# ANALYSIS OF THE IMPACT OF HEALTH EXPENDITURES ON KEY HEALTH INDICATORS IN KENYA.

BY

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## DECLARATION

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

ODHIAMBO MARTINE OLECHE — DATE 05/09/05

This research paper has been submitted for examination with our approval as university supervisors.

PROF. W. MASAI — DATE 07/09/05

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## DEDICATION

I wish to dedicate this paper to my late parents Mr. Patrick Oleche Mado and Mrs. Margaret Akelo Oleche for their sacrifice to facilitate my education.

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## LIST OF ABBREVIATIONS

ADF-Augmented Dickey Fuller

AERC-African Economic Research Consortium

AIDS-Acquired Immune-Deficiency Syndrome

ARI-Acute Respiratory Infections

CBS-Central Bureau of Statistics

DF-Dickey –Fuller

DW-Durbin-Watson test.

ECM-Error Correction Model.

EPI-Expanded Programme on Immunization

GDP-Gross Domestic Product

GOK-Government of Kenya

HHEUS-Household Health Expenditure and Utilization Survey

HIV-Human Immune-Deficiency Virus

HSSA-Health Sector Status Analysis

KDHS-Kenya Demographic Health Survey

LE-Life Expectancy

MOD-Ministry of Defence

MOE-Ministry of Education

MOF-Ministry of Finance

MOH-Ministry of Health.

MOPND-Ministry of Planning and National Development

NCPD-National Council of Population and Development

NGO-Non Governmental Organizations.

NHA-National Health Accounts

NHIF-National Hospital Insurance Fund

NHSSP-National Health Services Strategy Paper

O.L.S-Ordinary least squares

SSA's-Sub-Saharan African Countries

STI-Sexually Transmitted Infections

TB-Tuberculosis

THE-Total Health Expenditures

U5MR-Under Five-Mortality Rate

UNDP-United Nation's Development Programme

UNICEF-United Nation's Children Education Fund

VAR-Vector Auto Regression

WHO-World Health Organization

WMS-Welfare Monitoring Survey

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## ABSTRACT

This research paper analyses the impact of health expenditures on key health indicators in Kenya over the period 1975-2004. The study estimates the aggregate health production function. The variables used are government health expenditures percapita, percentage private health expenditures, expenditures on education percapita, percentage population with access to safe water, under five-mortality rate and life expectancy.

The study attributes the declining health indicators to insufficient spending by the government and the inadequacies of the private health sector in financing health care in Kenya. The main objective was to statistically test the nature and the significance of the relationship between health indicators and health expenditures.

The findings of the study indicate a strong contribution to health indicators by the health expenditures both private and public, access to safe water and education. The influences of the services that are dependent to consumer demand are more difficult to identify both for preventive services, such as immunization and for curative medical care.

The study recommends that the resources must be channeled towards primary and preventive health care as well as boosting the private health sector. It recommends that the government should stop directing more resources to areas with no direct effect on social welfare. The government should encourage the role of local authorities in education and health and this should be clearly defined. The private health care provision should also be streamlined and regulated by the government so as to act as checks and balances in their role of health care provision. The government should specifically do something about the supply – induced demand common in private health sector that leads to the consumers being exploited and thus worsening health indicators.

## EXECUTIVE SUMMARY

This paper analyses the impact of health expenditures on key health indicators in Kenya for the period 1975-2004. The purpose of the study is to test the impact of various health expenditures, both public and private on the health indicators in Kenya. The health indicators in this study are the mortality rate (in this case the under five-mortality rate) and the life expectancy. In particular the key variables analyzed are ministry of health expenditures (development and recurrent), private health expenditures as a percentage of the total health expenditures, education expenditures (development and recurrent) and the percentage population with access to safe water.

Education expenditures have been included in the study because it has a direct impact on health indicators of a country. As people become more and more educated, they can apply health care standards effectively and use their incomes to improve their health indicators. The Ministry of Education (MOE) is also responsible for training medical staff through its colleges and universities. Although much of the spending to train providers is covered in the MOH accounts, the MOE supports some of these costs. In addition to training, the MOE is active in health research (MOH, 2003). The University of Nairobi and Moi University combined receive substantive amount of funds from foreign donors to conduct health-related studies.

The theoretical methodology relies on health being a production function. Infact health expenditures are used as inputs in the production process of health indicators (longer life expectancy and lower under five-mortality rate). The demand for health is a derived demand. This is because the desire for health makes one to go for treatment in the

hospital. Therefore, the search for health care services is used to produce health (Grossman, 1972). The demand comes from the sick people who decide which services to buy. A number of factors determine their decision. First, availability: Does that supplier offer the relevant service? Secondly, price: How much does it cost? Other things being equal, buyers tend to prefer the least expensive service or the product, which leaves them with more money to spend on other things (Thompson, 2000).

Empirically, the methodology uses the OLS method to estimate the two health indicators (under five-mortality rate and life expectancy). Life expectancy and under-five mortality rates are used as the measures of health indicators. A health indicator of an individual is assumed to be a function of public expenditure on health percapita (MOH), private expenditure on health in percentage, percapita expenditure on education and percentage population with access to safe water. The dependent variables are: Under five-Mortality rate and life expectancy, which are used as, measures of health indicators.

The independent variables are public expenditure on health percapita (MOH), Expenditure on education percapita, private health expenditure as a percentage and percentage population with access to safe water. The double log regression analysis is then applied on time series data. The two equations with each health indicator are estimated by OLS separately. Each health indicator is regressed separately with the same explanatory variables to determine its outcome. The econometric package used is E-views. In the analysis all, the independent variables are regressed on each health indicator (dependent variable) to study their effects.

The regression results from the analysis show that health expenditures are positive determinants of health indicators. As health expenditures increase, life expectancy also increases and under five-mortality rate falls. This is consistent with the hypothesized results. The results indicate that expenditure on education decreases the under-five mortality rate and increase life expectancy. The reason could be attributed to the fact that an educated mother will apply proper health standards and hence take care of the children to reduce the under-five mortality rate. An educated mother is likely to marry later, have few children and provide better care to herself and her children than a girl without education. As more girls get educated, there is cumulative effect on more households. As more households become smaller, the provision of care improves and hence low under five-mortality rate (Manyala, 2000). Expenditure on health increases life expectancy because if more resources are spent on health care services such as health facilities, drugs, promotive and preventive health care, the majority of the poor will access the services and live longer. The under five-mortality rate will also be significantly reduced. All these activities improve the health indicators of the country.

The study can therefore be concluded to mean that a great variation in health indicators as measured by life expectancy and under five-mortality rate is caused by health expenditures and other social factors. The study shows that the explanatory variables are important in explaining the changes in the health indicators. Life expectancy and under five mortality rates are better explained by recurrent and development health expenditures as well as the private health expenditures. Both recurrent and development

education expenditure are important in explaining the life expectancy and under five mortality rate.

The study therefore recommends that in order to improve the health indicators, the government of Kenya should focus more on health sector expenditure allocation critically, since some of the policy impact negatively on health care. In terms of expenditure allocations, the ministry of health should increase the budget in real terms and bulk of expenditure must be channeled towards primary and preventive health care. Greater finances and health care resources (including drugs and staff) should be directed to primary health care clinics and district hospitals where the majority of the people seek health care services.

Maternal health services deserve more attention to enhance the access to majority. More resources should be channeled to HIV/AIDS campaign. In the case of education, it is true that quality of education is necessary in order to achieve desired behaviour. More resources should be allocated to primary education to ensure the equity and the reduction of poverty. Boys and girls should be given equal access to education. This would enhance female literacy levels and lead to better health outcomes. The government should encourage the private sector to provide education and health care. The government should stop directing more resources to areas with no direct effect on social welfare. The role of local authorities in education and health should be clearly articulated. The private health care should be regulated by the government to ensure that they do not overcharge on medical services so that the poor can afford the services.

# CHAPTER ONE: INTRODUCTION

## 1.1 BACKGROUND

Between the 1980s and early 1990s, African economies stagnated relative to other developing economies in Asia and Latin America. The annual growth rate in per capita income[1] in Africa barely rose above 1 percent, compared to growth rates of 2-3 percent in similar economies elsewhere (Berman and Rannan, 1993). Because of this poor economic performance, poverty increased substantially in virtually all countries in Sub-Saharan Africa. Increasing poverty made it difficult for countries in the region to provide effectively basic health services to the population. Pervasive poverty[2] in the continent contributed to the worsening of health indicators. Other factors, which adversely affected African economies in the 1980s and 1990s, included emergence of new and deadly diseases such as AIDS (Ainsworth and Over, 1996) and civil wars (Anand and Ravallion, 1963). Health indicators in Africa were affected in various ways by these shocks.

Good health is important as part and parcel of a human being (Schultz, 1961). It is for this reason that access to basic healthcare is considered a human right in virtually all societies. There are many documented benefits of adult and child health. They include[3]:

- Healthy population is a source of steady supply of labour force, and activities of such a population are uninterrupted by sickness.

[1] Percapita income is the Gross National Income of a country divided by the size of the population.
[2] Continuous spreading state of lack of the means of providing material needs or comforts.
[3] See Mwabu, 2002 on Health Service Provision and Health Status in Africa, the case of Cameroon and Kenya.

- Good health is conducive to the formation of physical capital, because it avoids disease treatment expenses, which typically weigh heavily on limited resources, reducing ability to save (Measham, 1986).
- Good health is associated with superior macroeconomic performance (Biswal, 2000)
- Better child health and nutrition are associated with better educational outcomes so that investment in child health and nutrition are important determinants of future human capital and labour productivity (Behrman, 1996).
- Good health is a key factor in the creation of wealth (Grossman, 1972). In a study of the relationship between health and wealth, Filmer, Prichet and Hammer (1998) conclude that wealthier nations are healthier nations.
- Good health contributes to the quality of life, and its various indicators such as mortality rates and life expectancy are good summary measures of human development (Manyala, 2000).
- In addition to contributing to economic development, good health enhances capacity to acquire cognitive skills and to undertake on job training. Cognitive skills and practical knowledge are both essential requirements for economic growth and human development.

## 1.2 HEALTH INDICATORS IN KENYA

### 1.2.1 General overview

Health is a state of physical, mental and social wellbeing of people and not just the absence of diseases ( WHO, 1993). A healthy population is capable of participating in economic, social and political development and is thus a great asset to the country.

Health indicator is the measure of physical and emotional wellbeing of an individual or population (Thompson, 2000). The major health indicators in Kenya are Mortality rates and Life expectancy (KDHS, 2003).

In most developing and developed countries, the Government always strives to ensure that the citizens are well catered for in terms of health (Caldwell, 1986). The allocation to the health sector by the government is therefore an important factor and hence the need to strengthen the allocation of resources towards the health sector (Manyala, 2000). The GOK has therefore put in place plans and programmes to reduce the disease incidence, including the spread of HIV/AIDS pandemic. This is in line with the government's policy to provide sustainable healthcare that is acceptable, affordable and accessible to every body under the framework of using the preventive[4] rather curative[5] approach in the management of health (MOH, 2003). The government therefore recently intensified its effort to reduce the spread of these diseases through a host of programmes including collaboration with NGO'S across the country to create awareness about the dangers of common diseases. Other endeavors have been the distribution of mosquito nets to pregnant mothers countrywide to prevent the spread of malaria (MOH, 2003). The Government has also ventured in the treatment of some diseases for example TB free of charge to improve health indicators of Kenyans and hence the health status (KDHS, 2003).

[4] The institution of measures to protect a person from a disease to which he or she has been, or may be, exposed.
[5] A medicine or therapy that cures disease or relieves pain.

The GOK (2001) report was targeted at attaining health levels that would permit people to live socially and economically productive lives. According to Geoff and Mills (1986), people must be healthy to contribute towards economic and social development. They assert that most African governments cosmetically seem to be committed to elevation of health situation of their people. Contrary to this, they still allocate a very low percentage of their expenditures on public health.

The type of health facilities (public and non-governmental) and health professionals in the public sector are presented in Table1. While there is an active non-governmental sector, the majority of facilities are owned by the Government.

