IMPACT OF PUBLIC HEALTH EXPENDITURE ON HOUSEHOLD CONSUMPTION IN KENYA

BY

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DECLARATION

This Research work is exclusively done by myself and has not been presented in any university for the award of a degree.

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This Research Work has been submitted for examination with my approval as the university supervisor.

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LIST OF ABBREVIATIONS AND ACRONYMS

ARDL	Auto Regressive Distributed Lag
FBO	Faith Based Organization
FY	Financial Year
MOH	Ministry of Health
NGO	Non-Governmental Organization
VAR	Vector Autoregressive Model
VECM	Vector Error Correction Model
WHO	World Health Organization

ABSTRACT

Regardless of the fact that public health spending contributes significantly in determining the consumption levels among Kenyan households, it is still not clear by what extent does public health spending determine household consumption. The paper sort to establish the impact of public health expenditure on Household consumption in Kenya and it utilized a time series data set for the period "between" 1988-2017 for the following economic variables: household consumption, public health spending, education, population size and income. The Error Correction Model estimated the long run relationship between the variables in level form and findings revealed that in the long run Public health spending, income & education had a positive and statistical significant relationship with household consumption while population size exhibited a negative and statistical significant relationship with household consumption. These research outcomes affirm that an increase in the share public health spending will improve the welfare of Kenyans. Therefore the government should make an effort to conform with the global health commitments such as Abuja declaration whereby African government pledged to allocate at least 15 percent of the general government expenditure to the Health Sector.

CHAPTER ONE: INTRODUCTION

1.1: Background of the Study

The Kenyan Health structure consists of the public system with key players which include the Ministry of Health and Parastatal organizations; private system which constitutes the Non-Governmental Organizations, private for-profit and Faith based organization facilities. Health care financing in Kenya is derived from varied sources which include: public (government) which contributes 29.3%, private firms 3.3%, households 35.9%, donors 31%, local foundation 0.1% and 0.4% which cannot be accounted for (Nyakundi et al, 2011). Overtime health budgetary allocations have shown an increasing trend but still at a very low rate considering the enormous health burden that we have in the country, for instance in the FY 2015/2016,2016/2017 and 2017/2018 public health spending as a share of general public spending was 5.1%, 5.6% and 5.8% respectively (Economic Survey of Kenya 2019). These entire ratios are falling short of the goal set during the Abuja declaration of allocating atleast 15% of the total government expenditure to the health sector (Nyakundi et al, 2011).The limited budget share has compromised the quality of health care service delivery process in terms of accessibility, availability and affordability. Regarding this some of the public hospitals usually face challenges such as shortage of drugs; unqualified staffs and lack of essential equipment etc. As a result some households opt to seek better medical care from private hospitals or elsewhere given that public hospitals are still far from providing the desired healthcare.

The cost incurred by the public health sector for it to maintain its operations have been relatively high consequently prices for medical services have been escalating over the years and by Considering the fact that at least 46% of the Kenyan population lives below the poverty line as per the World Bank publications (2008), it is clear that majority of Kenyans spend beyond their financial reach in order to sort these ever growing medical bills. As a result households end up being confined in a helpless situation where they either choose to forgo the necessary health care and continue with their illness to death or obtain medical care at the expense of other basic non-medical consumption such as education, food, housing etc. When medical expenses go beyond the ability to pay, households opt to

borrow or sell their assets; consequently they get pushed into poverty with catastrophic consequences (Tiris, T. & Posnett, J. 1992). Due to the ever-increasing medical expenses this has seen the rise in direct payments for medical treatment to levels that are unbearable. For instance in 2001/2002 direct healthcare payments as a fraction of public spending accounted for 54 percent, in 2005/2006 it accounted for 39.3 percent and 34.4percent in 2014/2015 (Government of Kenya, 2007).

Globally high levels of out of pocket expenditure have been considered as social injustice, and therefore the government of Kenya has shown concern in various ways in an effort to address this issue. First, the government is making an effort to conform to the Abuja declaration in 2001, of allocating not less than 15 percent of the total government expenditure to the health sector; this has been evidenced by the rising health sector allocations in every fiscal year for instance in 2001/02 the allocation was Sh5.2 billion and Sh 60.3 billion for the fiscal year 2016/17, this has increased health expenditure per capita meanwhile lowering the levels of out of pocket expenditure (Government of Kenya, 2001; 2016). According to World Health Organization (WHO) 2010, healthcare financing is considered equitable only if households are protected from getting into poverty trap which is resulted by incurring healthcare costs that are beyond their reach. To comply with WHO; in 2003 the government initiated the National Health Insurance Scheme which was meant to make health care services available to all the employees of the formal sector.

Regardless of the fact that the health sector is making progress towards the provision of desirable health care, gaps still exist in the health sector considering the fact that only 25 percent of the population in Kenya are beneficiaries of the health insurance schemes in Kenya, the remaining 75 percent rely fully on out of pocket payments to get medication (Nyakundi et al, 2011). This has the danger of impoverishing effects especially when medical expenditure become too large relative household income, consequently many households will fall into the poverty trap (Kimani et al 2016). Considering the prevailing poor situation in the health sector, more research is yet to be done to establish the causes and possible solutions behind the poorly performing health sector. Hence this research is focusing on the connection between public healthcare spending and household spending

thereafter come up with policy recommendations which will be part of the desired solution to address health issues in Kenya.

