Economic Growth and Public Healthcare Expenditure in Kenya (1982 - 2012)

Nyamwange, Mathew

University of Nairobi

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ECONOMIC GROWTH AND PUBLIC HEALTH EXPENDITURE IN KENYA (1982 – 2012)

By

Mathew Nyamwange
X50/70602/2007

SUPERVISORS
Prof G. Mwabu
Dr. M. Mugo

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DECLARATION

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

______________________ Date 28/8/2012

Mr. Nyamwange Mathew

X50/70602/2007

This project has been submitted for this examination with my approval as University Supervisor.

______________________ Date 6/11/2012

Prof. G. Mwabu

School of Economics

University of Nairobi

______________________ Date 6/11/2012.

Dr. Mercy Mugo

School of Economics

University of Nairobi

DEDICATION

This work is dedicated to God's glory! My dear parents, the Late Father Silas Nyamwange and Mother Hephziba Mokeira Nyamwange; my family – sisters and brothers of all whom have made the completion of this study worthwhile.

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I would like to thank my supervisor Prof G. Mwabu for his constructive comments, time, and advice which brought me to the completion of this study. I am ever grateful to Dr. M. Mugo for her contributions which helped a lot in ensuring that my studies proceeded smoothly.

Secondly, I wish to extend my appreciation to my mom for her support, and to my brothers and sisters especially Lynette and Fred, for their educational motivation. To them I say, *"Nyasaye abasesenie"*. *(Translation: God Bless You)*

Above all, I would like to thank my Heavenly Father for the guidance, grace and mercy which He showed me as I endeavored to complete this study.

ABSTRACT

This study examines the effect of per capita gross domestic product (GDP per capita) on public healthcare expenditure (PHCE) in Kenya. The study uses estimates of public recurrent & development expenditures, (1982 - 2012), as well as the economic survey and statistical abstracts for the same years. The analysis is a time series estimation of the effect of per capita gross domestic product on public healthcare expenditure, so as to explain the minimum amount of funding that the government should direct to public healthcare expense given future predictions of GDP per capita by institutions like World Bank. The study employs OLS regression and checks for co-integration on the long-run relationship between PHCE and GDP per capita, as well as other tests of granger causality, unit root presence and stationarity. The study attempts to determine the properties of healthcare in Kenya, and finds that healthcare in Kenya is a necessary good and has an elasticity of 0.024% to GDP per capita. This is to mean that for every 1% increase in GDP per capita, PHCE should increase by 0.024%.

For the policy makers, this study advices on a suitable strategy for financing healthcare in Kenya as it faces challenges of underfunding and an increased demand of quality and availability of health care services that are equitable and affordable for a growing population.

In this study, health care expenditure (PHCE) may simply refer to total public expenses from government budgetary allocation and financial aid that the Kenyan health sector spends annually on health care delivery systems.

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LIST OF ABBREVIATIONS/ACRONYMS

ADF	Augmented Dickey-Fuller
CPI	Consumer Price Index
DALY	Daily Adjusted Life Year
DHS	Demographic Health Survey
GDP	Gross Domestic Product
GOK	Government of Kenya
HFP	Health Policy Framework
HIV/AIDS	Human Immunodeficiency Virus/ Acquired immune Deficiency Syndrome
LTEF	Long term Expenditure Framework
MOH	Ministry of Health
MTEF	Medium Term Expenditure Framework
NGO	Non-Governmental Organizations
NHEA	National Health Expenditure Accounts
NHIF	National Health Insurance Fund
NHSSP	National Health Sector Strategic Plan
OLS	Ordinary Least Squared
QALY	Quality Adjusted Life Year
PAYE	Pay As You Earn
PHCE	Public Healthcare Expenditure
UN	United Nations
UNICEF	United Nations Children's Fund
WHO	World Health Organization

CHAPTER ONE

1.0 INTRODUCTION

1.1 Background

Health economics is widely used in health sectors these days because it provides concepts and techniques that can help policy makers to plan, allocate and manage health resources in order to efficiently and equitably meet the health needs of the population. Moreover, the evidence that can be generated using the discipline of health economics can be useful in determining the amount of a country's gross domestic product that should be allocated to the health sector. Studies exist on the relationship between gross domestic product (GDP) and public health care expenditure (PHCE) in developed countries (Newhouse, 1977) but no evidence exists on this issue in Kenya. The purpose of this study is to fill this knowledge gap.

Newhouse's (1977) study of the relationship between GDP and PHCE in developed countries showed that almost 92% of changes in PHCE can be explained by changes in economic growth, and that GDP per capita growth is the best indicator of the amount of resources a country can afford to allocate to the health sector.

To make clear PHCE projections for a country, there is need to look at the elasticity of demand of PHCE with respect to the country's growth in GDP. Studies exist on the estimates of the responsiveness of PHCE to national incomes in developed economies but hardly any exist for Kenya. The studies on this issue include (Culyer (1990), Dritsakis (2003), Felder et al (2000), Hansen and King (1996), Jowett (1999), and Okunade & Murthy (2002)). These studies highlight the following as major reasons for variation in PHCE.

Population growth: This increases the amount of PHCE invested in the country, especially because of the population senility rate usually caused by chronic illnesses and severe diseases that increase over time; Technology advancement: This reduces the amount of PHCE in the long-run given a heavy initial investment of medical technology by PHCE in the short-run; Expansion of medical infrastructure: The need for more hospitals, dispensaries, health clinics and roads would necessitate an almost immediate increase in PHCE; and Economic growth: The increase in GDP would lead to a percentage increase in PHCE, however the extent of increase would depend on the elasticity demand of PHCE in that country. To effectively plan, allocate and manage healthcare expenditure in a country, it is necessary to understand how economic growth affects government health expenditures.

1.2 Policy on Healthcare financing in Kenya

Despite the increase in the share of government spending on the ministries of health (MOH) from Kshs 26 billion in 2007 to Kshs 50.37 billion in 2012, efforts by the government of Kenya (GOK) to ensure equitable provision of quality public health services have been constrained by a host of factors. Among these factors are: inadequate funding to cater for the growing population; ineffective management of already available resources to the health sector; supporting health care advances in curing diseases and prolonging life expectancy.

To this end, the GOK established the "Health Policy Framework" (HPF) in 1994. The objectives of the framework were to:

- Generate increased financial resources for the health sector from cost sharing, namely, user fees and social financing, and
- Use resources more efficiently.

These two objectives were designed to be complementary, in recognition of the fact that neither one alone would fully address Kenya's health financing problems. Specific recommendations of the framework included:

(1) Increase public spending for primary and preventive services;
(2) Increase MOH revenue generation through cost sharing initiatives;
(3) Shift of the financial burden of curative services from the MOH to the National Hospital Insurance Fund (NHIF) and other social insurance schemes; and,
(4) Strengthen non-governmental organizations (NGOs), local authorities, private sector and religious missions' health services delivery by providing an enabling environment (Mwangi, 1998).

These structural adjustments for the health sector in place envisioned improved healthcare services especially since Kenya's population is increasing at 4% total per year, and diseases are becoming more complex worldwide. However, a decade into the implementation of the HPF briefly informs us otherwise. Therefore, does Kenya have a sustainable capability to provide adequate funding for its healthcare delivery system? And if the capability exists, can we then ensure that healthcare financing provision is strategically planned to be efficient and sustainable?