**Table 1: Human Resources (Public Sector) – 2002**

| | |
|---|---|
| Total number of doctors | 932 |
| Doctor Population Ratio | 1:32189 |
| Total number of dentists | 111 |
| Dentist Population Ratio | 1:270270 |
| Total number of pharmacists | 87 |
| Pharmacists Population Ratio | 1:344828 |
| Total number of nurses | 15,611 |
| Nurses Population Ratio | 1:1822 |
| Clinical officers | 1922 |
| Clinical officers population ratio | 1:15609 |
| Public health officers | 2092 |
| Public health officers population ratio | 1:14340 |
| Public health technicians | 1960 |
| Public health technicians population ratio | 1:15306 |
| Lab technicians | 1533 |
| Lab technicians population ratio | 1:19317 |

**Source: Ministry of Health, 2002**

An examination of the ratio of the number of the public sector health professional to the population shows that the ratio is lowest for dentists, pharmacists and doctors, and in general are considerably lower than what is required to provide good health care in the country.

**Table 2: Health Facilities in Kenya, 2003**

| Health facilities | Government | Private/NGO |
|---|---|---|
| Total number of hospitals | 114 | 120 |
| Total number of beds in hospitals | 18,806 | 11,350 |
| Total number of cots in hospitals | 2,279 | 601 |
| Total number of special medical institutions | 1 | 0 |
| Total number of beds in special medical institutions | 30 | 0 |
| Total number of maternity homes | 5 | 57 |
| Total number of nursing homes | - | 152 |
| Number of medical centres | - | 60 |
| Number of Health Centers | 392 | 114 |
| Number of beds in Health Centers | 3,175 | 1285 |
| Number of cots in Health Centers | 206 | 190 |
| Number of Dispensaries | 1,661 | 1061 |
| Number of Rural Health Training Centres | 7 | - |
| Number of beds in Rural Health Training Centers | 123 | - |
| Number of cots in Rural Health Training Centres | 40 | - |
| Number of Rural Health Demonstration Centres | 31 | - |
| Number of beds in Rural Health Demonstration Centres | 387 | - |
| Number of cots in Rural Health Demonstration Centres | 67 | - |

**Source: Ministry of Health, 2003**

The conclusion is that a network of over 4,500 health facilities and more than 45,000 trained health workers can no longer sustain the 1970s' gains in infant and child mortality and life expectancy in a population now at 30 million (MOH, 2003). In the 1990s immunization coverage had declined to about 60 percent (down from 80 percent in 1988). According to routine data and EPI evaluation report for 2002, there is now evidence that the previously declining trend has been reversed. The internal causes (as recognized in the NHSSP and HSSA) were related to the declining availability, access to and quality of

public health services, the persistence of malaria, malnutrition, and the HIV/AIDS pandemic. A main underlying external factor is the increasing level of poverty. Finally, a large proportion of Kenyans have inadequate access to clean water and sanitation.

The progress made in health improvements since the 1960s slowed down in the 1990s due to poor economic growth and fiscal constraints[6]. Changes in the financing of health services, poor quality healthcare, and increasing poverty led to the reversal of earlier health gains (Republic of Kenya, 1999; Kimalu, et.al, 2002). Childhood malnutrition has been on the increase, with available information indicating that at least130/1,000 new-borns weigh 2,500 grams or less. About 90% of these children die within 30 days of life (KDHS, 2003). Overall, malnutrition is reported as the cause of up to 30% of all child deaths in the country. Deaths from preventable diseases are increasing because of declines in immunization rates. It is feared that the decline in fertility rate revealed in the in Republic of Kenya (1999) may be reversed by the falling school enrolments (Kimalu et al., 2002) and by poor financing of family planning services.

### 1.2.2 Infant and Under-Five Mortality

Infant mortality is the probability of dying before the first birthday while under-five mortality is the probability of dying before the fifth birthday (Thompson, 2000). These are basic indicators of a country's socio-economic level and quality of life. The level of under-five mortality was 114 deaths per 1,000 live- births during the 1999-2003 period (KDHS, 2003), implying that 1 in every 9 children born in Kenya during the period died before reaching their fifth birthday. The infant mortality rate recorded was 78 deaths per

[6] Involving financial matters (Health expenditures) problems.

1,000 live births. Comparison of mortality rates recorded in 2003 KDHS with the earlier KDHS surveys shows an increase in both infant and under five mortality rates. For example, the infant mortality rate increased by 30 percent from 60 deaths per 1,000 live births in 1989 to 78 in 2003. Similarly, under-five-mortality rate increased by 30 percent between the same periods. The trend depicts continued deterioration in the quality of life amongst the Kenyan population over the last 20 years (Table 3). This study makes the use of under five-mortality rate as a proxy for all mortalities.

**Table 3: Trends in early childhood Mortality in Kenya**.

| Infant and under-five mortality, Kenya, 1984-2002 | | | |
|---|---|---|---|
| Survey Year | Approximate Calendar period | Infant Mortality | Under-five Mortality |
| 1989 | 1984-1988 | 60 | 89 |
| 1993 | 1988-1992 | 62 | 96 |
| 1998 | 1993-1997 | 74 | 112 |
| 2003 | 1998-2002 | 78 | 114 |

**Source: KDHS, 2003**

### 1.2.3 Life Expectancy

Life expectancy at birth is the number of years a newborn infant would live if prevailing patterns of Mortality at the time of its birth were to stay the same throughout its life. It is also a measure of overall quality of life in a country and summarizes the mortality at all ages (Thompson, 2000). It can also be thought of as indicating the potential return on investment in human capital and is necessary for the calculation of various actuarial measures[7].

[7] Statistical calculation of life expectancy.

The 1999 National Census estimated the population of Kenya to be 28.7 million, of whom 60 per cent are under 20 (GOK, 2000). The population is projected to grow at an annual rate of 2.4 percent (MOH, 2005). Life expectancy is on the decline at 48 years for females and 47 for males and expected to fall further due to the rising incidence of AIDS. As well, there is a steady decline in the life expectancy rate from 57.7 years in 1990's and is expected to be 44.6 years in 2005.

**Table 4: Kenya's Life Expectancy**

| Year | 1955 | 1960 | 1970 | 1980 | 1990 | 2000 | 2005 (prognosis) | 2015 (prognosis) | 2050 (prognosis) |
|---|---|---|---|---|---|---|---|---|---|
| Life expectancy at birth (Number of years) | 40.9 | 43.4 | 48.3 | 53.3 | 57.7 | 50.7 | 44.6 | 45.0 | 54.1 |

**Source: KDHS (2003)**

## 1.3 HEALTH EXPENDITURE DISTRIBUTION

### 1.3.1 Sources of Funds for Health Expenditures

Total health expenditure is the sum of both public and private health expenditures (KDHS, 2003). Public Health Expenditure is the sum of outlays on health paid for by taxes, social security contributions and external resources (without double counting the government transfers to social security and extra-budgetary funds). Private Expenditure on health comprises the outlays of insurers and third-party payers other than social security, mandated employer health services and other enterprise provided health services, non-profit institutions and non-governmental organizations financed health care,

private investments in medical care facilities and household out-of-pocket[8] spending (NHA, 2001-2002).

Out of the total amount of funds spent on health, 54% of the funding came from private sources, mainly households (51%) through out-of pocket spending (45% of THE) and contributions to insurance schemes (6% of THE). Government funding, mainly from general tax revenues, accounted for 30% (including government parastatals and local Councils), while the rest of the world (donors) provided 16% of the total health financing in Kenya. A small proportion of funds could not be classified by financing sources. Clearly, the results point out the heavy burden placed on households against a background of high level of poverty (NHA, 2001-2002).

Government expenditure on health was highest during 1965-1970, a period of exceptional Economic growth. The funding for healthcare came from the treasury, donors, and households. Due to heavy public subsidization of healthcare, out-of-pocket expenses on medical care at government health facilities were minimal (Mwabu, 2002). However, indirect costs, in terms of travel expenses were large because health facilities were not easily accessible. To increase coverage of hospital healthcare in the population, the government introduced the NHIF in 1967. However, since Fund membership was restricted to people with formal-sector employment, it did little to extend hospital care coverage in rural areas. It is estimated that 20% of the Kenyan population is covered by the NHIF (MOH, 2003). Even so, there is evidence to suggest that members of NHIF do

[8] This is the direct payment made to the provider at the point of service delivery.

not fully benefit from the Fund because of cumbersome reimbursement procedures (Mwabu, 2002).

Private health insurance schemes are limited. Moreover, as in the case of the NHIF, they benefit high-income groups, particularly in urban areas. The main sources of health finance are therefore the central government, local government, donors, parastatal employers, private employers and households (HHEUS, 2003).

**Table 5: Distribution of Private and Public Expenditure on Health as a Percentage**

| Year | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 |
|---|---|---|---|---|---|---|
| Public (%) | 45.2 | 41.1 | 46.5 | 42.8 | 44.0 | 46.0 |
| Private (%) | 54.8 | 58.9 | 53.5 | 57.2 | 56.0 | 54.0 |

**Source: GOK, 2005**

The main areas that the government spends on are capital[9] and recurrent[10] expenditures. The recurrent expenditures by the government take place in the following areas; salaries and other personnel, drugs and medical consumables and equipment. On the part of development expenditures, the services offered include; general administration, curative health, preventive and promotive expenditures, expenditure on rural health services and lastly on training and research services (GOK, 2005).

The Government, through the ministry of health, is the key player in the provision of health care service delivery in the country. Out of about 4,500 health facilities in the country the government manages 52% of them, 79% health centres, 92% sub health

[9] Expenditures on health fixed assets and equipment.
[10] Short-term day-to-day expenditure on health.

centres, and 60% dispensaries (NHA, 2001-2002). In addition, private institutions also run health facilities in the country. They include: Non-governmental organizations located in rural areas, private-for-profit practitioners and local government authorities, which provide mainly primary and preventive health care in major municipalities (NHA, 2001-2002). This study concentrates on both government and private health expenditures. The major problem in health sector has been limited data on the expenditure of health care services especially from the private sources including the households.

The government finances health care to the tune of about 46% of the national health expenditure. The private sector accounts for about 54%, including the missions, companies, donors and NGO'S (NHA, 2001-2002). In supporting the Expanded Health Programme, the government heavily relied on tax revenue leading to the rapid growth in the nominal health budget from Kshs.2554 million to Kshs.13820 million in 1996 out of which the recurrent component accounted for about 80% of the expenditure (GOK, 1999). The rise in nominal funding not withstanding, the M.O.H's total and recurrent expenditure as a percentage of treasury budget allocates have been on decline from early 1980's.

The NHIF established in 1967 provides an alternative financing system in Kenya. The scheme provides cover for the contributors and their families for in-patient care in approved hospitals. The fund provides for 50% of the cost sharing and until recently provided a major source of funds for many hospitals. The performance of NHIF has been

improving. The total number of contributors to the fund rose by 12.5 % from 1.6 million in 1994/95 to about 2.5 million in 2003/2004 (MOH, 2003).

### 1.3.2 Government Funding

This includes expenditure from the ministry of health, other ministries and donor assistance. The MOH is the largest institutional financing intermediary in the health sector. In 2003, it expended approximately one quarter of all funds spent on health care in the country. The GOK and foreign donors and creditors are its primary sources of funding (GOK, 2005).

The MOH receives almost all of the health funding made by the MOF and most of the contributions for health made by foreign donors and creditors. Part of the total funds received by the MOH are spent at its headquarters in Nairobi, but the majority of money is transferred to its facilities, where it is spent on health care provision and support services, such as training and administration (MOH, 2005).

The accounts system of the GOK is divided into votes for each of its ministries. The MOH vote is subdivided into the Recurrent and Development Account (MOH, 2005). The Recurrent Account typically covers the operating costs (personnel, drugs, supplies, maintenance, etc.) and is financed by transfers from the MOF and funds generated through cost-sharing programmes. The Development Account is meant to cover only expenditures on capital resources (items with an expected useful life of over one year) and is mostly funded by foreign donors and creditors. However, the Development Account actually finances a large portion of operating expenditures in addition to capital

expenditures. The main reason for this mixture is that donors include support for operating expenditures such as drugs, contraceptives and medical supplies in their development projects (GOK, 1998). The accounts are further sub-divided into sub-votes (functional categories), heads (provincial or district level expenditure), sub-heads (geographical location by province) and item (line item). In theory, the organization of MOH accounts into these categories is intended to provide information on spending to a level of detail that is required by the Health Policy Framework (MOH, 2005).