1.2: Problem Statement

Overtime health budgetary allocations have been inadequate considering the enormous health care burden in the country. For instance in the FY 2015/2016, 2016/2017 and 2017/2018 public health spending as a share of the entire government expenditure was 5.1%, 5.6% and 5.8% respectively. These entire ratios fall short of the recommended health expenditure set during the Abuja declaration whereby all African countries pledged to allocate at least 15percent of the total government expenditure to the health sector (Nyakundi et al 2011).

The limited budget share has compromised the quality of healthcare delivery process in terms of accessibility, availability and affordability. For instance the case in Turkana County whereby many of the health indicators are far much below the average compared to other counties. This is evidenced by the fact that Turkana County has only 65state managed medical facilities out of a total of 4,929 and only 21 private owned medical facilities out of a total of 3,794 in the country. As a result majority of the resident who stay at the borders of the county cannot easily access health services as it takes a two day walk for a person to reach a health facility. As a result of inaccessibility of health facilities birth deliveries that take place at hospital have gone down to 18% against a national agreed set standard of 61.2% (Kimathi, 2017).

Additionally, inadequate expenditure for the health sector has led to understaffing in the sector hence a substandard physician-population ratio. In Kenya the ratio stands at 14 doctors and 42 nurses for every 100,000 population, this ratio by far falls short of the ratio recommended by WHO of allocating a minimum of 21.7 doctors and 228 nurses per 100,000 populations. This explains the long hours patient have to wait to see the doctor. For instance 38 percent of the patients who visited Jaramogi Oginga Odinga Referral Hospital confirmed that it took 30 minutes before they got attended, while 47 percent were

attended within 2 hours and the remaining 14 percent were attended within a period of 2-5 hours (Kimathi, 2017).

In 2013 it was reported that 21 percent of the people who are ill, didn't seek medical services due to the high cost associated with health services. Furthermore nearly 2.6 million of Kenyans are at a high risk of getting into poverty trap due to catastrophic health expenditure. The high cost associated with health services has destabilized consumption patterns among households as it is approximated 6.2 percent of the Kenyan population direct 40 percent of their nonfood spending to health issues. Consequently expenditure on other basic non-medical consumption such as education and shelter has been sacrificed to a far extent (Republic of Kenya, 2015).

Such evidence clearly suggest that public health spending plays a major role in determining the consumption levels among Kenyan households, however it has not been clearly established by what extent does public health spending determine household consumption. For instance (vukenya 2015) who researched the impact of infrastructure investment on economic growth in South Africa didn't reach a clear consensus regarding the direction in which public spending on social infrastructure (health and education) influenced economic growth due to a proxy problem. Additionally Hotchkiss et al (1998) conducted a research in Nepal, the research focused on the implications of healthcare financing reforms on household expenditure, despite having encouraging results; the study didn't incorporate factors such as public health expenditure, population size in its econometric model as explanatory variables.

In an attempt to fill the knowledge gap created by previous studies this paper will not only incorporate factors such as public health expenditure, population size in its econometric model but also use the number of public health and educational institutions as proxy variables for public health expenditure and education respectively as recommended by Vukenya (2015) in order to clearly establish the extent by which public health spending influenced household consumption.

1.3: Research Questions

i. What is the impact of public health spending on household consumption?
ii. What are the policy recommendations based on the findings of the research?

1.4: Research Objectives

i. To establish the impact of public health spending on household consumption.
ii. To come up with policy guidance based on the findings of the Research.

1.5: Justification of the study

Regardless of the fact that public health spending plays a key function in determining the consumption levels among Kenyan households, it is still not clear by what extent does public health spending determine household consumption. Therefore by establishing the impact of public health expenditure on household consumption policy makers will get informed on how to design an equitable health care financing system that will prevent households from incurring healthcare cost that may destabilize their consumption patterns.

CHAPTER TWO: LITERATURE REVIEW

2.1: Introduction

This chapter constitutes of the following parts: Part one is focusing at the theories related to the study; part two looks into empirical literature while part three is a summary of the empirical literature.

2.2: Theoretical Literature

2.2.1: Human Capital Model

The Grossman model of health demand (1972) borrows a lot from the human capital theory [Becker (1964, 1967), Ben-Porath (1967), Mincer (1974)]. Health is regarded as a capital stock since it depreciates overtime once no investment are not done on it, in order to offset the depreciation, individuals invest much in health requisites such as healthcare utilization, working out as well as diet. According Grossmann Health as a good is needed for consumption purposes where it enters directly in an individual's utility function, and as an investment good which yields satisfaction indirectly by reducing the duration by which an individual will be sick. This has the impact of increasing the number of working hours for an individual whereby he/she yields many consumption goods that enter directly into his utility function and in addition to that more working hours imply an increase in a person income which he/she may use in the expenditure of other basic consumption such as education, housing and food. This resembles the human capital theory where education as a factor input increases a stock of knowledge to a person which is likely to boost productivity both in the market and non-market sector hence an increase in income earnings (Michael Grossman, 1972).

