the null hypothesis then the series is stationary, failure to reject the null hypothesis means the series is non-stationary or exhibits a random walk.

Dickey and Fuller (1979) test was conducted to test for clarity for each of the individual variables to verify if the variables are stationary or not stationary in this study.

ADF test is the same as Dickey Fuller in that in both there is the introduction of lags in the dependent variable. Augmented Dickey fuller considers the intercept unlike DF which doesn't and the ADF was used in this study. To avoid spurious results, the non-stationary variables are differenced so that the series can be stationary. The two equations will be estimated based on a random walk process from Equation (2).

$$Y_t = \alpha Y_{t-1} + \varepsilon_{t(3)} \text{……..……...…….3.5}$$

From the equation above we subtract Yt-1 from both sides of equation above which gave us the first difference form of the random walk model.

$$Y_t - Y_{t-1} = \alpha Y_{t-1} + \varepsilon_t - Y_{t-1} \text{…….……3.6}$$

$$\Delta Y_t = \alpha - 1 Y_{t-1} + \varepsilon_{t(4)} \text{ …….…….....3.7}$$

Now letting $\alpha - 1 = \delta$

$$\Delta Y_t = \delta Y_{t-1} + \varepsilon_{t(5)} \text{……..……....3.8}$$

$\Delta Y_t = Y_t - Y_{t-1}$gives us the first difference of the random variable Y at a time where $\delta = \alpha - 1$and εt are the random shocks or white noise at time t. Introducing a constant term in equation (3.5) gives a random walk model with a drift since equation (3.4) had no constant term which would have caused Y_t to drift in a random walk.

Introduction of constant can allow the model to drift in a random walk in given below:

$$\Delta Y_t = \beta_1 + \beta_{2t} + \delta Y_{t-1} + \varepsilon_t \text{.....3.9}$$

The null hypothesis $\delta = 0$ will test against the alternative null hypothesis$\delta < 0$. Rejecting the null hypothesis indicated that the series is stationary. Failure to reject the null hypothesis indicated that the series is non-stationary and has a unit root test. Then the t statistic was compared to the t critical. If t statistic is less than the t critical then reject the null hypothesis of non-stationary and accept that the series is stationary (MacKinnon, 1996). If the test met the stationary point, then we can proceed and test for the cointegration test to see if there is a long-run relationship between the variables.

3.6.2 Cointegration Test

After testing for stationary of the time series data, the study carried out a test for cointegration to assess if there was a long-run relationship between the variables. Before conducting for cointegration a hypothesis test was done to obtain the optimal lag length p to select the var according to AIC criteria.

The test is done on var in the form:

$$Y_t = v + \beta_1 Y_{t-1} + \beta_p Y_{t-p} + \varepsilon_{t(1)} \text{.....3.11}$$

p= is the optimal lag length model

Johansen and Juselius (1991) propose to test cointegration using two test statistics: the trace statistic (λtrace) and the maximum eigenvalue (λmax).

The ratio static for trace test is

$$\lambda trace = Ti = r + pln(1 - \lambda i)(2) \text{.....3.12}$$

Where λi is the largest estimated value of the ith eigenvalue obtained from a matrix in which r= 0, 1, 2……...p-1 where T is the number of observations. The null hypothesis of the root is less or equal to r.

The maximum eigenvalue is

$$\lambda max = r, r + 1 = -Tln(1 - \lambda r + 1)(3)\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots 3.13$$

The null hypothesis is tested as r=0 and the number of cointegrated vectors is r against the alternative r+1

H_0: No Cointegration (non-stationary)

H_1: Cointegration (Stationary)

Cointegration equation where the values of the trace statistics exceed 5% critical values then it can be said that the test yielded one cointegration equation. Cointegration will exist where the trace statistics will yield at least one cointegrated equation and all the variables have a long-run relationship without deviating from each other. The null hypothesis rejected if the test statistic is smaller than the critic value (Gregory and Hansen, 1996).

If one equation is said to at least have one cointegrated equation, then it was proceeded to test for error correction model and if there are more than three cointegrated equations then we test for vector error correction model. If there is no integration between the variables, then we proceed to test with the vector auto regression model.

3.6.3 Test Error Correction Model

According to Engle and Granger, when the variables are cointegrated that is having long-run equilibrium between them then there is disequilibrium in the short run. The

relationship can be expressed as ECM. Wooldridge (2009) argued that cointegration exists when the variables are equilibrium or have a long-run relationship. Based on the ECM model, a change in the dependent variable is in response to change in the explanatory variable and tends to establish a long-run relationship between the variables and also restore the long-run relationship between them. Hence the ECM model was used to tie the short-run behavior of the variables with the long-run behavior. The error term was used to tie the short-run behavior of the dependent variable to its long run. ECM was estimated using the following equation.

$$\Delta Y_t = \alpha_0 + \alpha_1 \Delta X_t + \alpha_2 \mu_{t-1} \varepsilon_t \ldots\ldots 3.14$$

Where μ_{t-1} is the one-period lagged value of the error term from the cointegrated equation (Wooldridge, 2009); and εt is the error term.

3.7 Diagnostic Tests

Diagnostic checks relating to the properties of data was used in time series data modeling need to be implemented in empirical research. In econometric modeling and cross-sectional data, it is essential to diagnose the following tests for multiple regression models

3.7.1 Normality Test

The test is conducted to check whether the error term follows the normal distribution. It also checks whether the variables used in the analysis are normally distributed. The normality test adopted was Jarque- Bera test for statistics which was used to check the normality of the model. The test used the null hypothesis to test for normality and the alternative hypothesis to test for non- normality. If the probability was less than Jacque-Bera at a 5% significance level, then the null hypothesis failed to be rejected (Jarque, 1980).

The Jarque- Bera test is presented as:

$$JB = \frac{(n-k)}{6}\ (S^2 + \frac{(K-3)^2}{4})$$

Where S is the skewness. K is the kurtosis, n is the number of the observations, k is the number of estimated coefficients.

3.7.2 Autocorrelation Test

The test was conducted to show if there is a relationship between the error terms and the set of time series data over a period of 1987-2018. The serial correlation was based on the lagrange multiplier test for residuals. The autocorrelation test was tested using the Breusch Godrey serial correlation LM test. Durbin Watson is not efficient for the test because it is biased. Montgomery et al (2001) argued that most time-series observations encountered positive autocorrelation and Mureithi (2014) outlined that lower lagged order leads to serial autocorrelation.

3.7.3 White Heteroscedasticity Test

This test was tested using the Breusch pagan Godfrey test to see the presence of heteroscedastic (Green, 2003). When the error terms have no constant variance, they are considered to be heteroscedastic. The probability of F-statistics and R^2 was used in the analysis. The null hypothesis will be rejected if the probability of the F statistic and $R^2$are less than 0.05 confirming the presence of heteroscedasticity within the residuals. If the probability of F statistic and R^2 are greater than 0.05 then we conclude that we do not reject the null hypothesis, indicating the absence of heteroscedasticity which will imply the errors are homoscedastic.

3.7.4 Multicollinearity Test

Multicollinearity exists when one independent variable is correlated with a linear combination of two or more independent variables. There are two measures of multicollinearity: compute a coefficient of multiple determination of each independent variable or compute a variance inflation factor for each independent variable. Variance Inflation factor is computed for each independent variable, using the following formula.

$$\text{VIF}_K = 1/(1-R^2k) \text{……………………………………...…} 3.10$$

Where VIF_K is the variance inflation factor for variable k and R^2k is the coefficient of multiple determination for variable k. If VIF_K=1, where variable k is not correlated with any other independent variable. As a rule of thumb, multicollinearity is a potential problem when the value is greater than 5 indicating that multicollinearity is likely a problem. Multicollinearity only affects variables that are highly correlated. If a variable has a small R^2, statistical analysis of its regression coefficient will be reliable and informative.

3.7.5 Dynamic Stability Test

The model was tested for stability using the roots companion matrix. To test if the variables lie inside the unit of cycle. If the variables lie inside the cycle then the model is stable if not then the model is not stable.