However, in practice, the accounts do not provide reliable information. The budget analysis has a number of problems[11] with the current accounting system (MOH, 2003), including inappropriate categorization, over-lapping of expenditures across categories and inadequate disaggregating of expenditures (*NHA, 2001-2002).* These inconsistencies make it impossible to measure expenditures according to function, line item and province. Therefore, estimates are normally used. These problems are particularly evident in the Development Account, where there is a great amount of missing data. The missing data is a result of insufficient coordination between the MOH and foreign organizations in accounting for donor contributions (*NHA, 2001-2002).* Some donors, especially the bilateral ones, contribute outside of the formal structure of aid support. Others have ignored the donor aid process and have established parallel accounting systems for their contributions.

Consequently, the MOH accounting system is unable to report on a large part of the Development Account. Another limitation of relying on the Budget Analysis results is

[11] See National Health Accounts 2001-2002

that they overestimate MOH spending on hospitals and underestimate, by the same amount, spending on outpatient centers (GOK, 2003). These mis-calculations are a result of the ministry's expenditure reporting system in which the accounts of many rural outpatient facilities are combined with those of nearby district hospitals before being sent to the MOH headquarters (MOH, 2003). The final major limitation of using the Budget Analysis results is that they do not provide functional information on the amount spent by the MOH for inpatient and outpatient care (MOH, 2003).

To make these estimates, the NHA team uses a couple of assumptions (*NHA, 2001-2002).* The first assumption is that all expenditures reported as being incurred at outpatient centers are for outpatient services. The second assumption uses information on hospital costs from the *1993 MOH Curative Services Financing Gap Study* to allocate hospital-spending data according to inpatient and outpatient care. According to the study, inpatient services accounted for 63 percent of the total costs of financing GOK hospitals, while outpatient services accounted for the remaining 37 percent (GOK, 2002).

Apart from the MOH, three other GOK ministries are involved in financing health services. The Ministry of Education (MOE) is responsible for training medical staff through its colleges and universities. Although much of the spending to train providers is covered in the MOH accounts, the MOE supports some of these costs. In addition to training, the MOE is active in health research (MOH, 2003). The University of Nairobi and Moi University combined receive a substantive amount of funds from foreign donors to conduct health-related studies. The MOPND provides research and policy-related support to the health sector through the activities of the National Council for Population

and Development (NCPD) and the CBS. The health-related activities of these organizations are supported largely by foreign donor contributions (GOK, 2003). The Ministry of Defense (MOD) is the only ministry apart from the MOH that operates its own health facilities. It offers both primary and secondary care to its employees and their families (NHA, 2001-2002). All ministries offer health care benefits to employees. Most of these benefits are in the form of medical allowances, which are paid to employees as part of their salaries. Since these benefits are monetary and can be used for any purpose (including, but not limited to, the purchase of health services), they are not included as part of MOH expenditure analysis. In addition to medical allowances, each ministry provides its employees with ex-gratia[12]payments to supplement NHIF contributions for in-patient services (MOH, 2005). These payments are made to partially reimburse those employees who pay above what the NHIF will cover for a hospital visit.

### 1.3.3 Private Financing

Private health care provision refers to all health care providers working outside the direct control of the state (Bennett, 1991). These can further be divided into for-profit and not-for-profit providers. These differences in economic orientation suggest that these two sectors may play quite different roles both in terms of the population served and the services provided, although this has not been formally demonstrated (WHO, 1991).They include; Out-of-pocket payments (user fees), private insurance and private employers health schemes (HHEUS, 2003).

[12] Additional payments to finance health rather than from the government.

Funds mobilized through the private sector financing agents accounted for about 57% (including donors and NGOs), an indication that the private sector was the largest purchaser of health services in the country (HHEUS, 2003). The public sector financing agents handled approximately 43% of the total financial outlays from the sources. These funds were in turn transferred to the ultimate providers of health care services. Analysis of data[13] showed that 60% of donor funding was channeled through the public sector financing agents, mainly through the MOH. The principal financing agents in the flow of funds were the households through out-of-pocket payments (45%) followed by the MOH, which handled about 35% of the total funds from the sources. The NGOs and the NHIF received 6% and 4% respectively of the total funds from the financing sources (NHA, 2001-2002). Other entities, which received funds from financing sources, included parastatals (3%), private firms through employer insurance programmes (2%) and private insurance firms (2%), and local authorities (1%). Although households are the largest purchasers of health services at 45%, approximately 88% of their spending passed directly to the ultimate providers of health care services. The rest was channeled through to private insurers, NHIF and private firms in form of group insurance schemes in which the employer and/or the employee contributed. Much of the funding of the NGOs expenditures stemmed from several sources with donors contributing 86 % (MOH, 2003).

The flow of funds in Kenya's health system from sources to financing agents identifies five major pathways of financing health care services, which can be summarized as follows[14]:

[13] See Household Health Expenditure And Utilizations Survey Report, GOK (2003)
[14] See National Health Accounts, GOK (2001-2002).

•From households through out-of-pocket spending directly to retail providers of pharmaceuticals, public and private health facilities (45% of total financing).

• From the GoK to MOH through the Budget (25% of total financing).

• From donors to the MOH 10% of total financing.

• From donors to NGOs 5% of total financing.

• From households to hospital facilities through the NHIF (3% of total financing).

## 1.4 STATEMENT OF THE PROBLEM

By the 1970s, Kenya had built a health sector that performed relatively well compared to neighboring countries, and some of its indicators were among the best in sub-Saharan Africa (Mwabu, 2001). However, these substantial gains made during the 1970s and the 1980s have been eroded to reflect a downward trend in health at the start of the new millennium. Health indicators (Mortality and Longevity) improved steadily over the period 1980-95, and then declined. However there are important regional differentials; North Eastern, Coast, Nyanza and Western Provinces have the worst health indicators (MOH, 2003).

In the 1980s and 1990s, Kenya introduced user fees in government health facilities to broaden sources of health finance. Per capita expenditures on health care began to decline in the 1990s. There is evidence that health sectors in Kenya are under-funded[15]. This scarcity of health finance in the country has implications for basic health services that policy-makers can afford to provide to everyone in the population. Although the local

[15] See Mwabu (2001).

cost of providing a minimum package of health services in Kenya is modest, governments and the private sector are not able to fully afford it.

Overall Morbidity and Mortality remain high, particularly among women and children. An infant mortality rate (IMR) of 62 in 1985 increased by some 12% to 74 in 1998, a short period, when the reverse should have taken place (MOH, 2003). This remained at this level by 2001. Under-five mortality also rose to 144 per 1,000 live births in 2003. There are wide regional variations, certain districts in North Eastern Province, the Lake Region and the Coastal area having the highest burden of disease (KDHS, 2003).

The major problem highlighted in this study is the declining trend in health indicators. The National Development Plan (2002 – 2008) states that the health care system in its current form does not operate efficiently. Some of the areas to be targeted include enhancing drugs, personnel, and facility utilization. Drugs, which account for 14% of the health budget, were deemed the most promising area for improvement, particularly in drugs selection and quantification (MOH, 2003).

In terms of health expenditure allocations, there are two central challenges regarding the distribution of resources between the curative and preventive health care; and allocation of expenditure between urban and rural areas (MOH, 2003). Private health expenditures are cumbersome for majority in the country and therefore remain a major daunting task for the poor (HHEUS, 2003). Curative care accounted for 67% of the total recurrent expenditure while preventive care accounted for 21% (GOK, 2004). This expenditure mix discriminates between the rural and the urban poor population in the allocation of

expenditure. Kenyata National Hospital accounted for 16.3% while the rural health centers 21% of the recurrent expenditure. Public Health expenditure therefore tends to favour the urban areas thus worsening the morbidity pattern in rural areas.

Therefore, health expenditure allocation, distribution and the actual use is posing a major problem and thus worsening the country's health indicators leading to poor health status (Manyala, 2000). Given the close association between health expenditures and health indicators, declining allocation and access of expenditure on health have continued to be a major challenge.

Precisely the study problem is based on the fact that public health expenditures are inadequate, biased towards curative rather than preventive and disparity in allocation between the rural and urban areas. Majorities have to rely on financing their health expenditures privately due to cost sharing in the public hospitals but since they are poor (about 60%); they cannot afford the much needed health services thus worsening the health indicators of the country. Therefore, the problem is the declining health indicators compounded by inadequate health expenditures. Although expenditure on health is accorded central place in MOH policies, few or no studies have been done to determine the effect of health expenditure and health indicators. This therefore bridges the knowledge gap.

## 1.5 STUDY OBJECTIVES

i. To test the impact of various health expenditures, both public and private on the health indicators in Kenya.

ii. To formulate policy recommendations to the health sector on how to improve the expenditures on health to meet the health needs of the country in order to improve the health indicators in Kenya.

## 1.6 JUSTIFICATION OF THE STUDY

This study is significant because majority of the population in Kenya are either directly infected or affected by various diseases and are thus worsening the country health indicators. Many cases of illness are recorded on a daily basis in both private and public hospitals thus leading to a substantial increase in mortality and morbidity (HHEUS, 2003). This shows that the government has not committed adequate funds towards fighting the diseases that worsen the health indicators.

Most of the studies done have shown that the government in distributing the expenditures on health have not taken care of the worsening health indicators in the country. This study will therefore fill the gap of information that may be used by policy makers to distribute funds in such away as to improve the health indicators. The outcome of the study may supplement the policy makers with information to assign, implement and monitor expenditure policies that improve the health indicators. The ministry of finance may use the study to fill the gap in funding the health services. MOH will on the other hand use the result to examine the ways of reallocating financial resources to bridge the gap between urban and rural distribution of public health expenditure. The NGO's,

donors and other partners in health care financing will be provided with useful information that could help them to specify which health care system is appropriate for the country.

In general, the study will supplement the private sector and government with information regarding the efficiency of the health sector on health indicators. This will enable them to carry out improvements in the health expenditure of the country and thus improve the accessibility of medical services.

## CHAPTER TWO: LITERATURE REVIEW

This chapter reviews the empirical as well as theorical literature. The literature covers the relationship between health expenditures and the health indicators.

### 2.1 THEORICAL LITERATURE

Cuyler (1989) in his study estimated the total health expenditure and its relationship among the middle and low-income countries. He argued that the total health expenditure ranges between 1%-5% share of GDP among the low and middle-income countries respectively. The government share of these expenditures account for between 30%-70%. Geoff (1986) argues that people must be healthy to contribute and share into social and economic development to enhance the level of health indicators. The author further asserts that when one is healthy he/she can contribute towards income generating activities to improve the health indicators of the nation. The GOK (2001) target was to attain health levels that would permit people to live socially and economically productive lives and hence a positive indicator of health.

Abel ( 1963) carried out a study on health care services and sources of revenue in six countries from Western Europe and North America. The author found that health care expenditure was associated with increased life expectancy and reduced infant mortality. In Abel's (1967) study, the author incorporated the level of national income and found that, it was influencing health indicators and that the demand for healthcare increased in countries with declining mortality.

Carrin (1988) argues that public health expenditure is related to health indicators in SSA'S. This is because most of these governments are constrained budget wise because health has to compete with other sectors for resources. The sectors that health has to compete with are defence, education, housing and agriculture. He therefore suggests other alternative methods of financing heath such as insurance, foreign aid; raising taxes and so on. However, this has a far-reaching effect on the poor who cannot afford other alternative methods.

Caldwell (1990) showed that provisional differences in geographical areas as well as density might affect access to health care although the percapita spending might also be the same. Greater density leads to lower unit price of health. This encourages the greater care on health care expenditure and therefore greater life expectancies and lower mortality.

Filmer, et. al. (1998) explains why public spending in health might not be an important health indicator even though relatively cheap and effective medical interventions might be possible. He further argued that cross-national differences in the public spending on health does not always translate into large supply of effective health services and that public money might be spent on expensive but ineffective curative services.

## 2.2 EMPIRICAL LITERATURE

Murray et. al. (1993) carried out a study on the global domestic expenditures on health. He divided expenditure into public and private. In public expenditure, the authors included government and parastatal expenditures whereas on private they included voluntary and household spending. They found that public health expenditures accounted for 44% in Africa. Capital expenditure accounted for 17% of the total government health expenditure.

Ravallion and Biddani (1997) did a study on the relationship between the level of life expectancy and infant mortality. They used multivariate regression analysis that explains health indicators. Their findings were consistent with the impact of spending on health indicators. They found that health expenditures stimulated life expectancy and reduced infant mortality.

Caldwell et. al. (1986) highlighted the high mortality in poor countries. They examined cross-national health data on health indicators. They found that a gap between public spending to improve the health indicators and the actual performance existed. However, they discovered that public expenditures explained very little about the cross-country

differences in infant and child mortality but asserted that they were caused by both social and economic factors. In their other study, they found the existence of some poor countries with exceptionally good health indicators and hence good quality of life. They argued that both aggregate and household expenditures showed that higher levels of female education are associated with better health indicators.