The Grossman model also stems itself from the law of demand, the law states that a rise in the price of a particular good is accompanied by a fall in the consumption of that particular good assuming all other factors are held constant, and it follows that demand for healthcare to have an inverse relation with its shadow price. Kenya health sector incurs a huge cost for it to obtain many of the health inputs such as drugs, medical equipment etc, this has seen the rise in price for medical services and regarding this the consumption of health care

has definitely fallen. This has an indirect effect to household consumption as we know that if an individual can't reach better medical support increases the probability of him/her being unhealthy hence increasing the hours of being ill. Many hours of being ill implies few hours of working, hence this will result to a fall in the production of consumption goods and also a decline in income earnings which may have been used to finance other basic household consumptions (Grossman, M. 1999).

2.2.2: The Life Cycle Hypothesis

The life cycle hypothesis (Modigliani and Brumberg, 1954) was established to examine saving and consumption behavior of individuals at the retirement age. The life cycle hypothesis observes that consumption and income levels to be unequal at the various stage of life, at the initial phase of lifecycle individuals consume more than their income and therefore they have to borrow and keep up with the situation, in the middle stage individuals earn higher income and use this higher income to pay the debts accumulated in the early stage of life and also make savings, in the final stage individual earnings reduce due to retirement and as a result people opt to use the saving they had accumulated in the middle stage. As the population ages, and the proportion of older people gets bigger relative to the middle aged people, then it is expected that the level of national saving to be increasing, contrary to this, life cycle theory anticipates a decline in saving as the population ages. The Life cycle hypothesis explains this by stating that, the presence of pension payments and social security fund to be taking a key role in discouraging saving at an old age (Ando, Albert, and Franco Modigliani, 1963).

In order to validate the predictions of life cycle hypothesis about individuals saving patterns, it is also essential to observe the consumption patterns of individuals. Generally as people grow old they develop a complicated health system, hence prone to attacks by illness which sometimes take long; this is usually accompanied by consistently increasing medical expenditures, and by considering the fact that pension payments erode overtime and may not be sufficient enough to sort direct healthcare cost, this may result to an increase in dissaving at an old age.

The cost of healthcare incurred by older people usually shifts the composition of private household demand, and more importantly an aging population may have influence to the national budgetary allocations, for instance the government may opt to reduce expenditure on housing schemes, education for the young, and spend more on pension and healthcare insurance. It is evident that their exist a connection between demographic factors e.g. age; consumption e.g. healthcare and income, implying that when coming up with a policy framework meant for old people, then this relationship should be put into consideration and more importantly policy maker should be knowledgeable about how life-cycle events influence consumption patterns in old age (Banks J. et al 1998).

2.3: Empirical Literature

Christoph (2015), using a simple linear regression model, assessed how income influenced consumption behavior at a household level using the 2011china household finance survey which involved 8438 households across china. The empirical conclusions indicated a direct l relationship between income and consumption, considering all groups i.e. affluent, lower middle class, upper middle class and the poor. A 1 percent increment in income leads to a rise in household spending by 0.26 percent.

Sekhamphu and Niyimbanira (2013) using a multiple regression model evaluated the factors determining household spending in a South African township, among the factors being investigated included income; results suggested that an increase in income by 1% was accompanied with a 32% rise in aggregate household consumption. Lekobane and Seleka (2017) studied Determinants of household welfare and poverty, employing regression analysis the study found education was among the fundamental causality for household welfare and poverty in Botswana.

Khan (2014) studied the consumption function under relative income hypothesis an evidence from farm households in Northern Pakistan. The research suggested that income, education and family size had a positive and statistical meaningful relationship with consumption. Khan and Ahmad (2014) investigated the relationship between income and consumption utilizing cross sectional dataset in Pakistan. The study observed a statistical

significant relationship whereby an increase in income by Rs. 1 million leads to a rise in consumption by Rs.0.86 million. Research findings also revealed a direct and statistical significant relation between household consumption and education, household size.

Young et al (1994) examined the effects of household size and composition on household consumption. Empirical finding suggested that, increasing a child to a household while holding household full income constant leads to an increase in the expenditure for food, notably when a younger child is involved. Research findings suggested that in elasticity terms a 1 percent increment in household size led to a rise in household spending by 17 percent which conformed to those of Sekhamphu and Niyimbanira (2013).

Barnett and Brooks (2010), on their working paper, investigated on how public expenditure on health and education increased household consumption in China. The main findings are that public expenditure on health but not education influenced household spending patterns. An increase in public health expenditure by one Yuan was accompanied by a rise in urban household expenditure by two Yuan.

Biswal et al (2001) analyzed the effects of government spending on Education and health on poverty in Indian states; findings suggested that education, health and development expenditure contributed to reduction of poverty which meant growth of household expenditure. Vukeya (2015) investigated the influence of infrastructure investment on economic growth in South Africa. To analyze the study utilized Ordinary Least Square technique to estimate an Auto Regressive Distributed Lag model. Findings suggest that public spending on social infrastructure (Health and Education) slowed down on economic progress.