3.8 Multiple Regression

The multiple regression model was employed in analysis of the determinants of economic growth rate which were health expenditure, life expectancy, nutrition status and access to health services in Kenya as depicted by equation 3.2.

$$Y_t = \beta_0 + \beta_1 InHE_t + \beta_2 InLE_t + \beta_3 InNS_t + \beta_4 InAHS_t + \varepsilon_t \text{………………}3.15$$

Where $Y_t, InHE_t, InLE_t, InNS_t, \beta_4 InAHS_t, \varepsilon_t$ represents economic growth rate, health expenditure, life expectancy, access to health services and the random error term respectively.

3.9 Ethical Considerations

In carrying out this study, formal approval was carried out for mutual interest between the researcher and the participants. Consequently, the following approvals were obtained prior to commencement of the study:

a) Obtained a written introduction letter from Moi University, School of Business and Economics through Economics Department (Appendix A.1).

b) Acquired research permit from National Council for Science and Technology-Kenya (Appendix A.2).

CHAPTER FOUR

EMPIRICAL RESULTS AND DISCUSSION

4.1 Overview

This chapter consists of analysis and interpretation of data based on the secondary data from World Bank. The empirical model was obtained from chapter three to determine the relationship of GDP as a dependent variable and healthcare expenditure, life expectancy, nutrition status and access to health services as an independent variable. Descriptive statistics, estimation of parameters and post estimation test procedures were presented in this chapter.

4.2 Descriptive Statistics

In this section the study present summary of statistics of the variables. Descriptive statistics was conducted in the table 4.1.

Table 4.1: Descriptive Data Analysis

	GDP	HE	LE	NS	AHS
Mean	4.001188	4.637866	57.41913	24.47188	4.11875
Variance	5.49582	1.21451	24.1167	29.73564	3.023508
Maximum	8.405699	6.116751	66.342	35.1	9.9
Minimum	-.7.99494	2.501781	50.921	12.8	2.4
Std. Dev	2.344317	1.102048	4.910876	5.453039	1.738824
Skewness	-.4318737	-.4522123	0.3533593	-.1301592	1.818924
Kurtosis	2.222171	1.9854	1.905245	2.715263	5.773767
Observations	31	31	31	31	31

Source: Author (2022)

The mean values summarizes the average observations of data over the period of time. The table reveals that the mean of all the variables were positive with life expectancy recording the highest mean of 57.41913 over the period 1987-2018. The average of

GDP was lowest and positive than the average of other variables indicating that on average over the period there was slow GDP growth rate from 1987 to 2018. The results show that the maximum and minimum values for GDP from 1987 to 2018 was 8.405699 and -.799494 respectively, meaning that maximum growth rate was 8.4 per cent and the minimum growth rate was -.8.0 per cent. The maximum value for health expenditure was 6.1 and the minimum value was 2.5 indicating government health expenditure as percent of GDP. For life expectancy, the maximum value was 66.4 and the minimum was 50.9 indicating the number of years one would live throughout the life time. For nutrition status, the maximum was 35.1 and the minimum was 12.8 indicating the prevalence of nourishment over the observations and to access to health services, the maximum was 9.9 and minimum was 2.4 indicating the coverage of social health insurance to the population over the period of observations.

The standard deviation represented the dispersion of data from its mean. Life expectancy had the highest dispersion of data from its mean of 4.9 while health expenditure had the lowest dispersion of data from its mean of 1.1. This indicated that health expenditure was more uniform than other variables for the period of study.

Skewness and Kurtosis are measures of normality of data. Skewness measures the degree of symmetry and Kurtosis measures the degree of sharpness of the distribution of the series. Normal skewness has 0 skew; distribution is symmetric around the mean. Positive skewness has higher values and negative skewness has lower values. The coefficient for skewness -0.43, -0.45, 0.35, -1.30 and 1.81 for GDP, HE, LE, NS and AHS respectively. GDP, HE and NS are weakly negatively skewed while LE and AHS are positively weakly skewed noting that the data was not perfectly skewed and there exist some degree skewness. On kurtosis, mesokurtic has a normal distribution of 3, leptokurtic has higher values of positive kurtosis and platykurtic has lower values of

negative kurtosis. The coefficient of GDP, HE, LE, NS of 2.2, 1.9, 1.9 and 2.7 are platykurtic because they are less than 3, whereas AHS was leptokurtic because the coefficient was more than 3.

4.3 Graphical Presentation

4.3.1 Plot of variables in Log form

The plot for log of GDP (In GDP) it is shown in figure 4.1 it is non-stationary as the mean, variance and covariance are not constant overtime.

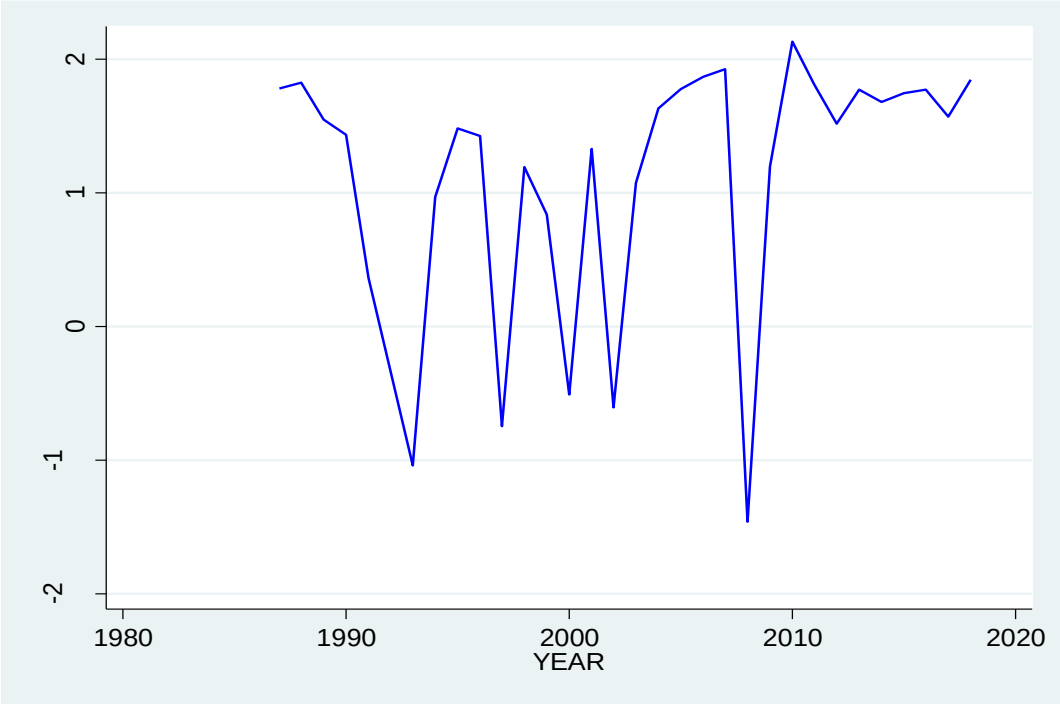

Figure 4.1: Plot for Log of GDP (InGDP)

Source Author (2022)

The plot for log of HE (In HE) is shown in figure 4.2.

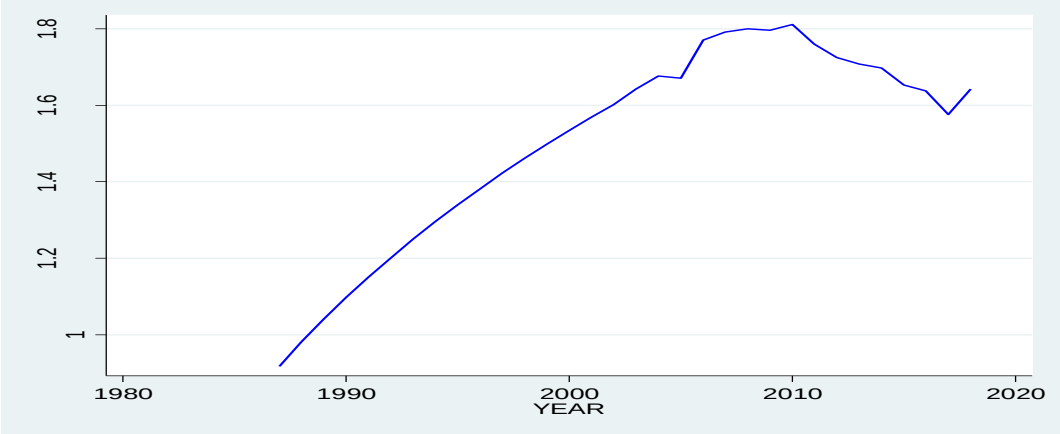

Figure 4.2: Plot for Log of HE (InHE)

Source: Author (2022)

The figure shows an upward trend which was not constant and also weakly trended to the log of HE and it was not stationary.