1.3 Statement of the problem

The share of government spending on health is constantly increasing; (from Kshs 26 billion in 2007 to Kshs 50.37 billion in 2012) and is met by an almost immediate increase in the demand for healthcare. However, this increased public expenditure to health is usually insufficient to cater for its demand. One concern that has brought about this insufficient allocation is that the share of PHCE in Kenya is not well linked to the GDP per capita or to the capacity of the economy to finance health services.

This study fills the knowledge gap of the effect of GDP on PHCE in Kenya. Determining the effect of GDP on PHCE provides a good starting point in effectively planning for sufficient financial resources for the health sector in Kenya.

1.4 Objectives of the study

The broad objective of the study is to investigate the relationship of public healthcare expenditure and GDP in Kenya.

The specific objectives of the study are:

a) To understand the nature of the relationship between GDP growth and PHCE in Kenya.
b) To estimate the elasticity of PHCE with respect to GDP growth using Kenyan data.
c) In line with findings in (a) and (b) above, to outline policy options necessary for increasing PHCE so that it can be used to improve the health of the population as the economy grows.

1.5 Justification of the Study

Kenya faces a problem of insufficient financial resources to support its growing demand for healthcare. In an article on 30th June 2010 - The daily standard reported that cash shortage is being blamed for the rise in health woes in Kenya. The Ministry of Public health noted that government (budget) allocations to healthcare expenditure had been increasing over the years, at a constant rate of 5% but the funding was insufficient to cater for the growing demand of healthcare delivery, this in turn led to the worsened state of healthcare indicators in the country. The danger then as experienced is that the inefficiency in public healthcare expenditure would lead to increased costs of service delivery over time, and therefore weakens the sustainability of healthcare financing.

There is a lot of literature on healthcare expenditure strategies in developed countries, and how the effect of GDP to the economy can be effectively used in planning for a sufficient healthcare expenditure framework. There is need to fill this knowledge gap in Kenya and in turn identify a good foundation for policy makers to effectively, adequately and equitably fund health care systems in Kenya.

CHAPTER TWO

2.0 LITERATURE REVIEW

2.1 Recent Economic Trends

Globally, statistics show that economic trends have slugged from 5% in 2010 to 3.8% in 2011. This slug was mainly due to among other factors; the Middle East political instability that caused a rise in oil prices in the international markets in mid 2011, the Euro debt crisis that has left Greece at a 159.1% debt ratio to GDP in the 3rd quarter of 2011[1], and a reduction in the industrial growth progress in emerging countries like China, due to higher production costs.

The global fall in GDP did not leave Kenya out. Kenya has had its own share of economic shocks among which the main shock being the depreciating shilling that had reached its all time low against the US dollar in 2011 and in effect led to the increase in fiscal and current account deficits, and high inflation.

However, according to World Bank group (2012) despite the shocking factors, the GDP nominal for Kenya increased from kshs 2.5 trillion ($32,187.60 million) in 2010 to kshs 3.0 trillion in 2011 ($34,059.00 million). This was led by many factors including better indirect returns from infrastructure development, and more revenue from Kenyans in the Diaspora. Inflation in Kenya reduced from 18.1% in late 2010 to 14.5% in mid 2011 and down to 13.06% as of April 2012.

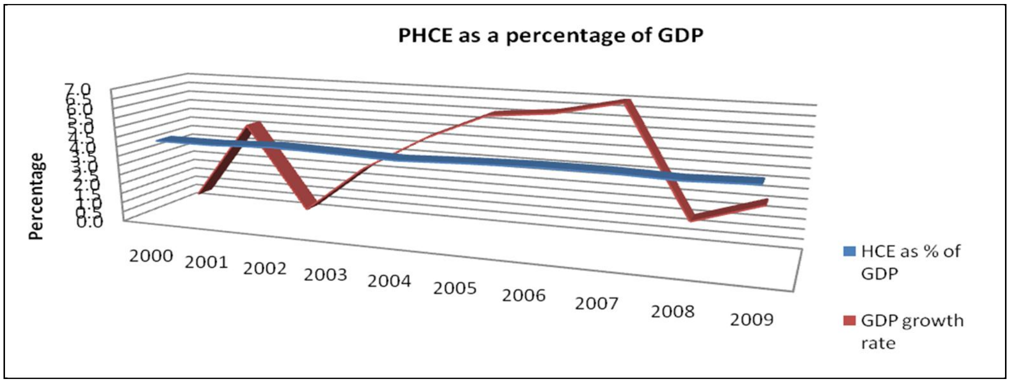
Despite the increase in cost of living, the total government allocation to the social sector (i.e. health and education) was not as substantial as expected. According to the Ministry of Finance - Kenya, budgetary allocations to the social sector (health and education) increased from Kshs 189.9 billion in financial year 2009/2010 by only 70 billion (approx, 1 shilling per person) to Kshs 259.9 billion in 2011/2012. This allocation is only 10% of total GDP capacity. In particular the health sector received

[1] Eurostat statistics (2012)

Kshs 51.9 billion in the financial year 2011/2012 – that is 1% of GDP outlay in 2011, a figure that has brought many contentious issues by the ministries heading health in Kenya.

The figure below gives a clearer picture of public health care spending in comparison to economic performance in Kenya.

Figure 1: PHCE as a percentage of GDP, 2009/2010



Source: World Bank on Kenya NHEA 2009/10

We notice that public healthcare expenditure has almost not changed significantly from its GDP performance, showing that whether GDP increases or reduces; healthcare expenditure in Kenya is not affected.

For better management of PHCE, a bare minimum cost derived from the relative GDP performance to PHCE ratio is necessary and sufficient, as has been researched by economic scholars including Culyer (1990), and Dritsakis (2003).

2.2 Recent Health Trends

Kenya's health finance is at a dire state and is reducing with time. According to the Ministry of Planning, total expenditure on health as a percentage of GDP in Kenya has reduced from 5.1 % in 2002 to almost 1.5% in 2012. Overall in the last decade this reduction is drastically below the 15% GDP to PHCE ratio recommended by the 2005 Abuja declaration. This means that, Kenya's health spending stands at $36.1 per capita, below the WHO recommended level of $41 per capita.

Health financing in Kenya is a challenge, however, the implementation of medium term expenditure framework (MTEF) and the long-term expenditure framework (LTEF) outlined by the national health sector strategic plan (NHSSP-2009) seeks to attend to strategies of raising adequate resources to healthcare delivery in Kenya.[2]

According to UNICEF, 2010 life expectancy in Kenya is at 57 and is expected to decrease further given the high adult (aged 15-24) HIV/AIDS prevalence rate of 6.3%. UNICEF states that the situation of health in Kenya is further worsened because of the 20% of the population below the international poverty line of $1.25 per day, and also by the fact that of the 20% only 77% contribute to the total PHCE.

Low financing of the health expenditure in Kenya has reduced the ability of the country to adequately provide proper health care services to its population. According to the GOK budget analysis (2011) 36.07% of financing to healthcare was derived from external sources and in addition, other factors like insufficient use of resources, increased diseases and rapid population growth also contribute to the strain. This means Kenya is only 63.97% capable of sustaining the health expenditure of its population.