Kolawale and Adebayor (2013), in their investigation on the impacts of Education on Household Welfare in Nigeria which utilized a double hurdle model and a quantile regression model found that household consumption per person to be an increasing function of education.

Njong (2010) investigated the influence of educational attainment on poverty reduction using cross-sectional data in Cameroon. A logistic regression model was employed and the results indicated that improvement in experience and educational attainment minimized the chance of being poor.

Himaz and Aturupane (2011), in their working paper "Impact of education on Household Welfare in Sri-lanka" utilized quantile regression approach and investigation found that an additional year in education attributed to an improvement in household welfare and it is worth noting people at higher quantiles experienced greater progress of their household welfare, probably this would be explained by the better quality education that they possess which in turn earned them more income.

Sen and Rout (2008) in their paper determinants of household's health expenditure, found that for individuals who were literate medical expenditure was high compared to the illiterate people. These results are consistent with those of Sekhamphu and Niyimbanira (2013); in their study on factors determining household expenditure in South African township they concluded that consumption was very high in those households where the bread winner was more educated compared to households where the bread winner was less educated.

Wanka and Rena (2019) analyzed the influence of educational attainment on household poverty in South Africa; results indicated that those households which had attained less education they were likely to be poor; hence less education implied less household consumption. Ali et al (2015) analyzed the impact of population growth rate on economic development. The investigation concluded that there is an inverse connection between population growth rate and real GDP growth rate.

Ogbuabor (2018) studied population growth and economic development in Nigeria. The study employed an Ordinarily Least Square regression technique and the findings suggested that population growth hampers economic advancement in Nigeria. Mankiw et al 1992 in his study "A contribution to the empirics of economic growth" employed an Ordinarily Least Square technique and found that population increase lessens income per capita.

Kim et al (2009) studied if fertility leads to a decrease in household consumption in Indonesia. Employing the propensity score matching approach the study concluded that a newborn kid resulted to a decline in consumption by 20% within 4 years. Wesley and Peterson (2017) studied the role of population in economic growth. The study found out that low population in a high income country may cause social problems and high population growth in a high income country will retard economic growth.

Obere et al (2013) researched about the impacts of population change on economic growth in Kenya. Results revealed that population growth attributed to economic progress in Kenya. Klasen and Lawson (2007) studied the effects of population growth on economic growth and poverty reduction in Uganda. The investigation concluded that population increase retards income per capita growth. Zheng and Liping (2011) studied population growth and economic growth and their findings suggested that population contributed to economic growth.

2.4: Overview of Empirical Literature

Different methodologies including multiple linear regression, simple linear regression model and log-log model etc. have been applied so as to analyze how the following factors (household income per capita, unemployment rate, education, public spending on health, household size) influence household consumption. Empirical evidence shows that all the variables presumed to influence household consumption were statistically significant in influencing household consumption. From various studies it is observed that Public health expenditure, Education and income were Consistent in terms of the direction in which they influenced household consumption however population size exhibited mixed results.

For instance in the studies conducted by Himaz and Aturupane 2011; Sen and Rout (2008); Kolawale and Adebayor (2013); Sekhamphu and Niyimbanira (2013); observed a positive relationship between education and household consumption. Different data types have been used for analysis of the various study relevant to the topic of study, however time series data seemed to be the most popular due to its high availability from different sources.

CHAPTER THREE: RESEARCH METHODOLOGY

3.1: Introduction

This chapter focusses on the techniques applied to carry out the research analysis. It encompasses the theoretical concept, model specification, Diagnostic Analysis, stationarity test, cointergration test, Data sources and Transformation.

3.2: Theoretical Framework

The Grossman human capital model (1972) forms the basis for the theoretical framework. According to Grossman, health is a capital stock that depreciates with age if there are no investments on it; individuals usual counter this by investing in a variety of health requisites such as health care usage, working out as well as diet. Expected returns from investing in health is that individuals derive utility (satisfaction) and moreover better health increases the time available for market and non-market activities. Therefore better health implies that household will have more time in the production of consumption commodities and also an increase in wage earnings which are in turn used to finance other basic household consumption such as expenditure on education, housing and food (Grossman, M. 1972).

The Grossman model also stems itself from the law of demand, the law indicates that a price rise of a particular good is accompanied by a fall in the consumption of that particular good assuming all other factors are held constant. According to Grossman health demanded is inversely related to its shadow price. Note that the shadow price of health includes costs of various variables and not only the cost of health care. The law of demand has its implications in the Kenyan context, considering that the government incurs enormous expenses to provide health services, definitely prices for medical care will rise and in response to this the consumption of health care will fall. This has an indirect effect to household consumption as we know that if an individual is not connected to better health care increases the probability of him/her being unhealthy hence increasing the hours of being ill. Many hours of being ill implies few hours of working, hence this will result to a

fall in the production of consumption goods and also a decline in wage earnings which may have been used to finance other basic household consumptions (Grossman, M. 1999).