Jamilson et. al. (1996) used econometric analysis to study the under five mortality. They found that public health spending lowered mortality in the Latin American Countries they sampled. They found a positive and significant impact of public spending on health situation.

Manyala (2000) argued that expenditure on education and health improved health indicators. In his study, he showed that percapita income is linked to the levels of mortality. He contends that some of the negative traits in health status could have been attributed to unfavorable growth and insufficient social spending on health. He asserts that current revenue had the expected effect on the life expectancy but not on the infant mortality.

Nganda and Ongolo (1999) carried out an analysis of government expenditures based on social services in Kenya. They wanted to know how much of the foreign aid flows was being spent on basic social services. They also considered financial implications for the basic social services in improving the health indicators. The increase in public health expenditures was attributed to improved health services because of the emphasis on preventive services such as immunization (for under-five diseases). Life expectancy at

birth also improved from 39 years in 1950's to over 60 years in 1990's. They found that the portion of spending on health as a share of real GDP was declining. The study further revealed that only 10% of the government budget went to development activities while the rest went to recurrent activities. In all this study showed a decline in infant mortality because of the increase in health expenditures.

Schultz (1999) did a study on health and schooling activities in Africa. He argued that health indicators would improve with increased spending on health services. However, health indicators will worsen with a rise in prices of health inputs such as salaries on medical personnel cost of drugs relative to prices of nutrients that fights off the infectious diseases. He found education to be highly correlated with lower mortality even after holding household income constant.

Hitrus and Posnett (1992) did a study on the determinants and effects of health expenditures in developing countries. They discovered that a reduction in healthcare spending is associated with reduced life expectancies for both male and female. There was a strong relationship between healthcare spending and some measure of quality of life expectancy.

Benefo (1996) observes that global spending on health amounted to $2.3 trillion in 1994 (about 9% of the global income). High-income countries spent just over $2 trillion (89% of the total health expenditures) while their population accounted for 16% of the global population. Developing countries with their 84% of the world population only accounted for a paltry 11% of all health spending. This dispending shows the enormous difference

between developing and developed countries interms of capacities and types of health services that can be provided. This translates into large difference in health infrastructure and health. This perhaps is a clear indicator why most developing countries are in abject poverty and suffering from all kinds of deadly diseases.

Wang and Jacoby (2003) examine the linkages between child mortality and morbidity, and the quality of the household and community environment in rural and urban China using a competing risks approach. They used data for 1992 China National Survey for children that resemble the Demographic and Health Surveys (DHS). The key findings include (1) use of unclean cooking fuels (wood and coal) significantly reduces the neonatal survival probability in rural areas - an outcome that is also confirmed in two other studies (India and Guatemala); (2) access to safe water or sanitation reduces child mortality risks by about 34% in rural areas; (3) higher maternal education levels reduce child mortality and female education has strong health externalities (i.e. controlling for other factors, a child living in a neighborhood with more educated mothers has about 50% lower mortality risk); (4) access to safe water/sanitation, and immunization reduce diarrhea incidence in rural areas, while access to modern sanitation facilities (flush toilets) reduces diarrhea prevalence in urban areas; (5) significant linkages between ARI incidence and use of unclean cooking fuels are found using the city level data constructed from the survey. The study indicates that effective policy interventions for improving health outcomes often lie both within and outside the health sector. Cross-sectoral approaches can potentially produce large health benefits.

In a related study Wang (2003), using the results from the 2000 Ethiopia DHS examines the environmental determinants of child mortality. The author runs three hazard models, the *Weibull,* the *Piece-wise Weibull* and the *Cox* model to examine three age-specific mortality rates: neonatal (under one month), infant (under one year), and under-five mortality by location (urban/rural), female education attainment, religion affiliation, income quintile, and access to basic environmental services (water, sanitation and electricity). The estimation results show that children born in rural areas face much higher mortality risk compared with those born in urban areas. Ethiopia is characterized by severe lack of access to basic environmental resources and strong statistical association is found between child mortality rates and poor environmental conditions. Safe water, sanitation and electricity are mainly accessible to households living in urban areas (accounting for less than 20% of the total population).

## 2.3 OVERVIEW OF LITERATURE

Based on the above literature, many issues have been seen to explain the impact of health expenditure on health indicators of any nation. Access to safe water, public and private share in health spending and expenditure on education percapita are major variables that have been found to determine the health indicators.

The studies reviewed have used different methodologies and variables to establish that increased health spending reduces mortality and improves life expectancy. Health expenditure is significant in determining the health indicators. It is therefore easy to determine whether the health expenditure has negative impact on health indicators. Economic variables used in different studies have shown some consistencies with what

economic theory predicts. Majority of the studies done in Kenya are confined to the impact of GNP percapita on health indicators. Government in most of the studies has been seen to rely heavily on tax revenue. All the studies show that because of inadequate health expenditure, health indicators have been declining considerably.

This study will therefore fill the knowledge gap by providing precise information on the relationship between health expenditures and health indicators. The study borrows a lot of literature from Manyala (2000) and Kargbo (2001).The two studies concentrated on public expenditure and its impact on health status. However, the point of deviation from the above studies and my study is that literatures from the private expenditure have also been included. It is worth noting that expenditure on health services such as water and sanitation, nutrition and housing have greater impact on health situation of a country and thus a positive health indicator.

The major shortcoming of the studies reveals that the results of the studies have differed in several ways. Most of the studies reviewed have found statistically significant positive relationship between the health expenditures and the health indicators. Out of several studies that considered material income, only few found a positive relationship of public health expenditures and health indicators. This could be attributed to the fact that public health expenditures cover a smaller percentage than the private sector due to cost sharing. To improve on this, my study has incorporated the out-of-pocket expenditures in public institutions as a dominant form of private spending on healthcare.

# CHAPTER THREE: METHODOLOGY

## 3.1 THEORETICAL FRAMEWORK

The demand for health is a derived demand. This is because the desire for health makes one to go for treatment in the hospital. Therefore, the search for health care services is used to produce health (Grossman, 1972).The demand comes from the sick people who decide which services to buy. A number of factors determine their decision. First, availability: Does that supplier offer the relevant service? Secondly, price: How much does it cost? Other things being equal, buyers tend to prefer the least expensive service or the product, which leaves them with more money to spend on other things (Thompson et. al, 2000).

Grossman (1972) regards health as both consumption good as well as an investment good. As a consumption good, it is desired to make a person feel better. Health as an investment good is used in the improvement of health indicators to enable one to produce other goods. Health has value-in-use but not value-in-exchange and therefore one consumes health to improve the health indicators. Thus, the analysis of health expenditures and health indicators involve the use of a simple production function.

Gertler, et. al (1990) argues that the benefit that is obtained from the use of health care services is an improvement of health. However, the cost of obtaining health care reduces the consumption of other goods and services. The costs are both direct and indirect cost. Direct costs are such costs as consultation fees and drugs among others. Indirect costs are such costs as the transport cost of going to the hospital and the opportunity cost of time

wasted when traveling to a health centre. Health is a valued asset but it should be noted that health is not everything in life. However, life without health is nothing because health is a prerequisite for other activities.

Phelps (1995), in his study observed that the process of transforming health care services into health can be assimilated into a process similar that used in the production of other goods and services. More health care produces more health and therefore makes the marginal productivity of health to be positive. As soon as one receives health care, the benefits derived from it declines. The author further argues that at any given time, individuals will posses a stock of health. The stock of health therefore creates the utility in such a way that when one is sick, he/she will be forced to restore his health through treatment by either going to the hospital or buying drugs from the chemists. This is done in the hope that the health indicators will be improved.

Health indicators can be measured by the number of percapita healthy days of the people, mortality rates, disability days, better nutrition, clean water and sanitation, family planning and other medical intervention (Thompson, 2000). Primary health care may be more important than the secondary care in improving the health of the population. This is measured by life expectancy. An individual derives happiness from the consumption of health care (Grossman, 1972).

Health is a production good that produces health indicators. The greater the stock of health, the greater the number of health days. In the study of Thompson, et. al (2000), the authors assumed that an individual enhances or improves his health indicator in the utility function such that:

$H_{ID}=k\,(H_P,\ S_T,\ V_S,\ HID_{t-1})$.....1

Where,

$H_{ID}$ - Health indicators

$H_P$ - Quality of health provider.

$S_T$ - Quality of self-treatment.

$V_S$ - Socio economic variables.

$HID_{t-1}$ - Lag of health indicators.

### 3.2 EMPIRICAL MODEL

Life expectancy and under-five mortality rates are used as the measures of health indicators. A health indicator of an individual is assumed a function of public expenditure on health percapita (MOH), private expenditure on health as a percentage, percapita expenditure on education and percentage population with access to safe water. Education though not an health indicator has been used because more educated people are assumed to be capable of applying healthcare standards better and thus become healthy.

The dependent variables are: Under five-Mortality rate, life expectancy, which are used as, measures of health indicators. The independent variables are public expenditure on health percapita (MOH), Expenditure on education percapita, private health expenditure as a percentage and percentage population with access to safe water.

In this study, public health expenditure has been divided into development and recurrent expenditures. Private expenditure is mainly analyzed through the percentage spent on health activities not in direct control of the government such as out-of-pocket/individual expenditure on health (HHEUS, 2003). Population with access to safe water component has been included because water is a very good indicator of health. The study makes use of percentage population with access to safe water but not expenditure on water and sanitation. This better explains health because it captures the actual specifications of the expenditure on water and sanitation. MOH health expenditures is the total of recurrent and development expenditure.

### 3.2.1 The model specification

The model can therefore be specified as;

$HID_i = f(MOH_E, PRHEP_E, MOE_E, AS_W)$.....2

MOH and MOE expenditures have been divided into their respective development and recurrent expenditures. This therefore modifies equation 2 into equation 3.

$HID_i = \alpha_0 + \alpha_{1i} PRHE_E + \alpha_{2i} PDHE_E + \alpha_{3i} PRHEP_E + \alpha_{4i} PRE_E + \alpha_{5i} PDE_E + \alpha_{6i} AS_W + \varepsilon_i$.....3

Taking natural logarithms (Ln) on both sides, we have a double log function of equation 3 as follows:

$LnHID_i = \alpha_0 + \alpha_{1i} LnPRHE_E + \alpha_{2i} LnPDHE_E + \alpha_{3i} LnPRHEP_E + \alpha_{4i} LnPRE_E + \alpha_{5i} LnPDE_E$

$+ \alpha_{6i} LnAS_W + \varepsilon_i$.....4

Where:

PRHE-Public recurrent health expenditure percapita.

PDHE- Public development health expenditure percapita

PRHEP-Private health expenditure in percentage of the total health expenditure

PRE-Percapita recurrent expenditure on education

PDE- Percapita development expenditure on education

$AS_W$-Population in access to safe water as a percentage.

This model is adopted from Kargbo, (2001).The model has been improved with inclusion of individual/out-of-pocket private expenditures. Kargbo's model had a major limitation in that it did not consider private expenditures on health, which cover about 56% of health expenditures in Kenya (MOH, 2003). It only concentrated on public health expenditures.

### 3.3 HYPOTHESIS

The hypothesis can be formulated as follows:

Null Hypothesis $H_0$: $\alpha_i=0$ Health expenditures are not related to health indicators.

Alternative Hypothesis $H_1$:$\alpha_i \neq 0$ Health expenditures are related to health indicators.

The relationship between explanatory and dependent variables are expected to have the following signs

**Table 6: Expected signs of explanatory variables**

| Dependent Variables | Explanatory Variables | Expected signs |
|---|---|---|
| $LogU_{5MR}$ | LnPRHE | |
| | LnPDHE | |
| | LnPRHEP | - |
| | LnPRE | - |
| | LnPDE | - |
| | $LnAS_W$ | - |
| Log $L_E$ | LnPRHE | + |
| | LnPDHE | + |
| | LnPRHEP | + |
| | LnPRE | + |
| | LnPDE | + |
| | $LnAS_W$ | + |

**Source: Authors own hypothesis**

### 3.4 ESTIMATION PROCEDURES

The log-log regression analysis was applied on time series data. The two equations with each health indicators are estimated by OLS separately. Each health indicator is regressed separately with the same explanatory variables to determine its outcome. The econometric package used is E-views. In the analysis all, the independent variables are regressed on each health indicator (dependent variable) to study the effects.