The plot of log life expectancy (ln le) is shown in figure 4.3.

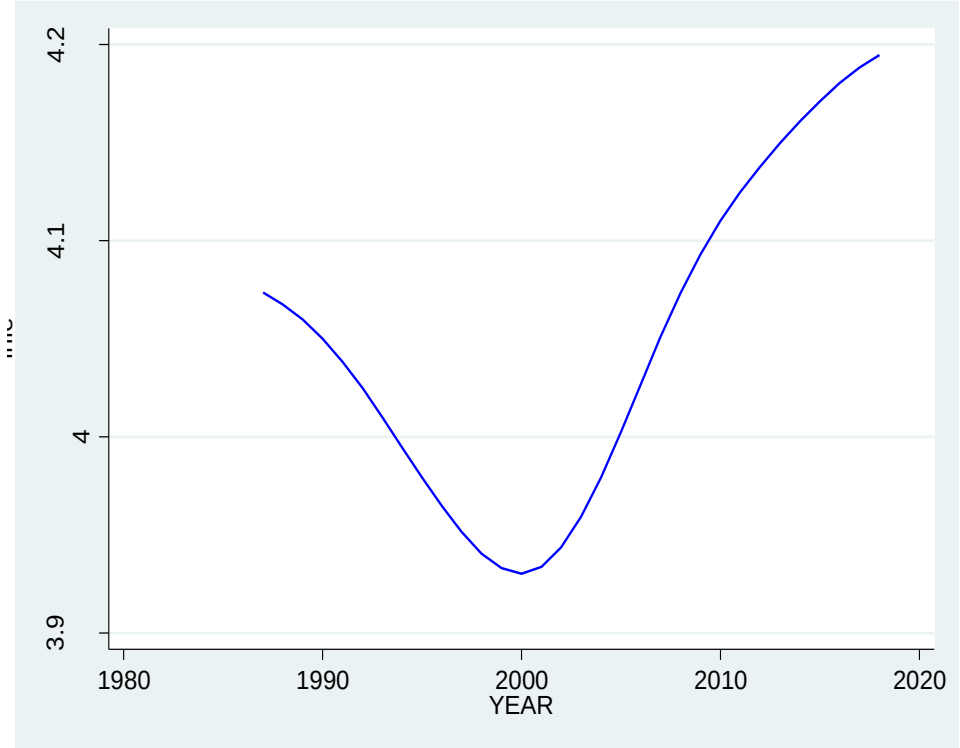

Figure 4.3: Plot for Log of LE (InLE)

Source: Author (2022)

The figure shows there was a downward trend to 2000 and then from 2000 there is sharp rise of upward trend of life expectancy and it is non-stationary.

The plot of log of nutrition status (ln ns) is shown in figure 4.4.

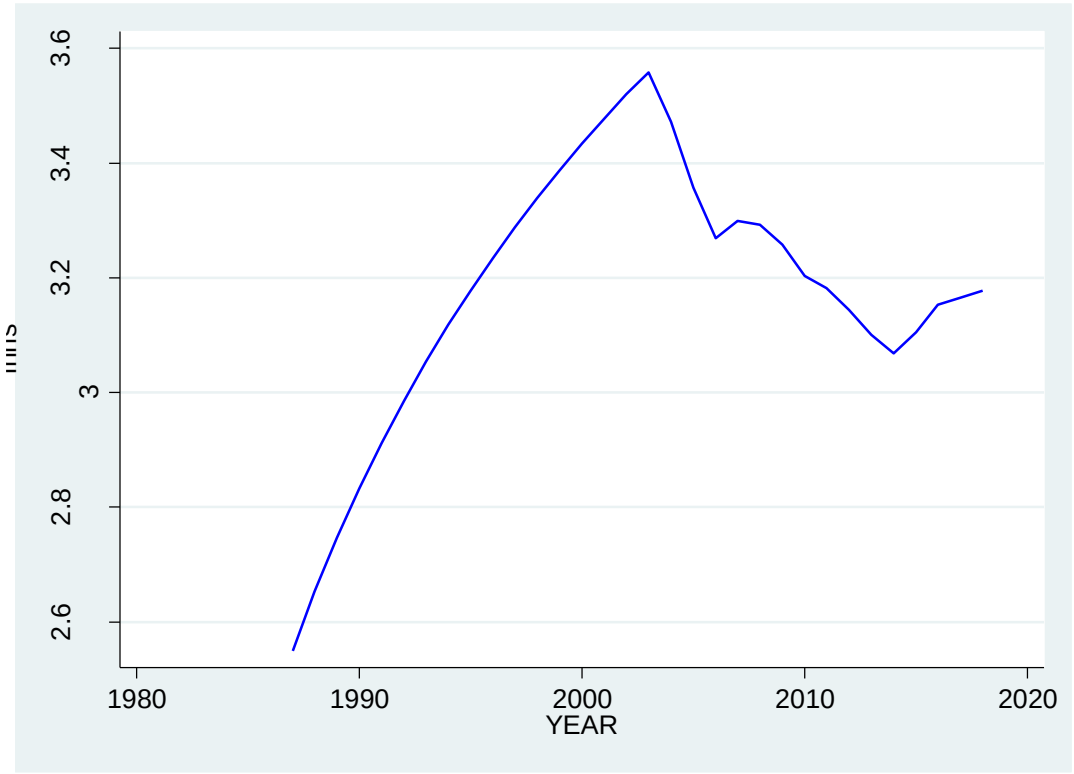

Figure 4.4: Plot for Log of NS (InNS)

Source: Author, (2022)

The plot shows an upward trend on nutrition status and a weakly downward trend with and it is non stationary.

The plot of log of access to health Services (InAHS) as shown in figure 4.5.

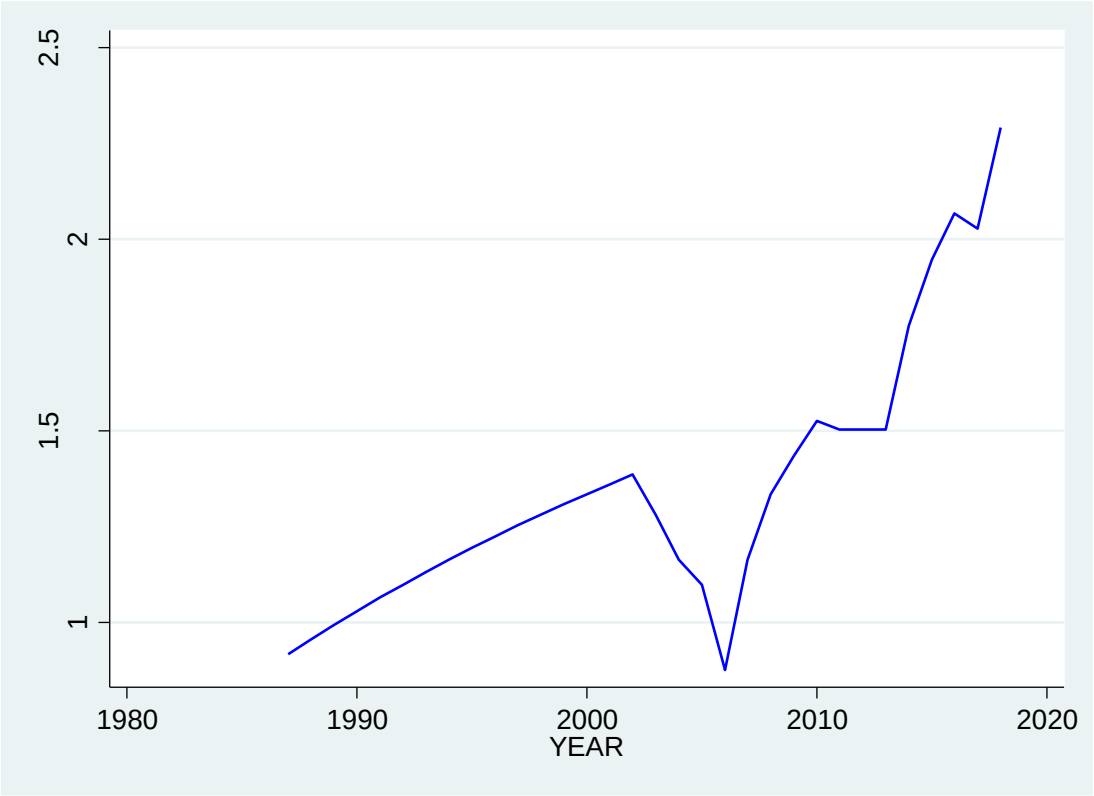

Figure 4.5: Plot for Log of AHS (InAHS)

Source: Author, (2022)

The figure shows a fluctuation in upward trend in log of access to health services (InAHS) and its non-stationary and a random walk with a drift. Figures 4.1, 4.2, 4.3, 4.4 and 4.5 show that the variables are non-stationary.