3.3: Model Specification

This Research intends to explore the link between public health spending and household consumption. An in-depth review of literature suggests that Household Consumption (HC) is a function of the following economic variables: Public Health Expenditure (PHE) Population size (PS), Income (I) and Education (ED). Hence

$$HC=f(PHE,PS,I,ED) \quad (3.1)$$

By assuming a Cobb-Douglass utility function equation (3.1) becomes

$$HC= A^{\beta o}PHE^{\beta_1}PS^{\beta^2}I^{\beta_3}ED^{\beta_4} \quad (3.2)$$

Taking the logarithms of both side equations (3.2) becomes

$$lnHC=lnA^{\beta o} + lnPHE^{\beta_1} + lnPS^{\beta^2} + lnI^{\beta_3} + lnED^{\beta_4} + \varepsilon_t \quad (3.3)$$

The corresponding econometric model of equation (3.3) is

$$lnHC=\beta_0 + \beta_1 lnPHE + \beta_2 lnPS + \beta_3 lnI + \beta_4 lnED + \varepsilon_t \quad (3.4)$$

Where;

$lnHC$ = Natural logarithm of household consumption

$lnPHE$ =Natural logarithm of public health expenditure

$lnPS$ = Natural logarithm of population size

lnI =Naturallogarithm of income

$lnED$ =Natural logarithm of Education

ε_t = Represent stochastic error term

$\beta_0, \beta_1, \beta_2, \beta_3, \beta_4$ are coefficients to be estimated

3.3.1: Definition of Variables

Household consumption: Refer to the total money spent on final goods and services by individuals and households for personal use and enjoyment in an economy.

Public health expenditure: It refers to the amount spent by the government to build health facilities, purchasing drugs and medical equipment, training of physicians and paying their salaries etc.

Income: It refers to income generated by a country's citizens and businesses, including any income earned from abroad.

Education: Is the process of learning especially from school or college.

Population size: It refers to the total number of people in the Kenyan population.

3.3.2: Contextualization of Variables

Table 3.1: Contextualization of Variables

Explanatory Variable	**Measurement**	**Expected Sign**
Log of Public Health Expenditure	It is measured by the log of yearly total number public health institution operating in the country.	Positive +
Log of Education	It is measured by the log of yearly total number of educational institution operating in the country.	Positive +
Log of Income	It is measured by the log of the sum of GDP and income obtained by citizens internationally minus income generated by non-nationals in the country.	Positive +
Log of Population size	It is measured by the log of yearly total count of people in the Kenyan population.	Positive+ or negative -

3.4: Diagnostic Analysis/Test

Diagnostic analysis is done to confirm whether the chosen model fits for the data reasonably well, as well as checks how powerful the model is. For Diagnostic Testing a range of tests will be considered these include: Heteroscedasticity, Auto correlation and Normality.

3.4.1: Heteroscedasticity

Heteroscedasticity arises if the variance of the error term varies across observation. In case of Heteroscedasticity the ordinary least square estimates are unbiased but standard errors will be biased. Biased standard errors will lead to a biased conclusions which means that we cannot carry out hypothesis testing using these standard error. To test for heteroscedasticity the study will employ the white test.

3.4.2: Auto correlation

It's a common problem in time series data. It's also known as serial correlation of the disturbances/error terms across periods. Auto correlation has consequences similar to those of Heteroscedasticity, as it may result to unbiased estimated parameter while standard errors are biased. To test for Auto correlation, the study will use Breusch-Godfrey test.

3.4.3: Normality

Normality test is performed to establish if the data set is well modeled by a normal distribution. To test for normality the study will employ jarque-bera test and Shapiro-Wilk Test.

3.5: Stationarity Test

Before building an econometric model it is essential to inspect the stationarity of the series so as to overcome spurious regression issues which may occur when non-stationary series are modelled jointly. The **Augmented Dickey Fuller test** is a widely applied approach to check for stationarity together with establishing the order of integration of the variables.

The test involves regressing the following equation:

$$\Delta Y_t = \beta_1 + \beta_{2t} + \delta Y_{t-1} + \sum_{i=1}^{m} a_i \Delta Y_{t-1} + \varepsilon_t \quad (3.5)$$

Where $\delta = \gamma - 1$, ε_t is the error term, t is the trend, β_1 is a drift and m is the number of lags. The regression equation wishes to test the two hypotheses:

H_0: $\delta = 0$ or $\gamma = 1$ (series has unit root or Non-stationary)

Against

H_1: $\delta < 0$ or $\gamma < 1$ (series has no unit root or Stationary)

The Augmented Dickey Fuller Test uses the **tau statistic** for hypothesis testing; the **(τ) tau statistic** is generated once the estimated coefficient of Y_{t-1} is divided by its standard error term. In this regard if absolute value of **(τ) tau statistic** is large compared to critical tau value do not accept the null implying the series is stationary and If absolute value of **(τ) tau statistic** is small compared to critical tau value fail to reject the null hypothesis implying that the series is stationary (Gujarati, 2009). According to Pantula principle 1989, if we have more than a unit root, it is recommended that we difference the series as much as needed to transform the series or until when the series become stationary, the number of differences required for the series to be stationary is the order of integration (G. Pantula, Sastry. 1989).