According to UN (2010) studies, Kenya faces a challenge in the access to medical care; it is unequally distributed in the country, as is the fertility rate and level of education (These are factors that contribute to better health status of a nation)[3]. According to a survey by the demographic health survey (DHS), 2008 Central Province and Nairobi have the best medical facilities, whereas the North-Eastern Province is the most under-developed in terms of medical facilities. In addition, in rural areas, when poor people get sick, their only option is to be treated in primary care facilities that are under staffed, under-equipped and have limited medicine. DHS (2008) survey reveals that 44% of the poor in the rural areas were hindered from receiving care because of cost, and 18% were hindered by long distance to the nearest health facilities in 2005.

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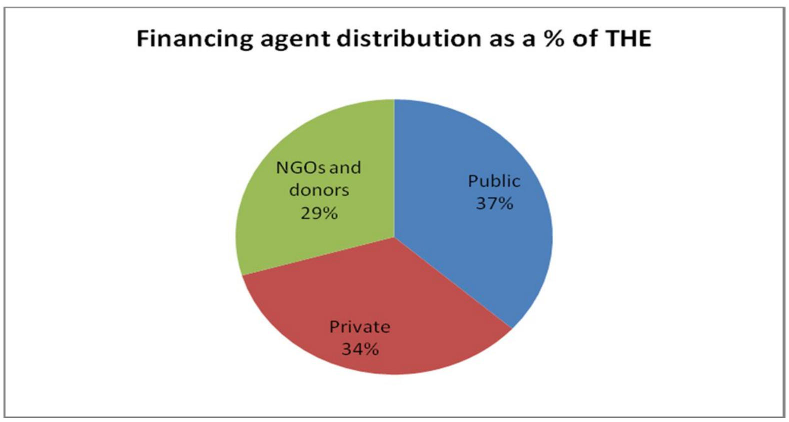
[2] GOK/Annual progress report on the implementation of the first Medium Term plan of Kenya Vision 2030, (2010)

[3] UNICEF annual report (2010)

Given the development income from the rural areas and comparing it to the annual government PHCE allocation to the same area, better planning needs to be undertaken to provide adequate and equitable infrastructure in health care provision.

There is a rise in the demand for proper healthcare in Kenya, and an increase in the cost to deliver these health services. In addition to planning, Kenya's economy should look into developing a sustainable capital formation for PHCE. One of the best ways to determine appropriately the proportion of capital outlay to PHCE is to look at the elasticity of demand for PHCE and relate this capital to the nation's economic capacity. The figure below shows current financing sources of healthcare expenditure in Kenya.

Figure 2: Financing agents of total healthcare expenditure (THE) in Kenya in 2009/2010



Source: USAID/MOH on Kenya NHEA 2009/2010

2.3 Theoretical Literature

Public healthcare expenditure allocations can be derived from a number of several decision factors that stem from both politics and economics. Buchanan's theory of healthcare spending in 1965 emerged at a time when economists feared that if government provided total healthcare to the public, an excess in demand for healthcare would develop and in turn lead to an unreasonable excess in government expenditure on health. Buchanan's theory, drawn from the above fear, encouraged political decisions on public spending to be made independent of the demand, so that inefficiency is noticed not from lack of supply but from reduced quality in the form of congestions, infrastructure, unequal distribution of hospital staff (doctors and nurses) and so on. This theory almost vividly describes the current health situation in Kenya, where inefficiency in healthcare is linked not in the inability to allocate funds to PHCE but in the reduced quality of healthcare systems in the country.

The danger of the above theory is that better quality healthcare systems will emerge from the private sector and in turn lead to expensive healthcare costs, deeming healthcare inequitable to the public, a concept that is converse to the purpose of the theory's aim. It is inevitable that decisions on healthcare financing will be made politically, and not automatic as would price dictate the supply and demand of a good. Therefore the political decisions on healthcare financing require an analytical mode of action popularly suggested by GDP projections as studies have shown (Jowett (1999), Leu (1986) and Bonsanquet (1986)).

It is clear to many researchers including Leu (1986) that the wealthier (per head) a nation, the more it spends on healthcare per head and the greater the proportion of its total income spent on health. In developing countries like Kenya, World Bank statistics show that Kenya's GDP nominal ranks 70th out of 154, it is expected that the proportion to healthcare will not be necessarily high. It is more likely that a country like Kenya would opt to slash public healthcare costs; however this is not a rational ideology. The ultimate goal of any healthcare system is to provide adequate welfare to citizens by maximizing the costs given the resources available and to adjust these resources so that they are equitably valuable.

According to A. J Culyer (1989) in the study of cost containment of healthcare in Europe, a study that set to find out the best way to determine healthcare spending in a country whose health delivery systems are mostly public oriented and not private, found that in order to address the challenge of demarcating adequate funds that are equitable and sustainable to the healthcare systems of all countries, given that private care is limited and no far-knowledge of the feasibility of the health programs is available, economic power per individual can be used to predict the aggregate outlay of PHCE. The study therefore advised that income per head (GDP per capita) is the best determinant of public healthcare spending because income per head is more likely related to policies that control PHCE. Therefore to determine PHCE, GDP per capita is the best estimating variable.

Other studies as well have gone into analyzing costing of PHCE. According to Newhouse (1977) in the study of medical care expenditure that attempted to answer the question 'what determines the quantity of resources a country devotes to medical care'?[4] , discovered that if a country has a high GDP, it does not directly mean doctors in the said country will receive higher salaries or that the health indicators in the country will improve, but rather reveals a higher allocation of funding to medical resources, and improved components of medical care within a country. These components of medical care include: a) improved ambulatory services that reduce anxiety, symptoms- pain & itching e.t.c, and b) improved decision making by doctors, given that they can carry out as many government funded tests as they see fit. In the Kenyan context/situation, where a doctors demand for more salaries drives decisions for increase in allocations to PHCE, does not necessarily improve the healthcare indicators in the country but rather displaces resources for care, as has been seen. If GDP per capita explains much of PHCE, this will assist a country like Kenya in finding ways to ration decisions consistent with its income. It is important therefore to know that proper planning for PHCE does not necessarily require a constant increase in allocation, but a well organized financial plan that considers the income of the country.

Later studies have been developed on the appropriate determinants to consider for a country's medical care spending. According to Abel Smith B (1994) in the study of health policy planning and financing for America, found out that the state of health of a population is directly influenced by the attention given to its healthcare system, and in effect is more efficient if the public healthcare expenditure outlay is correlated to the national economic growth per capita of the country. Some of the empirical results from the study drew to the conclusion that there exists a strong correlation of 0.85 between GDP per capita and PHCE, therefore if GDP is used to estimate PHCE; feasibility of expenditure outlay is achieved much easier.

Literature on public healthcare spending directs us towards the utilization of GDP as the major determinant in deciding on PHCE allocation. It is important therefore not to ignore this frame of thought.