4.3.2 Plot for variables after Differencing

The plot of log of InGDP after first differencing is shown below 4.6

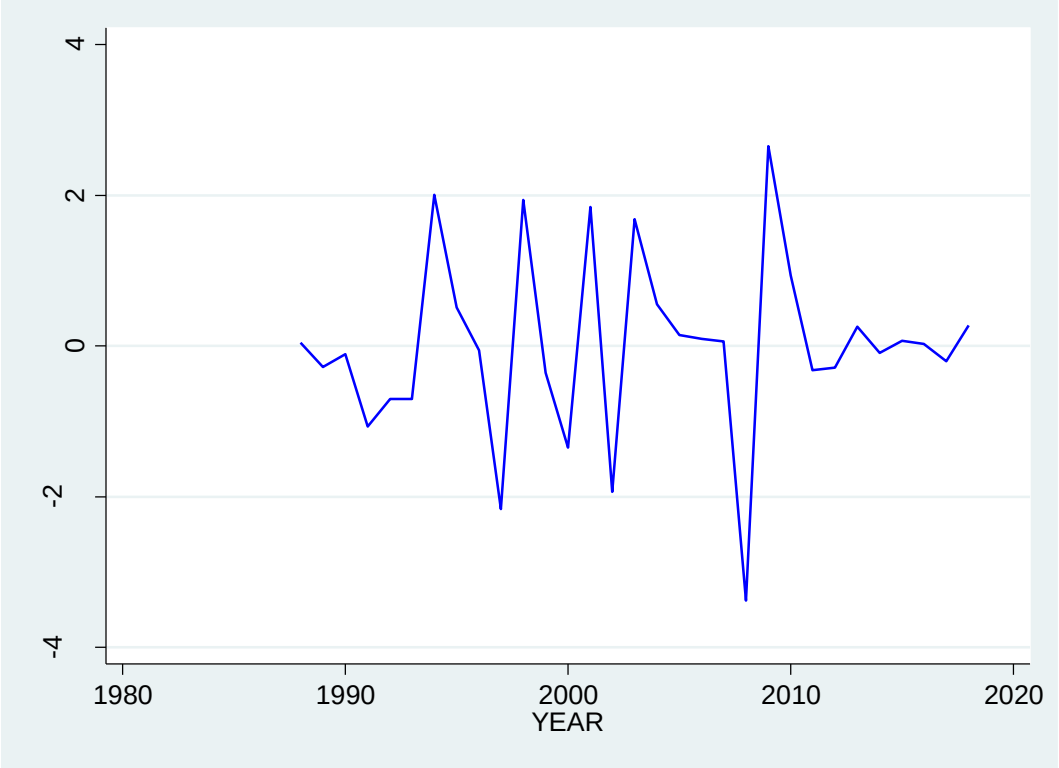

Figure 4.6: Plot for Log of GDP after first differencing

Source: Author (2022)

The first differenced variable was stationary around a trend or mean. The variable GDP was integrated of order 1 since it became stationary after being differenced once.

The plot of log of HE (InHE) after second differencing is shown below in figure 4.7

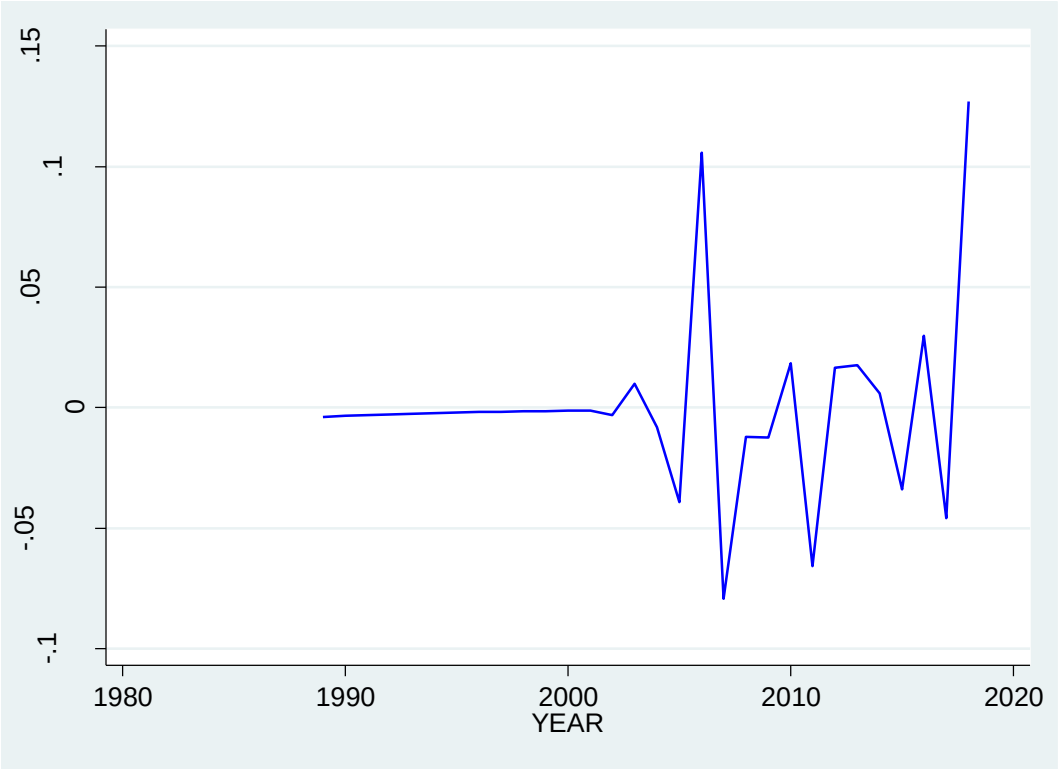

Figure 4.7: Plot for log of HE after second differencing

Source: Author (2022)

The second differenced variable was stationary around a trend or mean. The variable HE was integrated of order 2 since it became stationary after being differenced twice.