3.6: Cointergration

After examining the nature of the series through the various pre-tests, you can proceed and make a joint analysis of the set of variable so long as they fit to be modeled jointly, one of the methods employed to conduct multivariate analysis of time series is called the cointergration test. Cointergration test is the joint regression of non-stationary series to examine if a long run relationship exists between the variables or No. If a linear combination of two or more variables is I (0) this indicates that the two series are Cointergrated implying the presence of a long run relationship between them. To perform cointergration test the following econometric models will be estimated.

3.6.1: Vector Autoregressive Model (VAR)

The Vector Autoregressive Models are multivariate linear time series models intended to estimate the joint dynamics of multiple time series. The basic VAR model of order p can be stated as:

$$K_t = \alpha + \theta_1 K_{t-1} + \cdots + \theta_p K_{t-p} + \varepsilon_t \quad (3.6)$$

Where θ_i's (i=1…p) are time invariant n× n coefficient matrices, ε_t is a k-vector of error terms, α is a vector of constants (intercepts) and K_t is an n × 1vector of all endogenous variables i.e. Household consumption, public health expenditure, Education, Population size and income. The VAR model is mainly used to estimate the short run interaction between variables and its suitable when all the variables to be estimated are Stationary, however in a case where some of the series show stochastic trends then there is need to transform the series and the resulting stationary series can be fitted in the VAR model for analysis. It is worth noting that in a situation of simultaneity then all variables are treated as endogenous (Sims, 1980).

3.6.2: Vector Error Correction Model

Vector Error Correction Model is suitable for analyzing series that are non- stationary and exhibit cointergration relationship. The model is given as follows:

$$\Delta K_t = \prod K_{t-1} + \sum_{i=1}^{p=1} \phi_i \, \Delta K_{t-1} + \varepsilon_t \quad (3.7)$$

Where ϕ_i are n×n coefficient matrices outlining the short term dynamic effects and $\prod K_{t-1}$ is the error correction term and ε_t is the disturbance term.

Vector Error Correction Model test procedure begins by analyzing the deterministic components of the multivariate system there after Johansen cointergration test is employed to find out if a long run relationship exist between the first differenced series by analyzing equation 4. Johansen test makes use of the maximum Eigen values to test the following hypothesis:

H_O: There are r cointergrating vectors

H_1: There are r +1cointergrating vectors

According to Lütkepohl et al 2004the null hypothesis is not accepted if the test statistic is large compared to critical value and accept the null if the estimated test statistics is small relative to the critical. Confirmation of the existence of a cointergrating vector between variables permits the estimation of Error Correction Model to determine both the long run and short run relationship between the variables.

3.6.3: The Autoregressive Distributed Lag Bounds Testing Approach to Cointegration Testing

The Autoregressive Distributed Lag bound test procedure is recommended when determining the presence of a cointergrating vector between a set of variables that are of a different order of intergration (Pesaran and Shin, 1998) & Pesaran et al, (2001). Therefore under this test information regarding the order of integration of the variables is not a requirement prior to the analysis of level relationship between variables. The cointergration bound test begins by estimating an ARDL model (eqn 3.8) to determine the optimal lag structure that is essential when estimating the ARDL-ECM bound test. The ARDL model is specified as follows:

$$\Delta Y_t = c_o + \sum_{i=1}^{k} \Gamma_i \, \Delta R_{t-i} + \sum_{j=1}^{k} \phi_i \, \Delta M_{t-j} + \varepsilon_t \qquad (3.8)$$

From equation 6 the conditional ECM model is given as follows:

$$\Delta Y_t = c_o + \prod Y_{t-1} + \sum_{i=1}^{k} \Gamma_i \, \Delta R_{t-i} + \sum_{j=1}^{k} \phi_i \, \Delta M_{t-j} + \varepsilon_t \qquad (3.9)$$

Where Δ is the difference operator, $\prod Y_{t-1}$represents $(\prod_{RR} R_{t-1} + \prod_{MM} M_{M-1})$ and the longrun multiplier matrix is written as $\prod = \begin{bmatrix} \prod_{RR} & \prod_{RM} \\ \prod_{MR} & \prod_{MM} \end{bmatrix}$.

The model is assessed based on the following null and alternative hypothesis.

H_O: $\gamma_0 = \gamma_1 = \ldots = \gamma_q = 0$ i.e. No long run relationships between variables

H_1: $\gamma_0 = \gamma_1 = \ldots = \gamma_q \neq 0$ i.e. presence of a long run relationship between variables

According to Lütkepohl et al (2004) do not accept the null hypothesis if the computed F-statistic is large compared to the upper bound of the critical values contrary accept the null if the F-statistics is small compared to lower limit of the critical values and if the estimated F-value lies between the higher limit and the lower limit of the critical values then the test is inconclusive. Once the existence of a long run relationship has been established this justifies the estimation of a conditional ECM (equation 3.9) to establish both short term and long term relationship of the variables.