### 3.4.1 Univeriate Data Analysis

The univeriate data analysis is done with the aim of identifying data points that are potentially difficult. However, the test for normality is done to ensure that the series follow a normal distribution.

### 3.4.2 Unit Root Analysis

The unit root analysis was done on each of the variables to ensure that they are stationary. The main methods used to analyze the unit root tests were the Dickey Fuller test and the

Augmented Dickey Fuller test (Engle and Granger, 1987). This is because regression with non-stationary variables increases the chances for spurious regression (Green, 2003).

### 3.4.3 Cointegration Analysis

The model was subjected to cointegration analysis to ensure that there is a stable long-term relationship between the explained variable and the regressors. This test is necessary to guard against the loss of information relating to possible long-term relationship in a model specified in first differences. Testing for cointegration involves using the Engle-Granger (1987) two-step procedure due to its simplicity. Other cointegration tests procedures exist which are infact superior to the Engle-Granger approach but are normally applied in the VAR models. The long run relationship among the level of variables is restated through the Error Correction Mechanism. In testing for cointegration, this study used the Engle and Granger DF and ADF Approach of the cointegration. An error correction mechanism is necessary to ensure a systematic disequilibrium adjustment processes through which the dependent and explanatory variables are prevented from shifting away from their mean values.

## 3.5 DATA SOURCES AND TYPES

This study mainly uses secondary time series annual data covering the period 1975-2004. Most of the data was collected from the GOK official documents such as Economic Surveys and Statistical abstracts. The private health expenditures (Out-of-Pocket Expenditures) were found annually from the Welfare Monitoring Surveys, National Health Accounts and Health Information Management Systems. The budgetary data was

obtained from Ministry of finance (Annual and recurrent expenditures). Other sources are World Bank reports, WHO, UNICEF, MOH and UNDP annual reports.

Annual data was collected on the following: Health expenditure percapita (both public and private), access to safe water per capita, under 5 mortality rate, life expectancy and MOE expenditures percapita.

The data of the estimates of the private health expenditures was found from the MOH printed estimates of the health care finance division section and Health Information Systems and Management. The data is not allowed for public access, the recommendation from the university made me get the data.

### 3.5.1 Descriptions of the Variables Used

**Health Indicators=$HID_i$**: This is the measure of physical and emotional wellbeing of an individual or a defined population. Where i=1…2. This is because there are two health indicators in this study and each of them is modeled separately with the same explanatory variables. For i=1…$HID_1$...***Under-five mortality rate*** **($U_{5MR}$)**: This is the probability that a newborn baby will die before reaching the age of five subject to current age-specific mortality rate per 1000 live births in a given year.

For i=2…$HID_2$…***Life expectancy*** **( $L_E$)**: Number of years a new born infant would live if prevailing patterns of mortality at the time of it's birth were it to stay the same through out it's life.

**Ministry of Health percapita expenditure=$MOH_E$**: This is the total sum of both capital and recurrent expenditures spent by the ministry of health divided by the size of the

population. This is divided into percapita recurrent health expenditures **(PRHE)** and percapita development health expenditures **(PDHE).**

**Private health expenditure as a percentage=(PRHEP)**: This is the total expenditure on health from the person's own pocket and other sources not directly controlled by the government as a percentage of the total health expenditures. It is also referred to as the user-fees or the cost sharing fees.

**Education expenditure percapita =$MOE_E$**: This is the total sum of percapita development expenditure on education **(PDE)** and percapita recurrent expenditure on education **(PRE)** spent by the ministry of education. This study disaggregates education expenditures into development and recurrent expenditures and uses them separately.

**Access to safe water=$AS_W$**: This is the availability of at least 20 litres of water per person per source within one kilometer of user's dwelling. This study makes use of the percentage population with access to safe water.

**The error term**= $\varepsilon_i \rightarrow \varepsilon_1$ to $\varepsilon_2$ For each of the two health indicators.

**Parameters to be estimated**= $\alpha_0$ to $\alpha_6$ for both health indicators. In this case, these parameters are elasticities because of the double log function.

### 3.5.2 Summary Statistics of the Variables Used

**Table 7: Descriptions of the Variables Used**

| | ASW | PDE | PDHE | PRE | PRHE | PRHEP | U5MR | LE |
|---|---|---|---|---|---|---|---|---|
| Mean | 43.56667 | 51.79719 | 52.61711 | 832.8014 | 183.4886 | 51.27467 | 109.7767 | 52.28567 |
| Median | 43.4 | 40.38221 | 31.89009 | 543.6949 | 107.4679 | 53 | 113 | 53.165 |
| Maximum | 62 | 189.1714 | 239.1804 | 2580.061 | 498.1598 | 77.3 | 124 | 62 |
| Minimum | 27 | 4.86765 | 7.026279 | 101.3676 | 28.75324 | 23.08 | 89 | 44.6 |
| Std. Dev. | 10.28146 | 45.17902 | 54.90942 | 727.5808 | 148.9269 | 20.51322 | 12.59172 | 4.964471 |
| Skewness | 0.11058 | 1.252923 | 1.985155 | 0.871763 | 0.841786 | -0.01797 | -0.59776 | 0.368562 |
| Kurtosis | 2.269223 | 4.171555 | 6.606611 | 2.574251 | 2.345565 | 1.310708 | 1.886584 | 2.463155 |

Where

*ASW*-Population in Access to Safe Water in Percentage.

*PDE*-Percapita Development Expenditure on Education

*PDHE*- Percapita Development Health Expenditure

*PRE*-Percapita Recurrent Expenditure on Education

*PRHE*-Percapita Recurrent Health Expenditure

*PRHEP* –Private Health Expenditure Estimate in Percentage

*U5MR*-Under-Five Mortality Rate per 1000 Live Births

*LE*-Life Expectancy in Years.

# CHAPTER FOUR: DATA ANALYSIS

This chapter analyses the regression results of the study. The tests carried out before the actual regression analyses are normality tests, stationarity tests and Cointegration analysis.

## 4.1 NORMALITY TESTS

This test is done to ensure that the variables used in the analysis are normally distributed. The common test for normality is the Jarque–Bera statistics test (Jarque, 1980). This test utilizes the mean based coefficient of skewness and kurtosis to check the normality of all the variables used. A normal distribution is assumed by many statistical procedures. Normal distributions take the form of a symmetric bell-shaped curve. *Skewness* is the tilt (or lack of it) in a distribution. A common rule-of-thumb test for normality is to run descriptive statistics to get skewness and kurtosis, and then divide these by the standard errors. Skew should be within the +2 to -2 range when the data are normally distributed. Negative skew is left-leaning, positive skew right leaning.

*Kurtosis* is the peakedness of a distribution. Kurtosis also should be within the +2 to -2 range when the data are normally distributed (a few authors use +3 to -3). Negative kurtosis indicates too many cases in the tails of the distribution. Positive kurtosis indicates too few cases in the tails. In this Study, the essential Jarque Bera test statistic has a chi-square distribution (Jarque, 1980).

**Table 8: Normality test results analysis of Jarque Bera tests**

| | LNASW | LNLE | LNPDE | LNPDHE | LNPRE | LNPRHE | LNPRHEP | LNUM5MR |
|---|---|---|---|---|---|---|---|---|
| Mean | 3.746109 | 3.952421 | 3.545869 | 3.541073 | 6.291496 | 4.868499 | 3.84992 | 4.691718 |
| Median | 3.770417 | 3.9734 | 3.668872 | 3.462278 | 6.297821 | 4.677164 | 3.970114 | 4.727349 |
| Maximum | 4.127134 | 4.127134 | 5.242653 | 5.477218 | 7.855568 | 6.210921 | 4.347694 | 4.820282 |
| Minimum | 3.295837 | 3.797734 | 1.582611 | 1.949657 | 4.618754 | 3.35875 | 3.138966 | 4.488636 |
| Std. Dev. | 0.24516 | 0.09409 | 0.969241 | 0.92291 | 1.003903 | 0.870026 | 0.437386 | 0.119694 |
| Skewness | -0.33637 | 0.189301 | -0.21441 | 0.277496 | -0.09416 | 0.019385 | -0.24634 | -0.68752 |
| Kurtosis | 2.334773 | 2.303803 | 2.114715 | 2.248757 | 1.751207 | 1.832519 | 1.465111 | 1.967958 |
| | | | | | | | | |
| Jarque-Bera | 1.118879 | 0.785038 | 1.209517 | 1.090476 | 1.993688 | 1.705643 | 3.248279 | 3.694802 |
| Probability | 0.571529 | 0.675354 | 0.546206 | 0.579704 | 0.369042 | 0.426211 | 0.197081 | 0.157646 |

Normality test uses the null hypothesis of normality against the alternative hypothesis of non-normality. If the probability value is less than the Jacque Bera chi-square at the 5% level of significance, the null hypothesis of the regression is not rejected. A sufficiently low probability value of the estimated jarque-bera chi-square statistics leads to acceptance of the null hypothesis of a normal distribution. From the table 8, all the variables are normally distributed since all the probabilities are less than the Jarque Bera chi-square distribution.

## 4.2 STATIONARITY TEST

Stationarity means that the statistical properties of the process do not change over time (Engle, 1987). If the non-stationary time series data is used, it may lead to conclusion whose validity is questionable. A convenient but weak definition of stationary regarding quantitative variables is that there is no systematic change in either mean or variance in the time series. If there were such changes, an increasing or decreasing trend in the data would be present.

Time series data regression analysis is not complete unless stationary data is used. It is therefore important to test whether the data used is stationary or not. Most time series data used is non-stationary as indicated in the Appendices 1(a) and (b). It is therefore necessary, as a first step is to correct the situation. This can be done by differencing to eliminate non-stationarity. Non-stationary series is integrated of order $\geq 1$. Stationary series on the other hand is intergraded of order I (0). If I ($\geq 1$), it can be differenced to obtain an I (0) series which is a stationary series.

Based on the graphs and Unit Root Test in Appendix 2(a) and (b), it can be seen that all the variables used are stationary after differencing. However, it is difficult to determine the order of intergration. This therefore calls for a more formal test for stationary since the graphical methods is inadequate. A unit root test has therefore to be conducted.

**4.3 UNIT ROOT TEST**

The unit root test indicates whether the variables are stationary or not. In carrying out a unit root test, a random walk model is used (Green, 2003). This variable assumes the same value as in the last period, modified by the current period shocks. The current period is analyzed by the past period plus a certain unpredictable value as indicated in equation 1.

$$Y_t = Y_{t-1} + \varepsilon_t \quad \ldots\ldots 1$$

Where, $Y_t$ is the current period, $Y_{t-1}$ is the past period and $\varepsilon_t$ are shocks to the system and assumed to be the white noise with zero mean ,constant variance and non-autocorrelated.

In general, the above equation can be analyzed with a modified equation (2) below for the purposes of hypothesis testing.

$Y_t=\alpha Y_{t-1}+\varepsilon_t$.....2

Where α is the coefficient of the past values and is the one used to measure the stationary.

The null hypothesis: $H_0$:α.>0 Non Stationary (Unit Root Presence)

Alternative hypothesis: $H_1$: α<1 Stationarity (No unit root)

Rejecting the null hypothesis would mean that the series is stationary and vice versa. Accepting the null hypothesis implies that the variable has a unit root or is a random walk variable and hence is non-stationary. If α<1, the process generating $Y_t$ is integrated of order zero and hence stationary I(0). My study uses Augmented Dickey-Fuller Test (ADF) to test for unit roots.

### 4.3.1 The Dickey-Fuller (DF) and Augmented Dickey- Fuller (ADF) Test

DF is an auto-regressive model. The random walk model is a special type of AR (1) model (Non-Stationary Model) with α=1 in equation 2. If α=1, $Y_t$ is non-stationary and contains a stochastic trend. Thus within the AR (1) model, the hypothesis that $Y_t$ has a trend can be tested by testing: $H_0$: α=1 vs $H_1$: α<1 on equation 2. The null hypothesis is that of non-stationarity while the alternative hypothesis is that of stationarity.The regression software automatically prints the t –statistic testing α<1.The t statistic is then compared with t critical. If is t-statistic is less than t-critical reject the null hypothesis of non-stationary and therefore the series is stationary (Green, 2003).

The ADF test was specified by (Granger and Engle, 1987). It follows the same procedure as the DF test. The ADF test was performed by introducing lags of the dependent

variables. To avoid spurious regression, the non-stationary variables are differenced to remove any stochastic trends in the series. The ADF test takes care of the intercept as opposed to the DF. This study concentrates on the ADF test.