The plot of log of life expectancy (lnle) after first differencing is shown below in 4.8

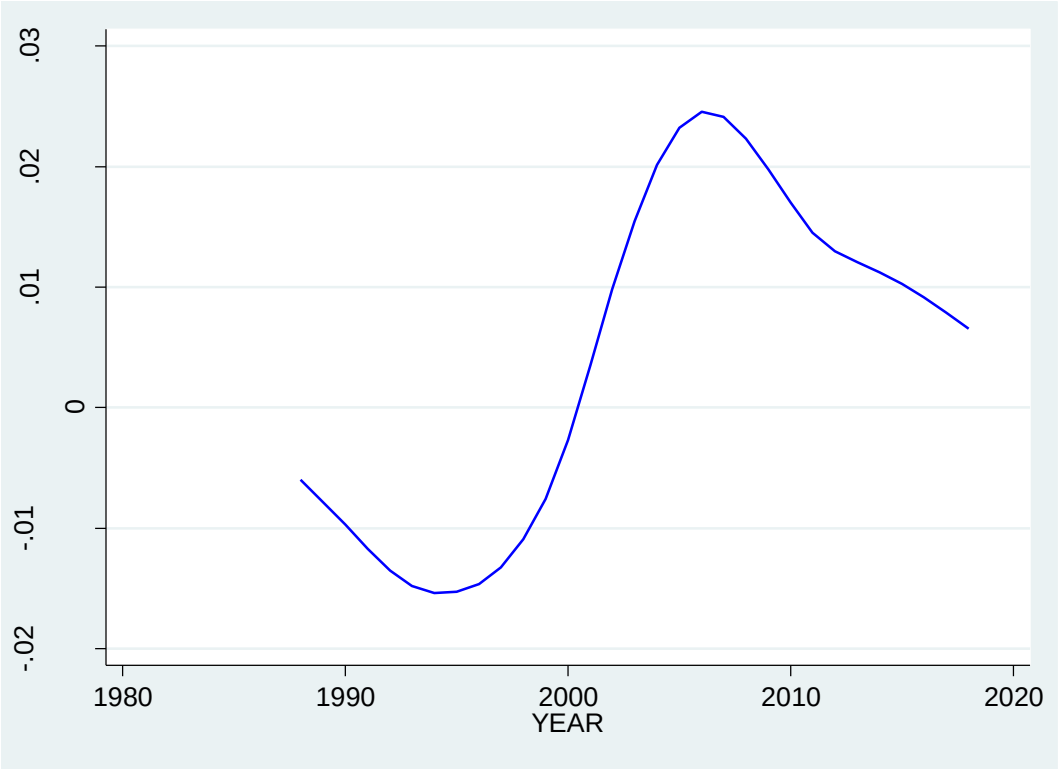

Figure 4.8: Plot for log of LE after first differencing

Source: Author (2022)

The plot of log of nutrition status (InNS) after first differencing is shown in figure 4.9.

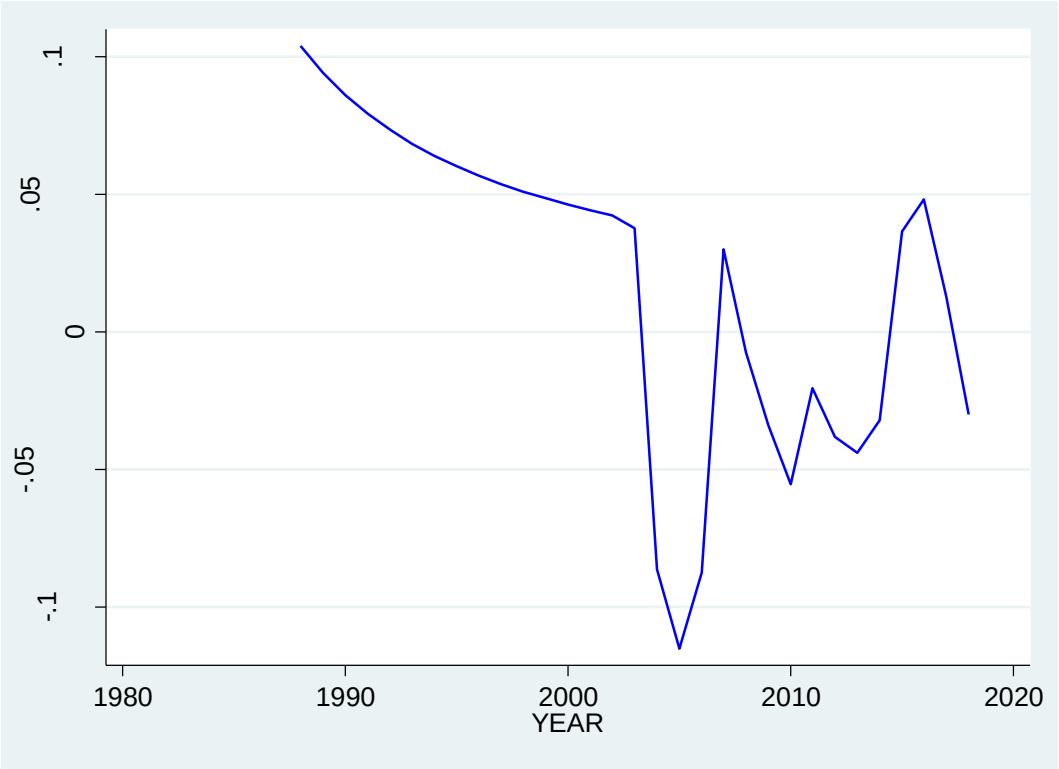

Figure 4.9: Plot for log of NS after first differencing

Source: Author (2022)

The first differenced variable was stationary around a trend or mean. The variable nutrition status was integrated of order 1 since it became stationary after being differenced once.

The plot of log of access to health services (InAHS) after first differencing is shown in figure 4.10.

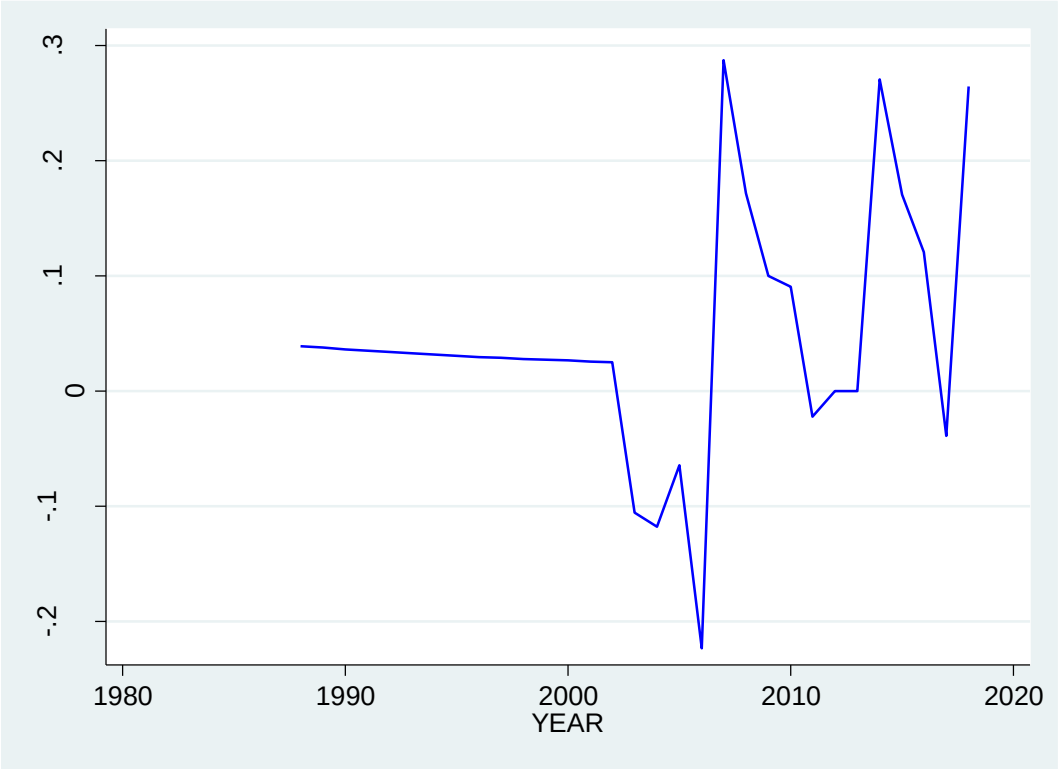

Figure 4.10: Plot for log of AHS after first differencing

Source: Author (2022)

The first differenced variable was stationary around a trend or mean. The variable access to health services was integrated of order 1 since it became stationary after being differenced once.

4.4 Unit Root Test

The results of the unit root test are shown in table 4.2.

Table 4.2: Augmented Dickey Fuller test

Variable	ADF t-statistics	1% level	5% level	10% level	Conclusion
InGDP	-1.785	-2.652	-1.950	-1.602	Non-Stationary
InHE	1.227	-2.652	-1.950	-1.602	Non-stationary
InLE	0.891	-2.652	-1.950	-1.602	Non-Stationary
InNS	-0.063	-2.652	-1.950	-1.602	Non-stationary
InAHS	1.876	-2.652	-1.950	-1.602	Non-stationary

Source: Author (2022)

The results in table 4.2 indicated that the variables used an absolute value to show that log of GDP, log of health expenditure, log of life expectancy, log of nutrition status and log of access to health services are < than the critical values at 5%. The unit root is present and stationary was rejected and the null hypothesis at 5%, concluded that there was a unit root under the study. To eliminate the presence of unit root, the variables were differenced as shown in table 4.3.