3.7: Data Sources and Transformation

This research will use a time series data set for the period "between" 1988 to 2017 for the following economic indicators: Household consumption per capita, public health expenditure, education, income, population size. Data for these variables will be obtained from secondary sources such as World Bank database, official government publication e.g. KNBS Statistical Abstracts and economic survey. All variables that were in monetary form were converted into local currency (Ksh) and furthermore each variable was in terms of millions. The Ordinary least square technique will be employed for analysis purposes and the variables will be subjected to log transformations as this ensures linearity for the nonlinear variables (Gujarati, 2004). For statistical analysis the study mainly used STATA statistical package.

CHAPTER FOUR: EMPIRICAL ANALYSIS AND INTERPRETATION OF RESULTS

4.0: Introduction

This chapter has two main objectives firstly it outlines the methodology used to estimate the relationship between household consumption, public health expenditure, population size, education and income; secondly it presents and interpret findings of the study.

4.1: Descriptive Statistics

This section outlines the basic characteristics for each series under study

Table 4.1: Descriptive Statistics

Variable	Mean	Std. Dev	Min	Max	Skewness	Kurtosis
Log Household consumption	-2.90256	0.1211097	-3.080565	-2.613997	0.91657	2.875953
Log Public Health Expenditure	-5.34749	0.4668293	-6.245583	-4.619472	-0.265002	2.223808
Log Education	-3.67395	0.3120519	-4.071781	-3.025532	0.4774078	0.0973764
Log Population Size	3.52645	0.2465671	3.095578	3.916015	-0.092564	1.838076
Log Income	9.857037	0.8112898	8.592671	11.26555	0.2886901	1.715969

Source: Authors own computation.

The summary statistic shows that Log of Household consumption, Log of Education and Log of Income are positively skewed hence they have a long right tail relative to the left tail which entails that they have more higher values above the sample average while Log

of Public Health Expenditure and Log of Population Size were negatively skewed thus they have a long left tail relative to the right tail suggesting that they have more lower values than the sample average. All variables have a kurtosis value less than three hence platykurtic which implies that their distribution generates fewer and less extreme outliers than the normal distribution.

4.2: Normality Test

All series were subjected to normality test to affirm whether the data is well modelled by a normal distribution. Shapiro-Wilk test was employed to carry out the test which involved assessing the null hypothesis which claims a normal distribution against the alternative which purports non-normality of the distribution. The test outcomes are indicated in Table 4.1.

Table 4.2: Normality Test Results

Variables	Log Household Consumption	Log Public Health Expenditure	Log Education	Log Population Size	Log Income
P Vaue	0.00392	0.13568	0.04796	0.29942	0.02705

Note: $\alpha = 0.05$

Source: Authors own computation.

According to (Lütkepohl et al 2004), do not accept the null hypothesis if the p-value does not exceed 0.05 and accept the null if the p-value surpassed 0.05. On the basis of the test results the researcher concludes that Log Public Health Expenditure and Log Population Size are normal distributed since their p-values exceed 0.05 while Log Household consumption, Log Education and Log income are **not** normal distributed since their p-values are less than 0.05.

4.3: Stationarity Test/ Unit Root Test

Before building an econometric model it is essential to test for stationarity of the series so as to avoid spurious regression problem which may arise if non-stationary series are modelled together. The augmented dickey fuller test was used to assess the null hypothesis which purports that the series is non-stationarity contrary to the alternative which states the variable is stationary. According to (Gujarati, 2009) do not accept the null hypothesis if in absolute terms the test statistic is large compared to the critical value at the chosen level of significance.

Table 4.3: Stationarity Test Results

Test for stationarity in levels					**Test for stationarity at first difference**			
Variable	lag	Test Statistics	5% Critical value	Remark	Lags	Test Statistics	5%Critical value	Remark
Log Household consumption	1	1.240	-2.99	Non - stationary	0	-4.023	-2.99	stationary
Log of Public Health Expenditure	2	-0.824	-2.99	Non-stationary	0	-4.101	-2.99	stationary
Log Education	1	0.719	-2.99	Non-stationary	0	-5.009	-2.99	stationary
Log Population Size	1	-7.461	-2.99	stationary				*
Log Income	1	0.714	-2.99	Non-stationary	0	-3.933	-2.99	stationary

Note: * implies stationarity was achieved in levels

Source: Authors own computation

With reference to the test procedure the unit root report establishes that it's only Log Population size was stationary in level hence integrated of order zero **I (0)** while for Log Public Health Expenditure, Log Education and Log Income stationarity was achieved after differencing once thus integrated of order one **I (1)** (see appendix figure 1). The mixed

order of integration makes the cointergration bound test procedure to be the feasible technique in determining the presence of a long run relationship between the variables.

4.4: Cointergration Analysis

According to the results from the stationarity test, the cointergration bounds test procedure was the feasible technique to determine the presence of a long run relationship between the variables. Under this test the null hypothesis asserts the absence of a long run relationship between variables in levels i.e.B_i=0 for i= 1,2,3,4,5 against the alternative hypothesis which affirms the presence of a long run relationship between variable in levels i.e. $B_i \neq 0$ for i= 1, 2, 3, 4, 5.Under the bound test approach do not accept the null if the computed F-value is large relative to the higher limits of the critical values otherwise accept the null if the F-value is small compared to the lower limits of critical values and if the F-value lies between the higher and lower limits of the critical values the test is inconclusive. Akaike information criteria was used to select the ideal lag length (2 2 2 0 0) which was essential for the estimation of subsequent models. Results for the cointergration bound test are shown in Table 4.4.