[4] Journal of Human Resources, Volume 12 , No.1

2.4 Empirical Literature

Studies have developed correlations between GDP and PHCE and derived different inferences to the results found. To determine clearly if GDP is the best determining variable of PHCE, various tests have to be undertaken to ascertain the reality of using GDP as a benchmark for policy planning

Given that PHCE is a fiscal, annual and social government entity that requires proper allocation overtime, shows that its expenditure factor is random. Meaning, today's expenditure outlay may vary with time and across areas. Although studies suggest the use of GDP per capita as the best tool, the challenge of variability exists. To tackle this challenge, Grossman (1972) developed a model that assumed an assured relationship between GDP and PHCE. In the model, Grossman considered PHCE as an investment on human capital because human capital is an input to economic production. Thus, an increase in health care spending could cause an increase in GDP and same vise versa. In theory however this assured relationship between health care spending and GDP could bring a lot of risks in cases of emergencies like disease outbreaks and political instability. However so, we learn from Grossman that we can accept the relationship if we take GDP per capita or the country's standard of living as a necessary but not sufficient variable to determine PHCE. To carry out this effect study, Grossman's condition for either variable to be exogenous caters for the necessary but not sufficient nature of the variable GDP per capita. The study therefore tested the extent to which current and lagged values of PHCE as a function of GDP can be used to predict future values of GDP as a function of PHCE and as a result found out that the relationship holds a 0.87 coefficient relation between the two variables. The context therefore means that GDP per capita is 87% necessary in determining PHCE.

Healthcare delivery systems change overtime in relation to technology advancement and varying medical/disease control measures. The challenge would then be to measure how the increased expenditure on e.g. the new technology would change PHCE in the long run and overall the healthcare delivery system in the country. According to Donahoe (2000) in attempt to describe policy developments on USA's national health care system, used the effect relation model of GDP to PHCE to determine if GDP per capita is sufficient to address variability in technology and other health improving programs. Danahoe used data from the NHEA[5] and a comprehensive measure of investment in medical sector capital visa vie total health expenditures as a share of GDP. The model was developed successfully and enabled Danahoe to predict a 17% increase in PHCE for USA in 2004 and in retrospect found a 0.05 elastic relationship between GDP and increased funding for technological and medical program advancement in the health system of USA. This draws the inference that the component of GDP per capita as a determining variable for PHCE is sufficient to cater for 5% of changes in funding to technological advancement.

Through the studies carried out in developed country's GDP per capita is the best estimate for PHCE projections. The question is then how far dose GDP per capita go in sufficiently determining capital outlay of PHCE in the long-run. According to Dritsakis (2003) the stationarity of the real per capita public health care expenditure and real per capita GDP while testing for co-integration, error correction, and unit root-testing reveals that GDP is as an appropriate method of projecting short run and long-run PHCE capital outlay, because the process relationship is stationery and has unit root presence. Stationarity approves a long-run relationship between the variables, therefore there seems to exist a long-run relationship between GDP and PHCE.

Recent studies have also been applied to ascertain empirically if GDP per capita is still the best method to estimate PHCE, against other variables. According to Amaresh Das & Frank Martin (2010), age of the population, the number of practicing doctors and the share of public finance do not necessarily contribute significantly to the explanation of health care spending. The question left to ask is what then currently affects PHCE directly? In their study, Das and Martin estimated GDP per capita and PHCE using co integration and concluded that an adequate amount of capital for PHCE should favorably be aggregated from the GDP per capita of the country.

The above tests confirm that if GDP per capita is utilized in projecting PHCE, a country might have a viable chance in providing funds that are efficient and equitable to meet the health needs of the population.

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[5] National Health Expenditures Accounts (NHEA) determine what types of investment in equipment would be most effective in ensuring healthcare improvement against specific medical problem issues in a country.

2.5 Overview of Literature

The literature in this study derives the fact that GDP per capita can serve as a good benchmark in making financial decisions on a country's pubic healthcare expenditure. Many studies have been developed mostly in developing countries, showing immensely the progress of estimations on PHCE by use of GDP per capita.

No such study has been undertaken in Kenya or any developing country. In a country where most national health accounts are not available, cost effective measures of expenditures can be difficult to calculate and monitor, however studies have developed an easier method in estimating PHCE appropriately and efficiently. This is by use of GDP per capita as a benchmark in deciding on the threshold to be outlaid to PHCE. Recently, a study by Thomas Barney and Olivier Damette in France (2005) on the analysis on the role of GDP per capita on health care expenditure per capita, described a long-run relationship between the two variables, which is set to derive a non-linear trend with structural breaks in the trend mostly because of transitions in the explanatory variables. In this sense we expect that the relationship of GDP to PHCE will operate as a random walk taking into account the variables that affect PHCE; population, technological advancement, medical human resources, and price control variables like inflation. This is an example of the numerous studies

The studies in the literature explicitly describe the importance of the use of GDP per capita; it will therefore be justifiable to introduce such studies in Kenya which can assist policy makers in making financial matters of PHCE.

CHAPTER THREE

3.0 METHODOLOGY

3.1 Theoretical Framework

The purpose of this study is to investigate economic growth and public health care expenditure, using the Augmented Dickey Fuller (ADF) test, Johansen tests and Granger causality test to determine the time series properties of healthcare expenditure, population growth rate, physicians per 100,000 population and income per capita as a ratio of GDP per capita.

Time series data contains a trend, which must be removed prior to undertaking any estimation. The traditional de-trending procedure separates the trend from the cyclical component of the series. This procedure is important for trend stationery time series. It is important to note that many macroeconomic time-series are difference stationary and must be differenced prior to any meaningful economic estimation. In cases where ordinary least squares estimation techniques are applied to un-differenced difference stationery series, the error terms will be serially correlated. This makes any hypothesis testing unreliable.

The study carries out the elasticity between GDP per capita and PHCE per capita using a linear approach taking a number of factors into account. The study introduces several types of explanatory variable on the basis of previous studies. In order to measure price elasticity, the study uses inflation as a measure. The study also introduces medical density; taking into account physician density, which lowers rates of profit and may lead the physicians creating unnecessary demand. To account for population progress, the study introduces population growth as an intermediate input proxy giving the cost impact of fertility.

3.2 Empirical model

Our main interest is to specify and estimate a simple form of health expenditure function model. We will employ a Cobb-Douglas production model simply because PHCE is assumed to depend on the GDP and its explanatory variables. We explore the effect of GDP on public healthcare expenditure by estimating the equation 1 below.

Equation 1 is a non-linear equation used to measure the change in public healthcare expenditure by finding its derivative with respect to GDP per capita. This means that, a percentage change in GDP per capita will change Public healthcare expenditure by $\beta_{1.}$

Given that the study involves GDP, the study shall employ Population growth rate (POP), Inflation/Consumer Price Index (INF) and Physicians per 100,000 population (PHYS) as other control variables that affect PHCE.

Equation 1

$$\mathbf{lnPHCE = \beta_0 + \beta_1 lnGDPPC + \beta_2 lnPOP + \beta_3 lnINF + \beta_4 lnPHYS + \varepsilon_t} \qquad \mathbf{(1)}$$

Where:

β_i = elasticity measure of changes of exogenous variables to public healthcare expenditure

ln PHCE = natural log of Public Health Care Expenditure

ln GDPPC = natural log of GDP per Capita

ln Population Growth = natural log of Population Growth

ln Inflation = natural log of Inflation

ln PHYS = natural log of Physicians per 100,000 population

ε = Error term

The above model employs the OLS regression model to measure the linear association between the independent and dependent variables. The focus of the study will be on the effect of GDP per capita on PHCE controlling for effects of other factors.