Table 4.3: Augmented Dickey Fuller after Differencing

Variable	ADF t-statistic	1% level	5% level	10% level	Conclusion
InGDP	-5.850	-2.654	-1.950	-1.602	I(0) Stationary
InHE	-5.309	-2.655	-1.950	-1.601	I(0) Stationary
InLE	-4.788	-2.654	-1.950	-1.602	I(0) Stationary
InNS	-2.508	-2.654	-1.950	-1.602	I(0) Stationary
InAHS	-2.406	-2.654	-1.950	-1.602	I(0) Stationary

Source: Author (2022)

From the results in table 4.3, after differencing the ADF t-statistics, log of GDP was -5.850, log health expenditure was -5.309, log of life expectancy is -4.788, log of nutrition status was -2.508 and log of access to health services was -2.406 which were greater than the critical values at 5%. This implied that the variables were stationary after differencing at 5% level of significance and concluded that there was no unit root.

4.5 VAR Order Selection Criteria

The study used optimal lag length 4 as it was selected from table 4.4. The decision rule is to choose the model with the lowest information criteria that avoids misspecification of errors (Greene, 2000).

Table 4.4: Order Selection results

Selection-order criteria
Sample: 1987 - 2018 **No of observations = 28**

Lag	LL	LR	df	p	FPE	AIC	HQIC	SBIC
0	54.0713				2.1e-08	-3.50509	-3.43237	-3.2672
1	243.619	379.1	25	0.000	1.7e-13	-15.2585	-14.8222	-13.8312
2	324.208	161.18	25	0.000	3.8e-15	-19.2291	-18.4292	-16.6123
3	430.131	211.84	25	0.000	2.1e-17	-25.0093	-23.8457	-21.203
4	533.232	206.2*	25	0.000	3.3e-19*	-30.588*	-29.0608*	-25.5922*

AIC = information criterion; BIC = Bayesian information criterion

Source: Authors (2022)

The lag length was determined before conducting the Johansen cointegration test. The results of sequential modified LR test statistic, final prediction error, aikaike information criteria, hannan-quinn information criterion and schwarz information criterion lag in table 4.4 points out the use of 4 lags as the best lag length. As for results in table 4.4 the study employed the use of four lags in the subsequent analysis with the selection of AIC which has the lowest value of -30.588* than other values.

4.6 Cointegration Rank Test

Cointegration test was conducted to establish a long run relationship using the Johansen cointegrating test to determine the number of cointegration equations to run. The results are shown in table 4.5.

Table 4.5: Cointegration Test

Johansen Test for Cointegration

Sample period 1991-2018 **No. of observations= 30**

Lags=4

Max rank value	Parms	LL	Eigen value	Trace statistic	5% critical
0	80	395.5866	-	275.2911	68.52
1	89	469.20338	0.99480	128.0576	47.21
2	96	512.80009	0.95558	40.8642	29.68
3	101	526.88756	0.63441	12.6892	15.41
4	104	533.22439	0.36405	0.0156	3.76
5	105	533.23218	0.00056	-	-

Trace test* ***indicates 4 Cointegrating equations at 5% level of significance*

Source: Authors (2022)

The cointegration rank test shows that there are three cointegrating equations. This has led to the rejection of null hypothesis of no co-integration. This implied that when there are shocks in the short run which could affect movement of individual series, they would converge in the long run.

4.7 Vector Error Correction Model

Cointegration occurs when there is a long-term or equilibrium allowing for the linear trend relationship between the variables. In the short term, there would be disequilibrium but corrected in the long run (Sargan, 1988). ECM later was adopted by Engle and Granger to correct for disequilibrium which stated that if two variables Y and X are cointegrated the relation of the two is the error correction model. Having established long run relationship, the vector error correction was run when each of the variables was taken as a dependent variable in order to determine the short run and long run relationships.

The short run relationship shows the deviation of the variable from its long term trend. This is shown by table 4.6.

Table 4.6: Vector Error Correction Model for GDP Growth rate (GDP)

Co-integration relations	coefficient	Standard Error	Z	P-value
Ce1 L1	-3.541802	1.180523	-3.00	0.003
Ce2 L1	46.57773	27.50123	1.69	0.090
Ce3 L1	-133.5392	99.33487	-1.34	0.179
Constant	0.0035185	1.00591	0.00	0.997

Source: Author (2022)

Short run fluctuations would cancel each in the long run whereby they would adjust toward the mean. These deviations in GDP in the short run are statistically significant for cointegration relation 1 while they were insignificant for co-integration in relation 2 and 3. The deviation of the constant from the mean was not statistically significant. The constant term being statistically insignificant implies that GDP growth does not depend on its value in the previous period.

Table 4.7: Vector Error Correction Model for Health Expenditure

Co-integration relations	Coefficient	Standard Error	Z	P-Value
Ce1 L1	0.0280334	0.0277053	1.01	0.312
Ce2 L2	-1.46242	0.6454164	-2.27	0.023
Ce3 L3	-0.4858358	2.331254	-0.21	0.835
Constant	-0.0010502	0.0236073	-0.04	0.965

Source: Authors (2022)

The deviation in health expenditure in the short run were statistically insignificant for co-integration relations 1, 3 and statistically significant for relations 2. The deviation of the constant from its mean was not statistically significant. The constant term being statistically insignificant implied that health expenditure did not depend on its value in the previous period.

Table 4.8: Vector Error Correction Model for Life Expectancy

Co-integration relations	Coefficient	Standard Error	Z	P-Value
Ce1 L1	-0.0004096	0.0004216	-0.97	0.331
Ce2 L1	-0.0107067	0.0098205	-1.09	0.276
Ce3 L1	-0.0504851	0.0354719	-1.42	0.1552
Constant	-0.0002198	0.0003592	-0.64	0.541

Source: Authors (2022)

The deviations in life expectancy for short run were all statistically insignificant for cointegration relations 1, 2 and 3. The deviation of the constant from its mean was statistically insignificant implies that the variable life expectancy did not depend on its value in the previous period.

Table 4.9: Vector Error Correction Model for Nutrition Status

Co-integration relations	Coefficient	Standard Error	Z	P-Value
Ce1 L1	0.00704	0.0272007	0.26	0.796
Ce2 L1	0.2995794	0.633661	0.47	0.636
Ce3 L1	-0.05691743	2.288793	-0.25	0.804
Constant	0.0610163	0.0231774	2.63	0.008

Source: Authors (2022)

The deviations in Nutrition status for the short run were statistically insignificant for co-integration relations 1, 2 and 3. The deviation of the constant from the mean was statistically significant which implied that the variable nutrition status depended on its value in the previous period.

Table 4.10: Vector Error Correction Model for Access to Health Services

Co-integration relations	Coefficient	Standard Error	Z	P-Value
Ce1 L1	0.1314587	0.1015296	1.29	0.195
Ce2 L1	-2.002145	2.365213	-0.85	0.397
Ce3 L1	5.493766	8.543186	0.64	0.520
Constant	0.0917522	0.0865121	1.06	0.289

Source: Authors (2022)

The deviations in access to health services in the short run were all statistically insignificant for cointegration relations 1, 2 and 3. The deviation of the constant from its mean was statistically insignificant implied that access to health services did not depend on its value in the previous period.

4.8 Cointegration Results

Cointegration test was used to test the long run relationships. The estimated long run results are shown in table 4.11.