The test is based on the following equation $Y_t = \alpha_0 + \alpha_1 Y_{t-1} + \varepsilon_t$.....3

Equating equation 2 and 3 we have $Y_t = \alpha_0 + (\alpha_1 - 1) Yt_{-1} + \varepsilon_t$.....4

Now letting $\alpha_1 - 1 = \delta$.

The null hypothesis occurs when $\delta < 0$ and $Y_t$ is a non-stationary series. Under alternatives hypothesis, $\delta = 0$.The t-statistic is the compared with t-critical. If t- calculated is less than t-critical, then reject the null hypothesis of non-stationery and accept that the series are stationary.

**Table 9: The Unit Root Test using ADF**

| VARIABLE | ADF STATISTIC | 5% CRIRICAL VALUE | NATURE |
|---|---|---|---|
| LNASW | -0.951432 | -2.9705 | NON-STATIONARY |
| LNLE | -0.885239 | -2.9705 | NON-STATIONARY |
| LNPDE | -1.354612 | -2.9705 | NON-STATIONARY |
| LNPDHE | -2.197829 | -2.9705 | NON-STATIONARY |
| LNPRE | -0.787712 | -2.9705 | NON-STATIONARY |
| LNPRHE | -0.818682 | -2.9705 | NON-STATIONARY |
| LNPRHEP | -1.674389 | -2.9705 | NON-STATIONARY |
| LNUM5 | -1.430444 | -2.9705 | NON-STATIONARY |

The result in table 9 shows that the variables are non-stationary because the ADF t-statistics is greater than the ADF t-critical at 5% level of significance. The variables are then differenced and subjected to the same tests. The results of the differenced ones are

presented in the table 10. The graphs and the unit root test of these non-stationary series are shown in Appendix 1(a) and (b).

**Table 10: Unit Root Test after Differencing (ADF)**

| VARIABLE | ADF STATISTIC | 5% CRIRICAL VALUE | NATURE |
|---|---|---|---|
| LNDASW | -3.914262 | -2.9750 | STATIONARY |
| LDNLE | -3.074266 | -2.9750 | STATIONARY |
| LNDPDE | -3.580248 | -2.9750 | STATIONARY |
| LNDPDHE | -4.451667 | -2.9750 | STATIONARY |
| LNDPRE | -5.138791 | -2.9750 | STATIONARY |
| LNDPRHE | -3.775403 | -2.9750 | STATIONARY |
| LNDPRHEP | -5.418708 | -2.9750 | STATIONARY |
| LNDU5MR | -3.377299 | -2.9750 | STATIONARY |

The results from table 10 shows that the ADF t- statistics is less than the t critical and therefore we reject the null hypothesis of non-stationary and accept that the series are stationary. The first differencing of all variables is therefore stationary which implies that these variables are integrated of order one, I(1) except LNPRHEP which is stationary after the second differencing and is therefore integrated of order two I(2).The series in table 10 are therefore integrated of order zero, I(0) and are thus stationary. The graphs and the unit root test of these stationary series are shown in Appendix 2(a) and (b).

### 4.4 COINTEGRATION ANALYSIS

This analysis combines both short-run and the long run properties and at the same time maintains stationarity in all the variables. Such an analysis tests the existence of long run relationship between an independent variable and its explanatory variable. If two or more variables are integrated of the same order and their differences have no clear tendency to increase or decrease then this will suggest that their differences are stationary. Thus if non-stationary series have a long run relationship they will be stationary. If the linear

combination of the residual from the variables is integrated of order zero I(0),then this will be a case of cointegration (Green, 2003).

The existence of cointegration is important because failure to find cointegration between variables will be a manifestation of the existence of spurious regression in which case the valid influence will not be realized. Cointegration tests can be carried out using two methods namely Johansen approach and Engle-Granger two-step procedure based on residual tests. This study makes use of Engle-Granger procedure based on the Equation 1.

$Y_t = \alpha_0 + \Phi X_t + U_t$ .....1

Where $\Phi$ is the cointegrating coefficient, which must be tested prior to testing for a unit root in the error correction model.

$H_0$: No Cointegration.....Non-Stationarity

$H_1$: Cointegration.....Stationarity

Test on stationarity is done on residuals. In this case, we first get the static equations of the variables in levels then we generate the residuals. If the residuals are stationary, then the two series are cointegrated. The Engle-Granger cointegration test results are at the Appendix 3.From the results ADF t-statistic is less than ADF t-critical value at 5% level of significance and therefore we reject the null hypothesis of no cointegration. Based on the results we can conclude that there is cointegration between the variables since both the residuals of differenced LE and differenced U5MR are stationary. The stationarity graphs for the residuals are also at the Appendix 3(a) and (b).

These results suggest that an Error Correction Model (ECM) will provide a better fit than one without the error correction variable (Green, 2003).

## 4.5 DIAGNOSTIC TESTS

Diagnostic Tests are necessary to indicate whether the models are consistent or not. The following diagnostic tests are carried out in the analysis.

### 4.5.1 Jarque-Bera (JB) Residual Normality Test

This test is done to test for normality of the residuals. It focuses on the distribution of the first four moments (mean, standard deviation, skewness and kurtosis in addition to the minimum and the maximum values) of the series. The difference is distributed as chi-square distribution. This is then compared to the standard normal distribution. Since the error, terms explain the dependent variables, the normality tests are carried out on the dependent variables, which in this study are under-five mortality rate (U5MR) and life expectancy (LE).

**Table 11: Jarque Bera Test for Normality on the Residuals**

| | RESDLNLE | RESDLNU5MR |
|---|---|---|
| Mean | 3.84E-18 | 4.46E-18 |
| Median | 0.003876 | 0.001711 |
| Maximum | 0.049476 | 0.077255 |
| Minimum | -0.069178 | -0.175109 |
| Std. Dev. | 0.030484 | 0.048283 |
| Skewness | -0.51976 | -1.397399 |
| Kurtosis | 2.65545 | 7.463142 |
| Jarque-Bera | 1.399202 | 32.35229 |
| Probability | 0.496783 | 0.012310 |

**Source: E-Views Computation**

The results in table 11 indicate that the probability values of both the residuals are less than the Jarque Bera chi-square statitistics and therefore the residuals are normally distributed at 5% significant level (Jarque, 1980). The conclusion is that the error term is normally distributed and hence the regression obeys the OLS assumption of consistency and efficiency.

### 4.5.2 The Autocorrelation Test

This is a test for serial correlation of the residuals because the DW TEST is not efficient when higher lagged order of the dependent variable are included as explanatory variables. This study shows that there is no serial correlation. The test uses correllogram method to test for serial correlation/autocorrelation of the residuals. The results of autocorrelation test is shown in the Appendix 4. Since the stars are within the dotted bands, there is no autocorrelation in the residuals. If any of the stars would have been out of the dotted band then there would have been a serious autocorrelation in the residuals.

### 4.5.3 The Whites Heteroscedasticity Test

This is a test for heteroskedasticity in the residuals from a least squares regression (Green, 2003). Ordinary least squares estimates are consistent in the presence heteroskedasticity, but the conventional computed standard errors are no longer valid. White's test is a test of the null hypothesis of no heteroskedasticity against heteroskedasticity.The probability value of the F-statistic is then used in the analysis. If the probability value is less than 0.05, reject the null hypothesis. The results on the heteroscedasticity test are in Appendix 4. Since all the p-values of both the residuals are greater than 0.05, Heteroskedasticity is not a serious problem.

## 4.6 REGRESSION RESULTS

The data analysis is done using the Autoregressive Distributed Lag (ADL) model. Both the dependent and additional predictors (variables) have been lagged in this amodel. The study makes the use of ADL (1, 1) model in that the dependent variable and the independent variables have been lagged once (Green, 2003).

### 4.6.1 Modeling of Life Expectancy by OLS

Dependent Variable: DLNLE

Method: Least Squares

Date: 08/02/05 Time: 13:00

Sample(adjusted): 1978 2004

Included observations: 27 after adjusting endpoints

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| C | 0.029593 | 0.007380 | 4.009991 | 0.0017 |
| DLNLE_1 | 0.127615 | 0.082855 | 1.540219 | 0.1495 |
| DLNLNPRHEP | 0.071935 | 0.033576 | 2.142468 | 0.0534 |
| DLNLNPRHEP_1 | 0.041320 | 0.034634 | 1.193050 | 0.2559 |
| DLNPDE | 0.047581 | 0.007334 | 6.487332 | 0.0000 |
| DLNPDE_1 | -0.014965 | 0.008098 | -2.847883 | 0.0494 |
| DLNPDHE | 0.003575 | 0.005946 | 0.601237 | 0.5589 |
| DLNPDHE_1 | 0.014971 | 0.007465 | 2.905425 | 0.0380 |
| DLNPRE | -0.291108 | 0.035782 | -8.135569 | 0.0000 |
| DLNPRE_1 | 0.021492 | 0.045220 | 0.475291 | 0.6431 |
| DLNPRHE | 0.052980 | 0.040309 | 2.314352 | 0.0133 |
| DLNPRHE_1 | 0.019348 | 0.040596 | 2.476599 | 0.0422 |
| RESDLNLE | 1.076340 | 0.088390 | 12.17723 | 0.0000 |
| DLNASW | 0.151641 | 0.055000 | 2.757117 | 0.0174 |
| DLNASW_1 | -0.079262 | 0.067504 | -1.174195 | 0.2631 |

| | | | |
|---|---|---|---|
| R-squared | 0.961085 | Mean dependent var | -0.003935 |
| Adjusted R-squared | 0.915685 | S.D. dependent var | 0.042959 |
| S.E. of regression | 0.012474 | Akaike info criterion | -5.630171 |
| Sum squared resid | 0.001867 | Schwarz criterion | -4.910262 |
| Log likelihood | 91.00731 | F-statistic | 21.16909 |
| Durbin-Watson stat | 1.995732 | Prob(F-statistic) | 0.000003 |

Life expectancy was modelled using the ECM. The variables were differenced and lagged to eliminate the non-stationarity problem. The residual (RESDLNLE) was generated and found to be stationary and hence cointegrated.

The results show that most of the coefficients had the expected signs with the apriori expectations. The Durbin Watson statistics is 1.995732, which is closer to two signifying that there is no serial correlation among the residuals. The p-value of the constant, the differenced lagged exogenous variables and the original variables are significant except for the differenced previous period of life expectancy, lagged period of private health expenditures, the lagged period of population with access to safe water, the previous period of the recurrent education expenditure and the current period of the percapita development expenditure on health. The p-value is said to be significant if it is less or equal to 0.05, otherwise not significant. Some of the coefficients such as the previous development expenditure on education, previous recurrent expenditure on education and previous population in access to safe water are not matching with their expected signs. From the results, the previous period life expectancy explains much of the variations in the current period of life expectancy with a coefficient of 0.127615. The population with access to safe water variable also explains much of the variations in life expectancy in the current period with a coefficient of 0.151641.

The $R^2$ is 0.961085 showing that the explanatory variables have a higher explanatory power of the life expectancy. The results can be interpreted to mean that the changes in level of life expectancy depends on the extent of both private and government health

expenditures. Since the private and government, health expenditures have a positive signs it can be interpreted that an increase in both government and private health expenditures leads to an increase in life expectancy. The fact that the private health expenditures, public development and recurrent health expenditures have the expected signs and statistically significant at 5% level of significant. This shows how important they are in explaining the life expectancy, which has a positive relationship. Percapita development expenditure on education and the lag of recurrent expenditure on education also have a positive relationship with life expectancy. This shows that previous period education is important in improving life expectancy. The amount of recurrent expenditure on education is appositive determinant of life expectancy because a well-educated society can apply health standards effectively and live longer. This can also be manifested in the fact that expenditure on education also goes to training of the health experts who apply proper health standards and make people improve their life expectancies. A well-educated society can also apply the proper nutritional standards thus improving the life expectancy and hence the health indicators. The probability of F-statistics is 0.0000003, which is clearly below .05 meaning that on average all the coefficients of the variables of the regression analysis are jointly significant at 5 % level of significance and explains the variations in life expectancy. The $R^2$ is less than the DW signifying that there is no spurious regression. However if it could have been more than DW it would have signified the presence of spurious regression.