3.3 Data Sources

Table 1: Data sources, 1982-2012

Variable	Data Sources
Gross Domestic Product per capita	Central Bank of Kenya Annual Reports, (1982-2012) Kenya Economic Survey (1982-2012) and Statistical Abstracts (1982-2012) from Kenya National Bureau of Statistics and the Ministry o f Finance Library
Public Health Care Expenditure	Estimates of Expenditure(1982-2012) from the Ministry o f Finance Library
Inflation/Consumer Price Index	Central Bank of Kenya Annual Reports (1982-2012)
Population growth rate	Kenya Economic Survey (1982-2012) and Statistical Abstracts (1982-2012) from Kenya National Bureau of Statistics
Physicians Per 100,000 Population	Statistical Abstracts (1982-2012) from Kenya National Bureau of Statistics

3.4 Expected Results

Table 2: Expected results of Analysis

	Dependent Variable	Independent Variables	Expected sign
1. Unit root Test	PHCE	GDP Per Capita, Inflation/Consumer Price Index, Population growth rate and Physicians per 100,000 population	Stationery with mean (0) and variance (1)
2. Granger Causality	PHCE	GDP Per Capita	No causality exist (p values greater than the critical values)
3. Cointegration Test	PHCE	GDP Per Capita, Inflation/Consumer Price Index, Population growth rate and Physicians per 100,000 population	Existence of at least one cointegrating equation
4. OLS Regression	Series of PHCE divided by 1 billion.	Series of GDP Per Capita, Inflation/Consumer Price Index, Population growth rate and Physicians per 100,000 population	Fractional coefficients of variables present with either + or - signs

3.5 Estimation Procedures

Unit Root test

The first step in co-integration analysis is to test for the presence of unit roots in the variables. The augmented Dickey and Fuller test uses a regression of the first differences of the series against the series lagged once, X_{t-1}, and lagged difference terms. It may include a constant term α and trend term γ_t as follows:

$$\Delta X_t = \alpha + \beta X_{t-1} + \sum_{i=1}^{m} \gamma_i \, \Delta X_{t-1} + \varepsilon_t \qquad (2)$$

Where: Δ is a first-difference operator, m is the optimal lagged length, γ_t is the time trend and ε_t is the stationary random error.

To determine whether a variable trend stationary or difference stationary, we use the unit root test. A time series that contains unit roots is stationary with a mean μ equal to 0 and variance δ equal to1. If we reject our null hypothesis that the series possesses a unit root, then the series is trend stationary. If there is insufficient evidence not to reject the null hypothesis then the series is difference stationary.

The use of unit root tests on differenced difference stationary series determines the form in which the data will be used in regression. You may find that the first differences of the series are stationary, thus the series is said o be integrated of order one and no further unit root testing is required. Once the stationary properties of all the variables using ADF tests are determined, then OLS method of regression is used to estimate the long run relationship of the variables. The test for a unit root has the hypothesis that H_0: $\beta=0$, H_1: $\beta \neq 1$. If the coefficient is statistically different from 0, the hypothesis that X_t contains a unit root is rejected.

Granger Causality test

In our study, the Granger (1969) approach to the question of whether GDP per capita causes PHCE is to see how much of the current PHCE can be explained by past values of PHCE and then to see whether adding lagged values of GDP per capita can improve the explanation. PHCE is said to be Granger-caused by GDP per capita if GDP per capita helps in the prediction of PHCE, or equivalently if the coefficient on the lagged GDP per capita is statistically significant.

It is important to note that two-way causation is frequently the case; GDP per capita Granger causes PHCE and PHCE Granger causes GDP per capita. Therefore it is important to note that the statement “GDP per capita Granger causes PHCE” does not imply that PHCE is the effect or the result of GDP per capita. Granger causality measures precedence and information content but does not by itself indicate causality in the more common use of the term.

Co-integration

Cointegration tests ascertain whether there is a stable long-run relationship between the dependent variable and its regressor. This test implies that there must be an adjustment process to prevent the deviations from long-run equivalent relationship from becoming larger and larger.

Co-integration theory

Consider a VAR[6] of order p

$$\boldsymbol{y_t = A_1 y_{t-1} + \ldots + A_p y_{t-p} + B x_t + \varepsilon_t} \qquad (3)$$

Where y_t is a -vector of non-stationary I (1) variables, x_t is a d-vector of deterministic variables, and ε_t is a vector of innovations. We may rewrite this VAR as,

$$\Delta \mathbf{y}_t = \mathbf{\Pi y}_{t-1} + \sum_{i=1}^{p-1} \mathbf{\Gamma}_i \Delta \gamma_{t-i} + \boldsymbol{Bx_t} + \boldsymbol{\varepsilon_t} \qquad (4)$$

Where;

$$\mathbf{\Pi} = \sum_{i=1}^{p} \mathbf{A}_i - \mathbf{I}, \quad \text{and} \quad \mathbf{\Gamma}_i = - \sum_{j=i+1}^{p} \mathbf{A}_j$$

Granger's representation theorem asserts that if the coefficient matrix Π has reduced rank $r < k$, then there exist k x r matrices α and β each with rank r such that Π = αβ' and $\beta' y_t$ is I(0). r is the number of cointegrating relations (*the cointegrating rank*) and each column of β is the cointegrating vector. The elements of α, are known as the adjustment parameters in the VAR model. Johansen's method is to estimate the Π matrix from an unrestricted VAR and to test whether we can reject the restrictions implied by the reduced rank of Π.

3.6 Data Management

This study covers 30 years (1982 - 2012) of research in health care expenditure analysis. The data will be aligned in time series format and analysis will be done by E-Views statistical package used to estimate time series data, its stationarity, ADF test for unit root presence and cointegration on the linear relationship of the dependent to the independent variables.

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[6] VAR (vector auto regression) is a statistical model used to capture the linear interdependencies among multiple time series.

CHAPTER FOUR

4.0 ANALYTICAL RESULTS

4.1 Introduction

Data in our model is time series, and the analytics of the study are done using E-Views latest (2012) version 7. This is because E-Views has been tested as a statistical package for windows used mainly for time-series oriented econometric analysis. The study employs a number of tests before estimating the relationship between the dependent and independent variables, in order to ensure that our results are not spurious and full of statistical error.

The first step will be to test for stationarity of the model, because a stationary process assures us that the time series distributions of each variable do not change when shifted in time or space. This would mean that the relationship to be determined between GDP and PHCE will hold in time and space.

The use of unit root testing helps us to know whether the time series variables are stationery or not.
A unit root is a feature of a stochastic process that evolves through time if the mean and auto-covariance of the series depend on time, thereby causing the variable's distribution to shift in time and space resulting in unstable future predictions of the trend.

Given our model parameters can have a cause effect on each other; the study will test for granger causality, to determine if the independent variable is fit to be endogenous in the model selected. The next step, once we determine the casuality and stationarity of the process, will be to test for cointegration in the model, in order to check for the long-run relationship between the variables.

Finally, once the tests have been successfully carried out and estimation of the parameters for our model will be made, taking into consideration the authenticity of the results, usually given by the R^2 value.