Table 4.11: Estimated Long Run Results

Variable	Coefficient	Standard Error	Z	P-Value
InGDP	1	-	-	-
InHE	0	omitted	-	-
InLE	-1.42e-14	-	-	-
InNS	-5.6256	2.7645	-2.03	0.042
InAHS	3.4610	3.3333	1.04	0.299
Constant	9.4238	-	-	-

Source: Author (2022)

The result could be presented as:

$$InGDP_{t-2} = 9.4238 - 5.6256InNS_{t-2} + 3.4610InAHS_{t-2} \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots 4.1$$

(2.764) *(3.333)*

The results indicated that the coefficient of nutrition status was -5.6256, $p = 0.042 < 0.05$, which was negative and significant at 5 percent level of significance. This implied that in the long run, an increase of a coefficient nutrition status by one percent would result in a reduction of GDP growth rate by 5.6256 percent. The results revealed that nutrition status variable was an important variable in explaining the long run GDP growth rate. The results were consistent with (Wang, 2003) who found a strong association between nutrition on growth in the long run relationship. The study also conformed to those of Dawson and Tiffin (2002) who observed that the population should reduce the intake of saturated fats, cholesterol intake to make a healthy population for productive economic growth.

4.9 Post Estimation Diagnostic Test

The diagnostic tests performed; normality test, test order of autocorrelation test, heteroskedasticity test, multicollinearity test and stability test.

4.9.1 Normality Test

Jarque – Bera test was conducted to check for normality and the results are shown below.

Table 4.12: Normality Test Results

	Jarque-Bera Normality Test		
Equation	**Chi2**	**Degrees of freedom**	**Prob> Chi2**
D_lnGDP	0.418	2	0.81151
D_lnHE	1.088	2	0.58049
D_lnLE	9.923	2	0.00700
D_lnNS	4.138	2	0.12631
D_lnAHS	0.502	2	0.77819
ALL	16.068	10	0.09771

Source: Author (2022)

From the results, the residuals from the estimated multivariate model followed a normal distribution with the prob 0.17854> 0.05.

4.9.2 Autocorrelation Test

A Breusch – Godfrey serial LM test was conducted using two lags as shown in table 4.13.

Table 4.13: Breusch-Godfrey LM Test

Lags(p)	**chi2**	**df**	**prob >chi2**
2	10.400	2	0.0055

Source: Author (2022)

The lagrange- multiplier test was performed and the results revealed that there was no autocorrelation at the specified lag length. In table 4.14, the results showed chi-square was 10.400 with 2 degrees of freedom and a p-value of 0.0055. This implied that the hypothesis of no serial correlation was not rejected in the model.

A breusch pagan test/ cook –weisberg test for heteroskedasticity was conducted and the results presented in table 4.14.

Table 4.14: Breusch Pagan test/ Cook –Weisberg

F (1, 30) = 2.35

Prob> F= 0.1358

HO: constant variance

Source: Author (2022)

The results in table 4.5 revealed that the probability of F statistic was greater than 0.05. This indicated that null hypothesis was not rejected which implied that the errors were homoscedastic.

4.9.3 Multicollinearity

Multicollinearity does not violate any regression assumptions. The study used the general rule of thumb and Klein Lawrance rule of thumb which states that the greater the tolerance is close to zero the greater the degree of linearity. R2 are obtained from regression of explanatory variables. The study tested for multicollinearity and a rule of thumb and produces a VIF value of each explanatory variables in the model. If VIF is in excess of 10, or a tolerance (1/VIF) is 0.1 or more then there is multicollinearity.

Table 4.15: Multicollinearity Test

Variable	**VIF**	**1/VIF**
InHE	3.27	0.3058
InLE	2.20	0.4545
InNS	1.79	0.5586
InAHS	8.33	0.1200

Mean VIF= 3.27

Source: Author (2022)

The results depicted that, the null hypothesis of non-multicollinearity was acknowledged as the VIF were less than 10 or the tolerance (1/VIF) was more than 0.1 for all the variables.

4.9.4 Stability Test

The stability test was conducted and the results is depicted in figure 4.11.

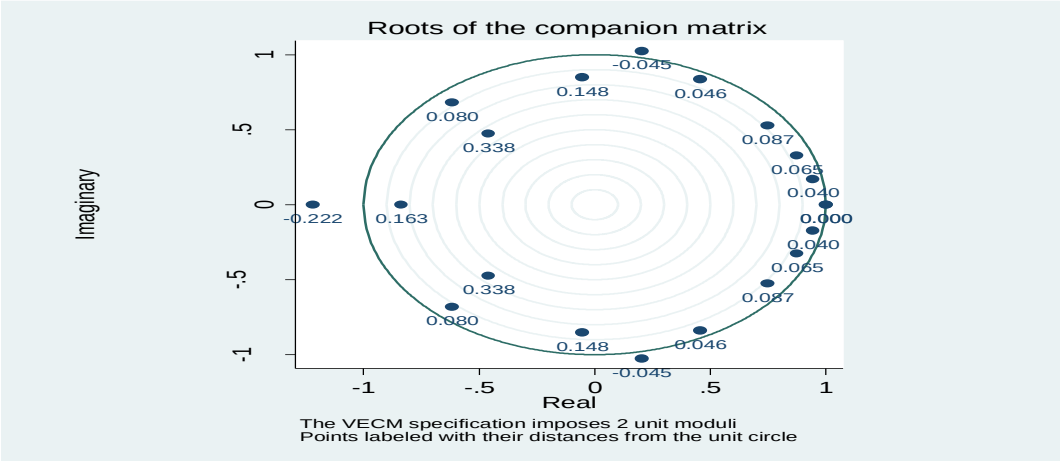

Figure 4.11: Roots of Companion Matrix

Source: Author (2022)

The results indicated that the model was stable since all the variable lied inside the unit cycle.

4.10 Regression Analysis

The final regression results

Table 4.16: Regression results

Number of observations =31
(F, 26)=13.97
Prob>F=0.000
R-squared=0.6742
Adj R-squared=0.6260
Root MSE=0.9072
Durbin W. 2.040715

Dependent variable is InGDP

Variable	Coefficient	Standard Error	t-value	Probability
InHE	1.607075	1.009194	1.59	0.123
InLE	1.329245	0.5219814	2.55	0.017
InNS	-2.072788	0.8327589	-2.49	0.019
InAHS	-0.0682604	0.5908583	-0.12	0.909

Source: Author (2022)

The Durbin Watson of 2.040715 is greater than the values R-Squared R^2=0.6742 and Adjusted R^2=0.6260 meaning the results can be used for analysis because the problem of correlation has been handled. The coefficient of determination (R2) of 0.6742 means that 67.4 percent of the variation in the dependent variable, GDP growth rate is explained by the independent variables: health expenditure, life expectancy, nutrition status and access to health services. Therefore, it indicates that 32.6 percent of the variation in GDP growth rate is due to error, other factors were not included in the model.

Life expectancy was found to be positively related with economic growth. The coefficient of life expectancy was 1.3292 which was positive and significant at 5

percent level. This implied that for one percent increase in coefficient of life expectancy, GDP growth rate could increase by 1.3292 percent. Coefficient of life expectancy was found to be influencing positively economic growth rate in Kenya.

Nutrition status was found to be negatively related with economic growth. The coefficient of nutrition status was -2.072 which was negative and significant at 5 percent level. This implied that for every one percent increase in coefficient of nutrition status, GDP growth rate would fall by 2.072. Coefficient of nutrition status was found to be influencing negatively economic growth rate in Kenya.

4.11 Hypotheses Testing Results

Applying Multiple Regression Approach, the stated hypotheses were tested and the summary of the results were as follows:

Ho_1: There is no significant effect of healthcare expenditure on economic growth in Kenya.

The observed test statistic, $p = 0.123 > 0.05$ for the coefficient of healthcare expenditure implying that healthcare expenditure did not influence the economic growth rate in Kenya at 5 percent level of significance. Therefore, the null hypothesis relating to healthcare expenditure was not rejected at the 5 percent level of significance.

Ho_2: Life expectancy does not significantly affect economic growth in Kenya.

The observed test statistic, $p = 0.017 < 0.05$ for the coefficient of life expectancy implying that life expectancy influenced the economic growth rate in Kenya at 5 percent level of significance. Therefore, the null hypothesis relating to life expectancy was rejected at the 5 percent level of significance.

Ho_3: Nutrition status does not significantly affect economic growth in Kenya.

The observed test statistic, $p = 0.019 < 0.05$ for the coefficient of nutrition status implying that nutrition status influenced the economic growth rate in Kenya at 5 percent level of significance. Therefore, the null hypothesis relating to nutrition status was rejected at the 5 percent level of significance.