### 4.6.2 Modeling of Under –Five Mortality Rate by OLS

Dependent Variable: DLNU5MR

Method: Least Squares

Date: 08/02/05 Time: 13:07

Sample(adjusted): 1978 2004

Included observations: 27 after adjusting endpoints

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| DLNU5MR_1 | 0.003846 | 0.003813 | 1.008665 | 0.3330 |
| C | 0.005869 | 0.000474 | 12.37371 | 0.0000 |
| DLNASW | -0.476454 | 0.003940 | -120.9399 | 0.0000 |
| DLNASW_1 | -0.006450 | 0.005093 | -2.266504 | 0.0294 |
| DLNLNPRHEP | -0.052098 | 0.002264 | -23.01323 | 0.0000 |
| DLNLNPRHEP_1 | -0.002970 | 0.002343 | -1.267712 | 0.2289 |
| DLNPDE | -0.033256 | 0.000479 | -69.46886 | 0.0000 |
| DLNPDE_1 | -0.000875 | 0.000535 | -1.635962 | 0.1278 |
| DLNPDHE | -0.025186 | 0.000405 | -62.15908 | 0.0000 |
| DLNPDHE_1 | -0.001359 | 0.000542 | -2.507159 | 0.0276 |
| DLNPRE | -0.017892 | 0.002379 | -7.521193 | 0.0000 |
| DLNPRE_1 | 0.001376 | 0.002650 | 0.519113 | 0.6131 |
| DLNPRHE | -0.104803 | 0.002749 | -38.12580 | 0.0000 |
| DLNPRHE_1 | -0.001699 | 0.002664 | -0.637545 | 0.5357 |
| RESDLNU5MR | 1.003270 | 0.003836 | 261.5350 | 0.0000 |

| | | | |
|---|---|---|---|
| R-squared | 0.899900 | Mean dependent var | 0.000000 |
| Adjusted R-squared | 0.799783 | S.D. dependent var | 0.056217 |
| S.E. of regression | 0.000828 | Akaike info criterion | -11.05517 |
| Sum squared resid | 8.23E-06 | Schwarz criterion | -10.33527 |
| Log likelihood | 164.2449 | F-statistic | 8562.218 |
| Durbin-Watson stat | 2.158175 | Prob(F-statistic) | 0.000000 |

The value of $R^2$ is 0.899900 which shows that the explanatory power is about 90% .The DW test is 2.158175 which shows no serial correlation of the residuals because it can be approximated to 2. Since $R^2$ is less than the DW there is no spurious regression suspected. Most of the coefficients in the equation have taken their expected signs that they are negatively related to under five-mortality rate except the lagged percapita recurrent education expenditure. All the variables in the model are significant except the lagged private health expenditure, percapita development education expenditure, percapita recurrent education expenditure, lagged private health expenditure and previous period

life expectancy. The F-statistic has a significantly low probability value meaning that all the coefficients are on average statitistically significant.

This is a clear indication that health expenditures both private and public, expenditure on education and access to safe water have an inverse relationship on under five mortality rates. As expenditure on health increases, the under five-mortality rate is expected to decline, As one becomes more educated the more he or she is able to apply the proper health standards and hence reduces the infant mortality rate. The more one gets access to safe water, the lower the under five-mortality rate. The more one spends on health care services, the more one becomes healthy and the lower is the life expectancy.

### 4.7 DISCUSSION OF THE RESULTS

The two key health indicators analyzed in this study are life expectancy and under five mortality rate. The focus of the study was to analyze the importance of health expenditures on the key health indicators such as mortality rate (in this case the under-five mortality rate) and the life expectancy. The log-log specification was used to estimate various health expenditure effects. The coefficients of the double log specification are the elasticities.

The results indicate that expenditure on education decreases the under-five mortality rate and increases the life expectancies. The reason could be attributed to the fact that an educated mother will apply proper health standards and hence take care of the children to reduce the under-five mortality rate. An educated mother is likely to marry later, have few children and provide better care to herself and her children than a girl without

education. As more girls get educated, there is cumulative effect on more households. As more households become smaller, the provision of care improves and hence low under five-mortality rate (Mehrotra, 2000).

Expenditure on health increases life expectancy because if more is spent on health care services such as health facilities, drugs, promotive and preventive health care, the majority of the poor will access the services and live longer. The under five-mortality rate will also be significantly reduced. All these activities improve the health indicators of the country.

# CHAPTER FIVE: CONCLUSION, POLICY RECOMMENDATIONS AND AREAS OF FURTHER RESEARCH

## 5.1 CONCLUSSIONS

The focus of the study was to estimate the impact of health expenditures on key health indicators in Kenya for the period 1975-2004. The results as indicated in this paper show a great variation in health indicators as measured by life expectancy and under five-mortality rate. The study shows that the explanatory variables are important in explaining the changes in the health indicators. Life expectancy and under five mortality rate are better explained by recurrent health expenditures and development health expenditures as well as the private health expenditures. Both recurrent and development education expenditure are important in explaining the life expectancy and under five mortality rate.

## 5.2 POLICY IMPLICATIONS

The study has established the significance of health expenditures on the health indicators in the country. This has great policy ramifications, which must be addressed by the health policy makers with a view of improving the health care system in the country. The study recognizes the fact that the negative trend in health indicators could not only have been caused by inadequate health expenditures but on such factors as social spending on health. In order to improve the health and education, the government of Kenya should re-think about the health sector expenditure allocation critically, since some of the policy impact negatively health care.

In terms of expenditure allocations, the ministry of health should increase the budget in real terms and bulk of expenditure must be channeled towards primary and preventive health care. Greater finances and health care resources (including drugs and staff) should be directed to primary health care clinics and district hospitals where the majority of the people seek health care services. Maternal health services deserve more attention to enhance the access to majority. More resources should be channeled to HIV/AIDS campaign.

In the case of education, it is true that quality of education is necessary in order to achieve desired behaviour. More resources should be allocated to primary education to ensure the equity and the reduction of poverty. Boys and girls should be given equal access to education. This would enhance female literacy levels and lead to better health outcomes. The government should encourage the private sector to provide education and

health care. The government should stop directing more resources to areas with no direct effect on social welfare. The role of local authorities in health should be clearly articulated. The private health care should be regulated by the government to ensure that they do not overcharge on medical expenses so that the poor can afford the services to improve the countries health indicators.

## 5.3 LIMITATIONS OF THE STUDY AND AREAS OF FURTHER RESEARCH

Despite the efforts on ensuring the study is complete, it must be conceded that the study has some limitations. Since data collection and measurement may not have been accurate, it is likely that measurement errors were obtained in the national account data used in this study. The major reliable situation as a major limitation is availability of data. It is difficult for the study to make recommendations on this issue because Central Bureau of Statistics renews the data entry system but they never incorporate the earlier periods. The availability and the quality of data are the main constraints of the study. This is because secondary data was used. Furthermore, data on private health expenditure variables is not easy to come by because most of them are estimations. In this study, after a lot of laboring, I only managed to get the data on the percentage estimations of private health expenditures. The study would have been more exhaustive if the actual expenditures on private health services would have been obtained.

The areas of further research should be on HIV/AIDS and test its effect on the health indicators. Other factors such as nutrition, percapita income and the size of the population should be incorporated in order to find out how they affect the health indicators

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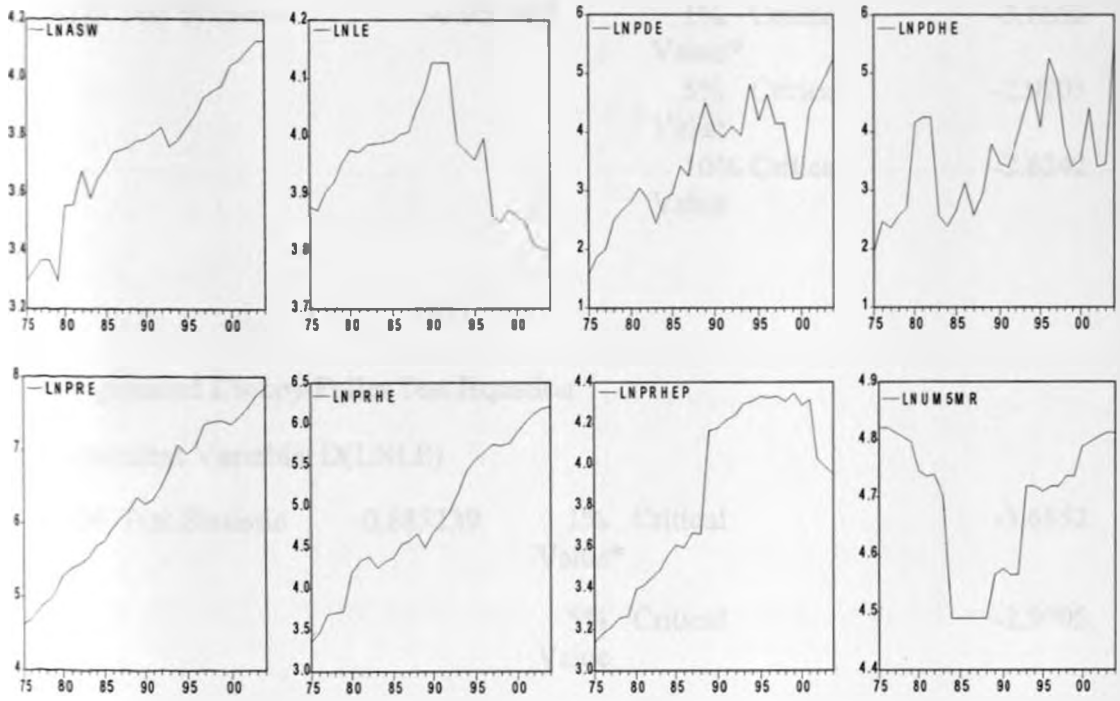
## APPENDICES

## APPENDIX 1(a): NON- STATIONARITY (GRAPHS)



**APPENDIX 1(b): NON- STATIONARITY (UNIT ROOT TEST)**

(i).Augmented Dickey-Fuller Test Equation

Dependent Variable: D(LNASW)

| | | | |
|---|---|---|---|
| ADF Test Statistic | -0.951432 | 1% Critical Value* | -3.6852 |
| | | 5% Critical Value | -2.9705 |
| | | 10% Critical Value | -2.6242 |

(ii).Augmented Dickey-Fuller Test Equation

Dependent Variable: D(LNLE)

| | | | |
|---|---|---|---|
| ADF Test Statistic | -0.885239 | 1% Critical Value* | -3.6852 |
| | | 5% Critical Value | -2.9705 |
| | | 10% Critical Value | -2.6242 |

(iii) Augmented Dickey-Fuller Test Equation

Dependent Variable: D(LNPDE)

| | | | |
|---|---|---|---|
| ADF Test Statistic | -1.354612 | 1% Critical Value* | -3.6852 |
| | | 5% Critical Value | -2.9705 |
| | | 10% Critical Value | -2.6242 |

(iv).Augmented Dickey-Fuller Test Equation

Dependent Variable: D(LNPDHE)

| | | | |
|---|---|---|---|
| ADF Test Statistic | -2.197829 | 1% Critical Value* | -3.6852 |
| | | 5% Critical Value | -2.9705 |
| | | 10% Critical Value | -2.6242 |

(v).Augmented Dickey-Fuller Test Equation

Dependent Variable: D(LNPRE)

| | | | |
|---|---|---|---|
| ADF Test Statistic | -0.787712 | 1% Critical Value* | -3.6852 |
| | | 5% Critical Value | -2.9705 |
| | | 10% Critical Value | -2.6242 |

(vi).Augmented Dickey-Fuller Test Equation

Dependent Variable: D(LNPRHE)

| | | | |
|---|---|---|---|
| ADF Test Statistic | -0.818682 | 1% Critical Value* | -3.6852 |
| | | 5% Critical Value | -2.9705 |
| | | 10% Critical Value | -2.6242 |