4.2 Unit Root Test

The study computes usual unit root tests using the Augmented Dickey Fuller's test, the results follow:

1. **Figure 3: GDP per capita growth (GDPPC)**

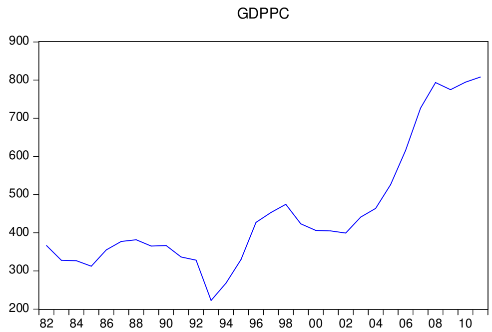


Table 3: Augmented Dickey Fuller test for unit root presence in GDPPC

Null Hypothesis: D(DGDPPC) has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 0 (Automatic - based on SIC, maxlag=6)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-6.901133	0.0000
Test critical values:	1% level	-4.339330	
	5% level	-3.587527	
	10% level	-3.229230	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(DGDPPC,2)
Method: Least Squares
Date: 08/16/12 Time: 11:39
Sample (adjusted): 1985 2011
Included observations: 27 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(DGDPPC(-1))	-1.322494	0.191634	-6.901133	0.0000
C	6.397317	22.27103	0.287248	0.7764
@TREND(1982)	-0.323554	1.250457	-0.258749	0.7980

R-squared	0.665087	Mean dependent var	-1.635610
Adjusted R-squared	0.637178	S.D. dependent var	83.84441
S.E. of regression	50.50343	Akaike info criterion	10.78640
Sum squared resid	61214.32	Schwarz criterion	10.93038
Log likelihood	-142.6164	Hannan-Quinn criter.	10.82921
F-statistic	23.83025	Durbin-Watson stat	1.918924
Prob(F-statistic)	0.000002		

The empirical findings above indicate that the test statistic α = -6.901133, is greater than our critical values at 1% = -4.339330, at 5%= -3.587527 and at 10%= -3.229230, therefore we reject the null hypothesis that the series GDPPC has a unit root and conclude that the GDP per capita series is stationery at lag (0) in the 1st difference. That is I (1).

2. Figure 4: Public Healthcare Expenditure (PHCE)

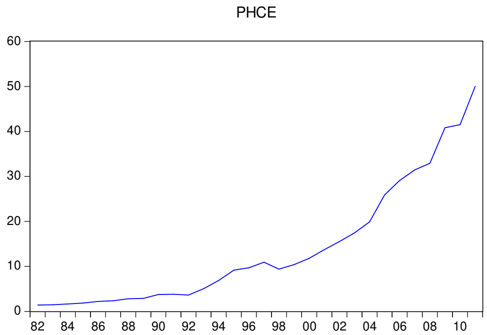


Table 4: Augmented Dickey Fuller test for unit root presence in PHCE

Null Hypothesis: D(PHCE) has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 0 (Automatic - based on SIC, maxlag=7)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-6.616674	0.0000
Test critical values:	1% level	-4.323979	
	5% level	-3.580623	
	10% level	-3.225334	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(PHCE,2)
Method: Least Squares
Date: 08/16/12 Time: 11:19
Sample (adjusted): 1984 2011
Included observations: 28 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(PHCE(-1))	-1.431879	0.216405	-6.616674	0.0000
C	-1.36E+09	7.04E+08	-1.931574	0.0648
@TREND(1982)	2.40E+08	49415708	4.847138	0.0001

R-squared	0.642311	Mean dependent var	3.01E+08
Adjusted R-squared	0.613695	S.D. dependent var	2.70E+09
S.E. of regression	1.68E+09	Akaike info criterion	45.42371
Sum squared resid	7.06E+19	Schwarz criterion	45.56644
Log likelihood	-632.9319	Hannan-Quinn criter.	45.46734
F-statistic	22.44652	Durbin-Watson stat	1.651672
Prob(F-statistic)	0.000003		

The empirical findings above indicate that the test statistic α = -6.616674, is greater than our critical values at 1% = - 4.323979, at 5%= -3.580623 and at 10%= -3.225334, therefore we reject the null hypothesis that the series PHCE has a unit root and conclude that the PHCE series is stationery at lag (0) in the 1st difference. That is I (1).

3. Figure 5: Population Growth (POP)

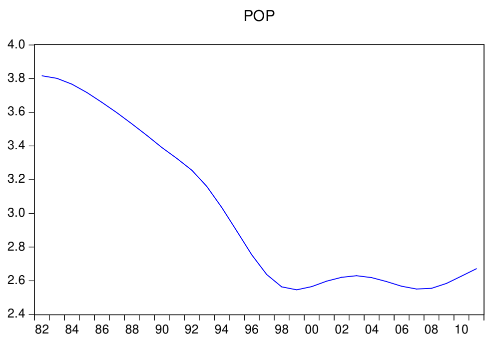


Table 5: Augmented Dickey Fuller test for unit root presence in POP

Null Hypothesis: D(DPOP) has a unit root
Exogenous: Constant
Lag Length: 1 (Automatic - based on SIC, maxlag=6)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-4.310727	0.0024
Test critical values:	1% level	-3.711457	
	5% level	-2.981038	
	10% level	-2.629906	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(DPOP,2)
Method: Least Squares
Date: 08/16/12 Time: 11:46
Sample (adjusted): 1986 2011
Included observations: 26 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(DPOP(-1))	-0.358947	0.083268	-4.310727	0.0003
D(DPOP(-1),2)	0.769585	0.132435	5.811027	0.0000
C	0.000725	0.001683	0.430598	0.6708

R-squared	0.642439	Mean dependent var	0.000647
Adjusted R-squared	0.611347	S.D. dependent var	0.013605
S.E. of regression	0.008481	Akaike info criterion	-6.593705
Sum squared resid	0.001655	Schwarz criterion	-6.448540
Log likelihood	88.71816	Hannan-Quinn criter.	-6.551902
F-statistic	20.66234	Durbin-Watson stat	2.231341
Prob(F-statistic)	0.000007		

The empirical findings above indicate that the test statistic α = -4.310727, is greater than our critical values at 1% = -3.711457, at 5%= -2.981038 and at 10%= -2.629906, therefore we reject the null hypothesis that the population growth series population growth has a unit root and conclude that the series is stationery at lag (1) in the 1st difference. That is I (1).

4. Figure 6: Inflation (INF)

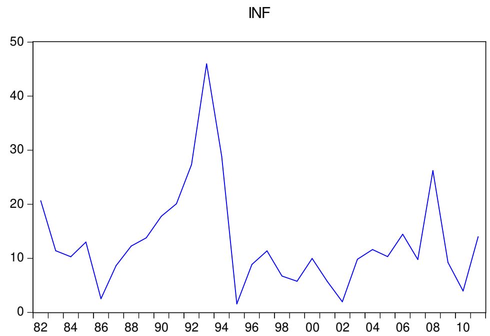


Table 6: Augmented Dickey Fuller test for unit root presence in INF

Null Hypothesis: D(INF) has a unit root
Exogenous: Constant
Lag Length: 1 (Automatic - based on SIC, maxlag=7)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-5.603185	0.0001
Test critical values:	1% level	-3.699871	
	5% level	-2.976263	
	10% level	-2.627420	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(INF,2)
Method: Least Squares
Date: 08/16/12 Time: 11:51
Sample (adjusted): 1985 2011
Included observations: 27 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(INF(-1))	-1.572582	0.280659	-5.603185	0.0000
D(INF(-1),2)	0.405108	0.188087	2.153836	0.0415
C	-0.079236	1.807111	-0.043847	0.9654

R-squared	0.625340	Mean dependent var	0.413846
Adjusted R-squared	0.594118	S.D. dependent var	14.71654
S.E. of regression	9.375740	Akaike info criterion	7.418567
Sum squared resid	2109.708	Schwarz criterion	7.562549
Log likelihood	-97.15066	Hannan-Quinn criter.	7.461381
F-statistic	20.02904	Durbin-Watson stat	1.963372
Prob(F-statistic)	0.000008		

The empirical findings above indicate that the test statistic α = -5.603185, is greater than our critical values at 1% = -3.699871, at 5%= -2.976263 and at 10%=-2.627420, therefore we reject the null hypothesis that the series inflation has a unit root and conclude that the inflation series is stationery at lag (1) in the 1st difference. That is I (1).