Ho_4: Access to health services does not significantly affect economic growth in Kenya.

The observed test statistic, $p = 0.909 > 0.05$ for the coefficient of access to health services implying that access to health care influenced the economic growth rate in Kenya at 5 percent level of significance. Therefore, the null hypothesis relating to access to health care was not rejected at the 5 percent level of significance.

CHAPTER FIVE

SUMMARY OF FINDINGS, CONCLUSIONS AND POLICY IMPLICATIONS

5.1 Overview

This chapter presents the summary, conclusions, policy implications, limitations of the study and areas for further studies. The chapter discusses the objectives investigated during the study and suggestion for further research.

5.2 Summary of Key Findings

The study empirically evaluated the impact of resident health indicator on economic growth in Kenya for the period 1987-2018. The specific objectives were to: evaluate the effect of healthcare expenditure on economic growth; evaluate the effect of life expectancy at birth on economic growth; to evaluate the effect of nutrition status on economic growth and to examine the effect of access to health services on economic growth. A regression analysis was run to evaluate the effect of health expenditure, nutrition status, life expectancy and access to health services on economic growth in Kenya. The results revealed the coefficient of health care expenditure to be positive and statistically insignificant. Coefficient of life expectancy to be positive and statistically significant. Coefficient of nutrition status to be negative and statistically significant. Coefficient of access to health services to be negative and statistically insignificant. The coefficient of determination (R^2) was 0.6742 meaning that all the independent variables explain 67.42 percent of the dependent variable.

5.3 Conclusions

From the study findings, this paper concludes that there is a relationship between economic growth, life expectancy and nutrition status since the coefficient of life expectancy and coefficient of nutrition status were significant. The other independent

variables; health expenditure and access to health services had coefficient that were not significant in explaining and influencing economic growth.

5.4 Policy Implications

Based on the study empirical findings, the study submits the following policy implications:

Life expectancy was found to be statistically significant. Life expectancy depends on the standard of living and health facilities of a country. Life expectancy has been majorly affected by the emergency of life style which in the long run would make the population unhealthy and unproductive towards attaining economic growth. Therefore, the government should invest in health facilities and in improving the standard of living, for life expectancy would accelerate economic growth.

Nutrition status was found to be statistically significant. Nutrition status as a proxy for dietary nutrient uptake/capita which represents under-nutrition especially for developing nations like Kenya has been affected by food security. Kenya still suffers from food insecurity or low dietary food uptake in the economy, hence affects the health and productivity of the economy. Hence the government should increase awareness on better foods intake and train farmers to improve on food security, for better dietary nutrient uptake for a better and healthy population to accelerate economic growth.

5.5 Limitation of the Study and Areas for Further Studies

The study has examined the period from 1987 to 2018 due to unavailability of data prior to 1987 which were not available from 1963 to 1987 of the selected health indicators and also beyond 2018.

Secondly there has been limited research on time series study on health indicators on economic growth hence most studies on health indicators are descriptive and primary only. The study was able to review the available literature on the selected health indicators in the Kenya context.

The study did not take account other variables which could affect economic in Kenya such as HIV prevalence rate, universal health services and public expenditure on health. There is need to incorporate these health indicators to assess the effect on economic growth.

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APPENDICES

Appendix 1: Introduction Letter from School of Business, Moi University

MOI UNIVERSITY
POSTGRADUATE OFFICE
SCHOOL OF BUSINESS AND ECONOMICS

Tel: 0790940508
0771336914
0736138770
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P.O. Box 3900
Eldoret.
Kenya

RE: SBE/PGE/2014/16 **DATE:** 25th February, 2021

TO WHOM IT MAY CONCERN

Dear Sir/Madam,

RE: KELVIN MUTIRA MISANGO

The above named is a bonafide student of Moi University School of Business and Economics, undertaking a Master of Arts in Economics Degree. He has completed coursework, defended his proposal, and is currently proceeding to the field to collect data for his research topic titled: **"Effects of Residents Health Indicators on Economic Growth in Kenya."**

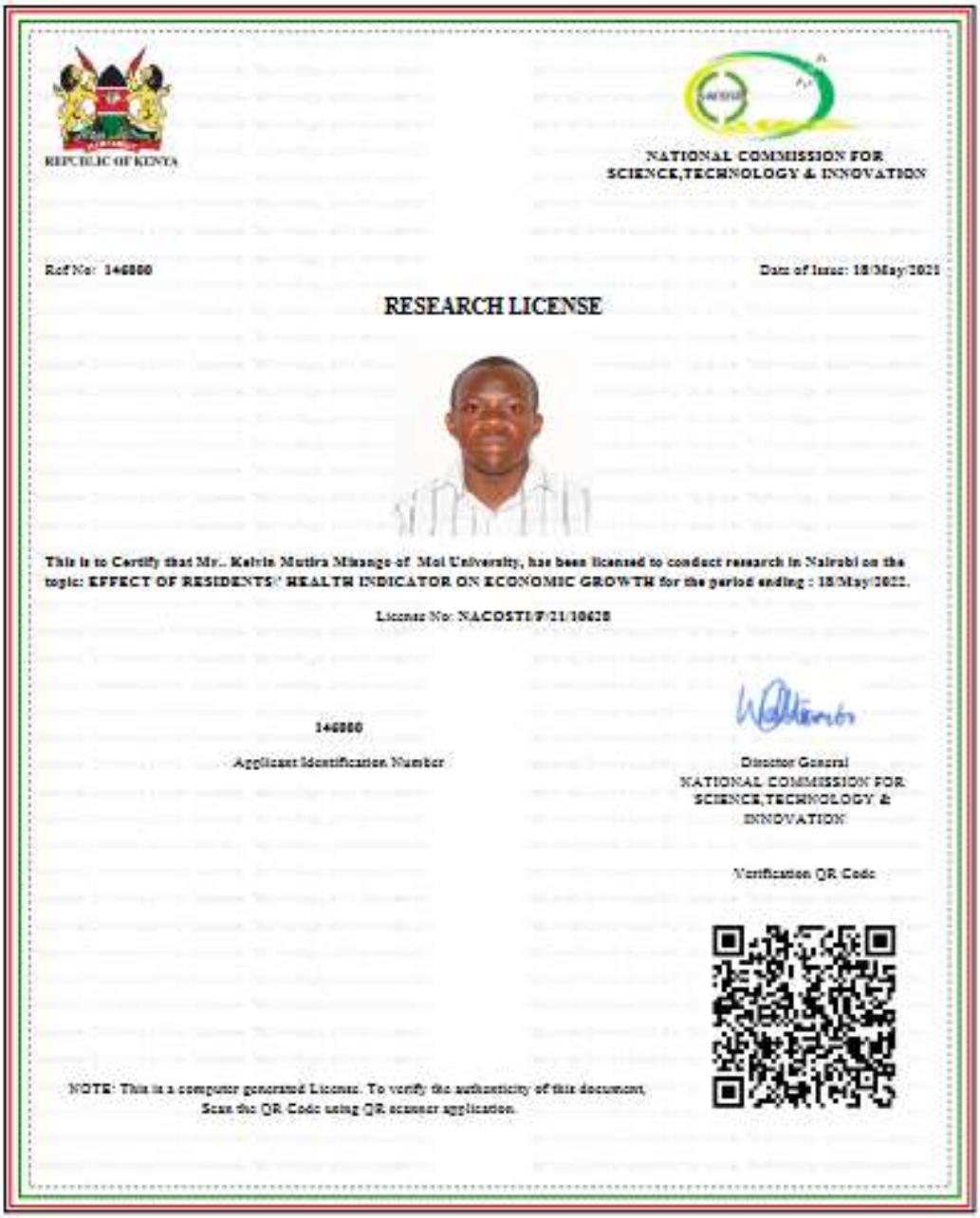
Any assistance accorded to him will be highly appreciated.

Yours faithfully,

DEAN
School Of Business and Economics
MOI UNIVERSITY

DR. JOSEPHAT CHEBOI
AG. DEAN, SCHOOL OF BUSINESS AND ECONOMICS

Appendix II: Research Permit - National Council for Science and Technology



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