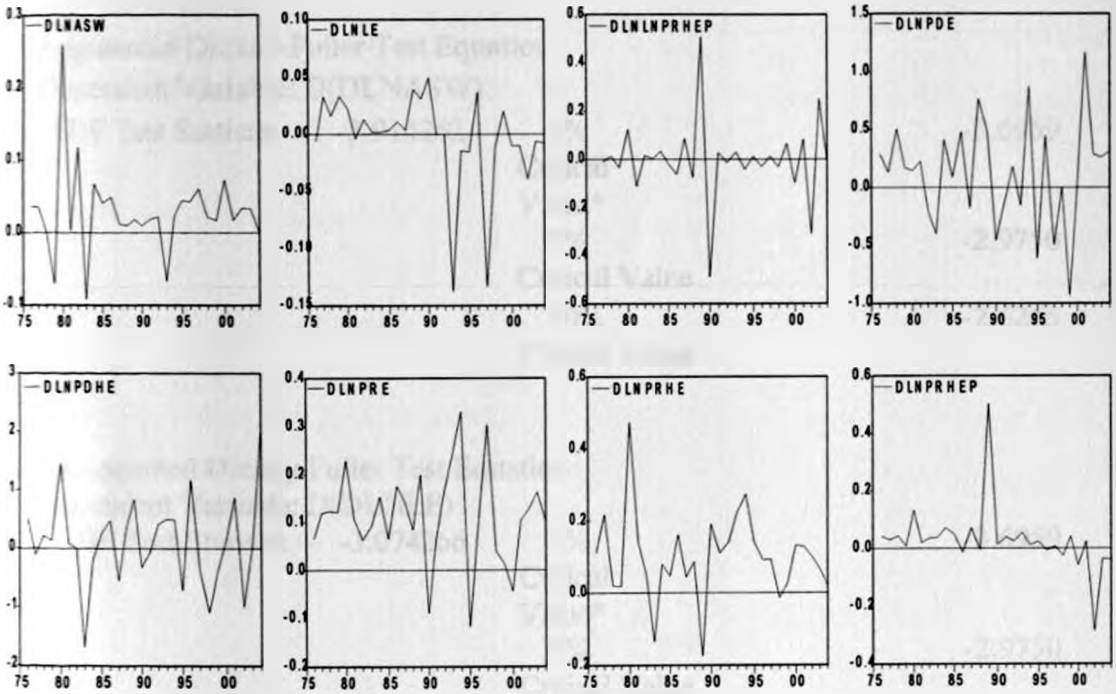
(vii) Augmented Dickey-Fuller Test Equation
Dependent Variable: D(LNPRHEP)

| | | | |
|---|---|---|---|
| ADF Test Statistic | -1.674389 | 1% Critical Value* | -3.6852 |
| | | 5% Critical Value | -2.9705 |
| | | 10% Critical Value | -2.6242 |

(viii). Augmented Dickey-Fuller Test Equation
Dependent Variable: D(LNUM5MR)

| | | | |
|---|---|---|---|
| ADF Test Statistic | -1.430444 | 1% Critical Value* | -3.6852 |
| | | 5% Critical Value | -2.9705 |
| | | 10% Critical Value | -2.6242 |

## APPENDIX 2(a): STATIONARITY AFTER DIFFERENCING (GRAPHS)



**APPENDIX 2(b): STATIONARITY AFTER DIFFERENCING (UNIT ROOT TEST)**

(i)Augmented Dickey-Fuller Test Equation
Dependent Variable: D(DLNASW)

| | | | |
|---|---|---|---|
| ADF Test Statistic | -3.914262 | 1% Critical Value* | -3.6959 |
| | | 5% Critical Value | -2.9750 |
| | | 10% Critical Value | -2.6265 |

(ii).Augmented Dickey-Fuller Test Equation
Dependent Variable: D(DLNLE)

| | | | |
|---|---|---|---|
| ADF Test Statistic | -3.074266 | 1% Critical Value* | -3.6959 |
| | | 5% Critical Value | -2.9750 |
| | | 10% Critical Value | -2.6265 |

(iii).Augmented Dickey-Fuller Test Equation
Dependent Variable: D(DLNPDE)

| | | | |
|---|---|---|---|
| ADF Test Statistic | -3.580248 | 1% Critical Value* | -3.6959 |
| | | 5% Critical Value | -2.9750 |
| | | 10% Critical Value | -2.6265 |

(iv).Augmented Dickey-Fuller Test Equation
Dependent Variable: D(DLNPRE)

| | | | |
|---|---|---|---|
| ADF Test Statistic | -5.138791 | 1% Critical Value* | -3.6959 |
| | | 5% Critical Value | -2.9750 |
| | | 10% Critical Value | -2.6265 |

(v).Augmented Dickey-Fuller Test Equation
Dependent Variable: D(DLNPRHE)

| | | | |
|---|---|---|---|
| ADF Test Statistic | -3.775403 | 1% Critical Value* | -3.6959 |
| | | 5% Critical Value | -2.9750 |
| | | 10% Critical Value | -2.6265 |

(vi).Augmented Dickey-Fuller Test Equation
Dependent Variable: D(DLNU5MR)

| | | | |
|---|---|---|---|
| ADF Test Statistic | -3.377299 | 1% Critical Value* | -3.6959 |
| | | 5% Critical Value | -2.9750 |
| | | 10% Critical Value | -2.6265 |

(vii).Augmented Dickey-Fuller Test Equation
Dependent Variable: D(DLNLNPRHEP)

| | | | |
|---|---|---|---|
| ADF Test Statistic | -5.418708 | 1% Critical Value* | -3.7076 |
| | | 5% Critical Value | -2.9798 |
| | | 10% Critical Value | -2.6290 |

(viii).Augmented Dickey-Fuller Test Equation
Dependent Variable: D(DLNPDHE)

| | | | |
|---|---|---|---|
| ADF Test Statistic | -4.451667 | 1% Critical Value* | -3.6959 |
| | | 5% Critical Value | -2.9750 |
| | | 10% Critical Value | -2.6265 |

## APPENDIX 3(a): COINTEGRATION ANALYSIS (UNIT ROOT TEST)

(i).COINTEGRATION TEST FOR RESDLNLE

| | | | |
|---|---|---|---|
| ADF Test Statistic | -3.680504 | 1% Critical Value* | -3.7076 |
| | | 5% Critical Value | -2.9798 |
| | | 10% Critical Value | -2.6290 |

*MacKinnon critical values for rejection of hypothesis of a unit root.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(RESDLNLE)
Method: Least Squares
Date: 08/27/05 Time: 16:36
Sample(adjusted): 1979 2004
Included observations: 26 after adjusting endpoints

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| RESDLNLE(-1) | -1.144054 | 0.310842 | -3.680504 | 0.0012 |
| D(RESDLNLE(-1)) | -0.008994 | 0.203580 | -0.044177 | 0.9651 |
| C | -0.001908 | 0.006181 | -0.308625 | 0.7604 |

| | | | |
|---|---|---|---|
| R-squared | 0.577395 | Mean dependent var | -0.000251 |
| Adjusted R-squared | 0.540647 | S.D. dependent var | 0.046421 |
| S.E. of regression | 0.031462 | Akaike info criterion | -3.971914 |
| Sum squared resid | 0.022767 | Schwarz criterion | -3.826749 |
| Log likelihood | 54.63489 | F-statistic | 15.71218 |
| Durbin-Watson stat | 1.935383 | Prob(F-statistic) | 0.000050 |

(ii). COINTEGRATION TEST FOR RESDLNU5MR

| | | | |
|---|---|---|---|
| ADF Test Statistic | -3.710306 | 1% Critical Value* | -3.7076 |
| | | 5% Critical Value | -2.9798 |
| | | 10% Critical Value | -2.6290 |

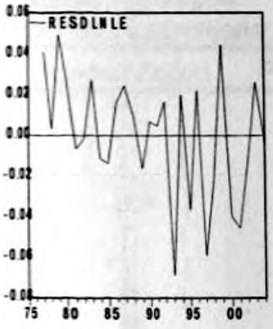
*MacKinnon critical values for rejection of hypothesis of a unit root.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(RESDLNU5MR)
Method: Least Squares
Date: 08/27/05 Time: 16:41
Sample(adjusted): 1979 2004
Included observations: 26 after adjusting endpoints

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| RESDLNU5MR(-1) | -1.057828 | 0.285105 | -3.710306 | 0.0012 |
| D(RESDLNU5MR(-1)) | 0.147495 | 0.210141 | 0.701888 | 0.4898 |
| C | 0.000605 | 0.010126 | 0.059778 | 0.9528 |

| | | | |
|---|---|---|---|
| R-squared | 0.462997 | Mean dependent var | -0.001690 |
| Adjusted R-squared | 0.416301 | S.D. dependent var | 0.067478 |
| S.E. of regression | 0.051553 | Akaike info criterion | -2.984247 |
| Sum squared resid | 0.061127 | Schwarz criterion | -2.839082 |
| Log likelihood | 41.79521 | F-statistic | 9.915155 |
| Durbin-Watson stat | 1.933990 | Prob(F-statistic) | 0.000785 |

## APPENDIX 3(b): COINTEGRATION ANALYSIS (GRAPHS)




## APPENDIX 4: AUTOCORRELATION TEST

### (a).CORRELOGRAM TEST OF RESDLNLE

Date: 08/01/05 Time: 17:50
Sample: 1975 2004
Included observations: 28

| Autocorrelation | Partial Correlation | | AC | PAC | Q-Stat | Prob |
|---|---|---|---|---|---|---|
| .*\| . \| | .*\| . \| | 1 | -0.136 | -0.136 | 0.5760 | 0.448 |
| . \| . \| | . \| . \| | 2 | 0.031 | 0.012 | 0.6066 | 0.738 |
| . \| . \| | . \|* . \| | 3 | 0.060 | 0.068 | 0.7293 | 0.866 |
| . \|*** \| | . \|*** \| | 4 | 0.355 | 0.381 | 5.1423 | 0.273 |
| . \| . \| | . \|* . \| | 5 | 0.022 | 0.152 | 5.1605 | 0.397 |
| .**\| . \| | .**\| . \| | 6 | -0.201 | -0.237 | 6.6994 | 0.350 |
| . \|* . \| | . \| . \| | 7 | 0.112 | -0.049 | 7.2022 | 0.408 |
| . \|* . \| | . \| . \| | 8 | 0.151 | 0.049 | 8.1659 | 0.417 |
| . \|* . \| | . \|* . \| | 9 | 0.092 | 0.158 | 8.5388 | 0.481 |
| .**\| . \| | .*\| . \| | 10 | -0.234 | -0.081 | 11.092 | 0.350 |
| . \| . \| | .*\| . \| | 11 | 0.054 | -0.086 | 11.234 | 0.424 |
| . \| . \| | .*\| . \| | 12 | 0.044 | -0.124 | 11.337 | 0.500 |

### (b).CORRELOGRAM TEST OF RESDLNU5MR

Date: 08/01/05 Time: 17:55
Sample: 1975 2004
Included observations: 28

| Autocorrelation | Partial Correlation | | AC | PAC | Q-Stat | Prob |
|---|---|---|---|---|---|---|
| . \|* . \| | . \|* . \| | 1 | 0.076 | 0.076 | 0.1787 | 0.673 |
| .*\| . \| | .*\| . \| | 2 | -0.135 | -0.141 | 0.7640 | 0.682 |
| . \| . \| | . \| . \| | 3 | 0.015 | 0.038 | 0.7713 | 0.856 |
| . \|* . \| | . \|* . \| | 4 | 0.173 | 0.154 | 1.8232 | 0.768 |
| . \| . \| | . \| . \| | 5 | 0.005 | -0.018 | 1.8240 | 0.873 |
| .*\| . \| | .*\| . \| | 6 | -0.159 | -0.123 | 2.7917 | 0.834 |
| . \|* . \| | . \|**. \| | 7 | 0.180 | 0.210 | 4.0856 | 0.770 |
| . \|* . \| | . \| . \| | 8 | 0.068 | -0.030 | 4.2817 | 0.831 |
| .*\| . \| | .*\| . \| | 9 | -0.138 | -0.110 | 5.1284 | 0.823 |
| .*\| . \| | .*\| . \| | 10 | -0.134 | -0.066 | 5.9712 | 0.818 |
| . \|* . \| | . \| . \| | 11 | 0.079 | 0.025 | 6.2818 | 0.854 |
| . \| . \| | . \| . \| | 12 | 0.042 | -0.025 | 6.3728 | 0.896 |

## APPENDIX 5.WHITES HETEROSKEDASTICITY TEST

(a). RESDLNLE

White Heteroskedasticity Test:

| | | | |
|---|---|---|---|
| F-statistic | 0.635885 | Probability | 0.778094 |
| Obs*R-squared | 24.40111 | Probability | 0.438863 |

(b). RESDLNU5MR

White Heteroskedasticity Test:

| | | | |
|---|---|---|---|
| F-statistic | 0.604462 | Probability | 0.787716 |
| Obs*R-squared | 23.72868 | Probability | 0.477197 |