5. Figure 7: Physicians per 100,000 population (PHYS)

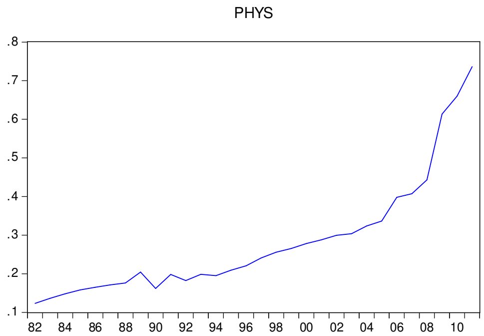


Table 7: Augmented Dickey Fuller test for unit root presence in physicians per 100,000 population

Null Hypothesis: D(DPHYS) has a unit root
Exogenous: Constant
Lag Length: 1 (Automatic - based on SIC, maxlag=6)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-7.213726	0.0000
Test critical values:	1% level	-3.711457	
	5% level	-2.981038	
	10% level	-2.629906	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(DPHYS,2)
Method: Least Squares
Date: 08/16/12 Time: 11:57
Sample (adjusted): 1986 2011
Included observations: 26 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(DPHYS(-1))	-2.702595	0.374646	-7.213726	0.0000
D(DPHYS(-1),2)	0.679511	0.221814	3.063430	0.0055
C	0.008027	0.006552	1.225239	0.2329

R-squared	0.867926	Mean dependent var	0.001200
Adjusted R-squared	0.856441	S.D. dependent var	0.085750
S.E. of regression	0.032490	Akaike info criterion	-3.907614
Sum squared resid	0.024279	Schwarz criterion	-3.762449
Log likelihood	53.79898	Hannan-Quinn criter.	-3.865812
F-statistic	75.57240	Durbin-Watson stat	2.121676
Prob(F-statistic)	0.000000		

The empirical findings above indicate that the test statistic α = -7.213726, is greater than our critical values at 1% = -3.711457, at 5%= -2.981038 and at 10%=-2.629906, therefore we reject the null hypothesis that the series physicians per 100, 000 population has a unit root and conclude that the physicians per 100, 000 population series is stationery at lag (1) in the 1st difference. That is I (1).

Given that all our variables are stationery at the same lag, I (1), enables us to successfully test for a co-integration relationship between the variables in order to determine the long-run relationship between the variables in the model.

Before we attempt on co-integration analysis of the variables, it is important to remember that our variables PHCE and GDP can relate to each other, in that one can cause the other. Therefore the next step in our analysis is to carry out the test for granger causality to determine whether the selected endogenous (dependent) variable is fit to be treated as an exogenous (independent) or should remain endogenous.

The results of the granger causality test are as follows.

4.3 Granger Causality Test

Table 8: Granger Causality Test Results

Pairwise Granger Causality Tests
Date: 08/16/12 Time: 12:02
Sample: 1982 2011
Lags: 2

Null Hypothesis:	Obs	F-Statistic	Prob.
GDPPC does not Granger Cause PHCE	28	3.19062	0.0599
PHCE does not Granger Cause GDPPC		11.5277	0.0003

The empirical results above show that the P values (3.19062 and 11.5277) are greater than the critical values at 1% 5% and 10% thus we do not reject the null hypothesis and conclude that GDP does not granger cause PHCE and neither does PHCE granger cause GDP. Therefore we are fit to say that PHCE is an appropriate endogenous variable.

Since both series are clearly integrated I (1), considering our results in the unit root test, we test the possibility of a cointegrating relationship using the Johansen procedure (1988, 1991). Testing a cointegrating relationship is equivalent to showing that the vector of residuals u_t is stationary.

4.4 Test for Co-integration

E-Views supports VAR-based cointegration tests using the methodology developed in Johansen (1991, 1995) performed using a Group object or an estimated VAR object. The results of the cointegration tests are as follows:

Table 9: Cointegration Test Results

Date: 08/16/12 Time: 14:47
Sample (adjusted): 1983 2011
Included observations: 29 after adjustments
Trend assumption: Linear deterministic trend
Series: PHCE GDPPC POP INF PHYS
Lags interval (in first differences): No lags

1.Number of cointegrating relations

Unrestricted Cointegration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.910416	118.2594	69.81889	0.0000
At most 1 *	0.514573	48.29470	47.85613	0.0454
At most 2	0.421179	27.33562	29.79707	0.0937
At most 3	0.326119	11.47954	15.49471	0.1837
At most 4	0.001144	0.033208	3.841466	0.8554

Trace test indicates 2 cointegrating eqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

Unrestricted Cointegration Rank Test (Maximum Eigenvalue)

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None *	0.910416	69.96468	33.87687	0.0000
At most 1	0.514573	20.95908	27.58434	0.2787
At most 2	0.421179	15.85608	21.13162	0.2334
At most 3	0.326119	11.44633	14.26460	0.1332
At most 4	0.001144	0.033208	3.841466	0.8554

Max-eigenvalue test indicates 1 cointegrating eqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

The empirical findings above indicate that there exists at least one (1) cointegrating equation, we therefore reject the null hypothesis that there is non-cointegration between the variables and conclude that cointegration relations exist, implying that our variables PHCE, GDPPC, POP, INF and PHYS are trend stationery and that there are at most (2) significant co-integrating relations between the variables at the 0.05 significant level, hence a long-run linear relationship exists between these variables, more so between GDP per capita and PHCE.

2.Estimates of the cointegrating relation and adjustment parameters

Unrestricted Cointegrating Coefficients (normalized by b'*S11*b=I):

PHCE	GDPPC	POP	INF	PHYS
-0.219912	0.001922	-0.504959	0.042900	11.04546
0.286017	-0.017958	0.602383	-0.041083	-7.697738
0.105149	-0.002685	-0.050636	0.097299	-3.588748
-0.237906	-0.004788	-0.748617	0.004356	28.63844
0.091938	-0.005169	3.230084	-0.008481	5.699629

The above results show the estimates of β and α based on the normalization $\beta'*S_{11}*\beta$, where $S_{11}$is defined in Johansen (1995) in our methodology above. The results indicate that PHCE has a negative effect on GDP per capita in the long-run given the adjusted parameters are mostly inverse to different co-integrating vectors preceding.

Unrestricted Adjustment Coefficients (alpha):

D(PHCE)	-1.107071	-0.336114	0.820117	0.659488	0.022817
D(GDPPC)	-24.71482	25.34430	6.859096	-4.512635	-0.119782
D(POP)	-0.030690	-0.017915	-0.007097	0.014360	-0.000674
D(INF)	-1.801597	-0.454167	-4.756519	0.312154	0.194767
D(PHYS)	-0.018847	-0.016005	0.011492	-0.003155	0.000140

The above results show the alpha unrestricted adjustment coefficients for our variables indicating the level of long-run relationship between the variables for every possible number of co-integrating relationships.

4.5 Estimation of Equation

Table 10: Regression Results

Dependent Variable: LOG(PHCE)
Method: Least Squares
Date: 08/27/12 Time: 17:21
Sample (adjusted): 1982 2011
Included observations: 30 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	7.471658	1.470197	5.082078	0.0000
LOG(GDPPC)	0.023549	0.216089	0.108979	0.9141
LOG(POP)	-3.433140	0.386659	-8.878978	0.0000
LOG(INF)	0.035738	0.046134	0.774647	0.4458
LOG(PHYS)	1.350406	0.199729	6.761193	0.0000

R-squared	0.976505	Mean dependent var	2.103472
Adjusted R-squared	0.972745	S.D. dependent var	1.114896
S.E. of regression	0.184058	Akaike info criterion	-0.396116
Sum squared resid	0.846937	Schwarz criterion	-0.162583
Log likelihood	10.94174	Hannan-Quinn criter.	-0.321407
F-statistic	259.7585	Durbin-Watson stat	1.008665
Prob(F-statistic)	0.000000		

The above results indicate that our estimating equation will be represented as:

lnPHCE **= 7.471658 + 0.023549** lnGDPPC **- 3.433140** lnPOP **+ 0.035738** lnINF **+ 1.350406** lnPHYS

The results above enable us to estimate the income elasticity of PHCE is defined by the percentage change in PHCE divided by the percentage change in GDP per capita. The results above imply that a 1% increase in GDPPC would mean a 0.0235% increase in PHCE.

The R-squared (R^2) statistic measures the success of the regression in predicting the values of the dependent variable within the sample. In standard settings, R^2 may be interpreted as the fraction of the variance of the dependent variable explained by the independent variables. The statistic will equal one if the regression fits perfectly, and zero if it fits no better than the simple mean of the dependent variable. The R^2results above of 0.97 depicts an almost perfect fit or high authenticity of the variables of data analysis.

** **N/B** the nominal values of PHCE have been divided by 1 billion to provide neater coefficient values of the variables.

The view of the fitted actual, fitted and residual graph of our model is as follows:

Figure 8: Actual, Fitted and Residual Graph of the model

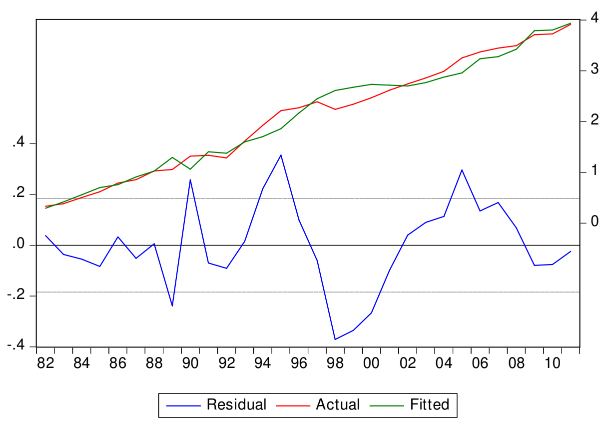
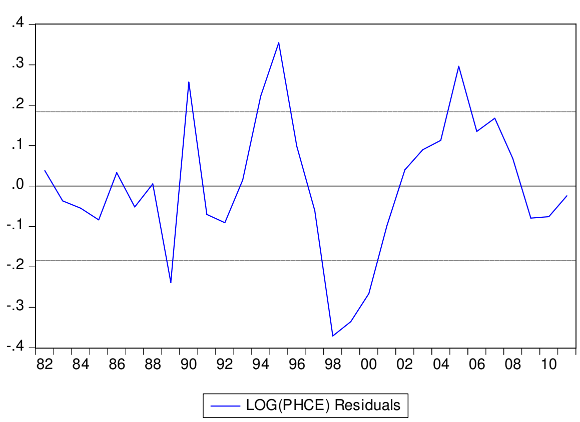


Figure 9: PHCE Residual Graph



CHAPTER FIVE

5.0 CONCLUSION

5.1 Summary

The study has conducted an analysis of the model after checking for the cointegrating properties. We see that PHCE has a negative impact on GDPPC in the long-run given the relationship described by the adjustment parameters.

The model estimated is stationary with mean (0) and variance (1), described by the fact that all variables have no unit roots at the 1sdt lagged difference. I (1)

Through the description of the regression coefficients, we see that a 1% increase in GDPPC should lead to a 0.024% increase in PHCE, also using other control variables; a 1% decrease in population growth will necessitate a 3.4% decrease in PHCE, a versa result. In Kenya, the population growth has been reducing as seen in the population chart above, it is however expected that an increase in population growth necessitates a much higher increase in PHCE, because of the population senility rate. The case presented in this study is just but the vise versa of the above theory, therefore the more the population keeps dwindling the far less outlay is to be expected of PHCE. Looking onto price matters, we can tell from the variables regressed that a 1% change in inflation will necessitate a 0.036% increase in PHCE. Finally, if the number of doctors, registered nurses, lab technicians and medical officers in the country increase by 1%, PHCE should increase by 1.35% taking into account value for money with time.

5.2 Conclusion

The direct impact of GDP per capita on PHCE is important to consider in financial planning. IN predicting future values of PHCE, we see that a 1% increase in GDP per capita would necessitate a 0.024% increase in PHCE. Therefore given the IMF World Economic Outlook 2011 of Kenya's GDP Per Capita Projection set to increase by 3.8% in 2013, we expect that PHCE will increase by 0.0912% or in nominal terms the expected increase of GDP per capita of Kshs 1,463 at Kshs current prices should increase PHCE by Kshs 4.6 billion.

The price elasticity of demand for PHCE in Kenya of 0.024 shows us that healthcare in Kenya would be described as one with an almost perfectly inelastic demand, this means that healthcare in Kenya is a normal good but mostly a necessary good, meaning that when income rises, demand for healthcare will increase. But the increase for healthcare is less than proportional to the rise in income, so the proportion of expenditure on healthcare will fall as income rises.

5.3 Policy Recommendations

The results of this derive proper benchmarks in deciding the directions of financing public healthcare in Kenya. Among the policy recommendations to be described, the following should be considered in drafting policy in Kenya:

1. The Health Policy Framework (1994) and the NHSSP (2005) of Kenya should be amended to include the elastic relationship of Kenya's GDP per capita to PHCE as a benchmark for determining the minimum financial outlay of PHCE.

2. Given that healthcare in Kenya has been described as a normal necessary good, policy makers should consider lobbying for healthcare to be as a necessary benefit to all employees under PAYE income, and especially to civil servants individual incomes and as a separate regime from NHIF.

3. Given that the National Health Accounts of Kenya neglect the use of QALY's and DALY's in their analysis, a policy recommendation for better healthcare monitoring by including QALY and DALY studies in the NHA accounts of Kenya is necessary to derive better analysis in monitoring healthcare in Kenya.

5.3 Limitations of the study

Given that variables like technological advancement in medical care are difficult to estimate in Kenya especially because no data of this nature exists and the amounts of public expenditure to chronic diseases in public hospitals are not available the study was not as exhaustive. I would encourage other researchers to venture into deriving this data in analyzing better results for such a study.

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