Table 4.4: Bound Test Results

F-value	$\propto = 0.05$		$\propto = 0.1$		$\propto = 0.025$		$\propto = 0.01$	
	Lower limits	Upper limits	Lower limits	Upper limits	Lower limits	Upper limits	Lower limits	Upper limits
10.200	2.86	4.01	2.45	3.52	3.25	4.49	3.74	5.06

Note: ∝refers to level of significance

Source: Authors own computation

Results from the bound test established the presence of a long run relationship between Log Household Consumption, Log Public Health Expenditure, Log Education, Log Income and Log population Size since the F-value surpassed the upper limits of all critical values.

4.5: Diagnostic Tests

A range of diagnostic test will be considered here to check for model adequacy.

4.5.1: Residuals Normality Test

Residuals extracted from the regression model were subjected to normality test to check if they are consistent with the standard normal distribution. Jarque-bera test was employed to assess the null hypothesis which claimed normality of residuals against the alternative hypothesis which claims non-normality of residuals. According to Lütkepohl et al 2004, reject the null hypothesis if the p-value is below 0.05 and accept the null if the p-value surpassed 0.05. The test results are as indicated below.

Table 4.5: Residuals Normality Test Results

Variable	Adjusted Chi(2)	p-value
Residual	3.89	0.1432

Source: Authors own computation

Since the p value was above 0.05 then accept the null which affirms normality of residuals.

4.5.2: Serial Correlation

Breusch-Godfrey LM test was applied to test for serial correlation of the regression residuals. The test involves assessing the null hypothesis which claims the absence of serial correlations of residuals against the alternative hypothesis which asserts presences of serial correlations of residuals. According to Lütkepohl et al 2004, reject the null hypothesis if the p-value is small compared to 0.05 and accept the null if the p-value is large relative to 0.05.The test outcomes are indicated in Table 4.6.

Table 4.6: Serial Correlation Test Results

Lag(p)	Chi2	df	P value
1	2.768	1	0.0962

Source: Authors own computations

Since the computed p-value large compared to 0.05 then accept the null hypothesis which affirms the absence of serial correlation of residual.

4.5.3: Heteroscedasticity

White Test was employed to test for heteroscedasticity in the model. The test involves assessing the null hypothesis which maintains that there is no heteroscedasticity in the model against the alternative hypothesis which purports heteroscedasticity is present in the model. According to Lütkepohl et al 2004, the null hypothesis is rejected if the p value is small compared to 0.05 otherwise accept the null if the p value is large compared to 0.05. The results of the white test are indicated Table 4.7.

Table 4.7: Heteroscedasticity Test Results

Source	Chi(2)	df	P value
Heteroscedasticity	28.0	27	0.4110

Source: Authors own computation.

Since the computed p-value is large compared to 0.05 then we accept the null hypothesis which asserts the absence of heteroscedasticity in the model.

4.6: Regression Results

The presence of a long run relationship as established by the Cointergration Bound Test justifies the estimation of an Error Correction Model in order to determine the long run between the variables. Results of the ECM are as indicated in Table 4.8.

Table 4.8: Regression Results

Variable	Coefficient	Std error	t-value	P value	Confidence interval	
					Minimum	Maximum
Log Public Health Expenditure	.4550266	.1470224	3.09	0.007	0.1448364	0.7652168
Log Education	0.6663321	0.1470224	4.51	0.000	0.354402	0.978262
Log Population Size	-1.775584	0.4060405	-4.37	0.000	-2.632254	-0.918913
Log Income	0.2148279	0.0482692	4.45	0.000	0.112988	0.3166669
Error Correction Mechanism	-0.487896	0.1117701	-4.37	0.000	0.1129888	0.3166669
	R-Squared=0.7919 Adjusted R-Squared=0.6695					

Source: Authors own computation

The error correction term of -0.49 is statistical significant and negative as desired. It means that the system corrects its previous period disequilibrium at a speed of 49 percent annually. The model has an R^2 of 0.792 implying that 79.2 percent of the variations in household consumption are accounted by public health expenditure, population size, income and education which presents a fairly good model for this study. The Adjusted R-squared of 0.6695 implied that 67% percent of the variations in household consumption were accounted by public health expenditure, population size, income and education after adjustments.

Regression results point out that in the long run there is a positive and a statistical significant relationship between public health expenditure and household consumption since a 1 percent increment in public health spending results into an expansion in household consumption by 46 percent holding all other factors constant. Public Health Expenditure had a significant effect on household consumption since its t-value of 3.09 was greater than 1.96 at 5%significance level and this is confirmed by the p-value of 0.007 which is less than 0.05.These results conform to the Grossman model of health demand which points out that a person's stock of Health determines the time available for producing money earnings and Commodities and still the results are empirically consistent with the conclusions of Barnet and Brooks (2010),Biswal et al(2001), Piabuo and Tieguhong (2017).

The study also reveals that in the long run there is a positive and a statistical significant relationship between education and household consumption since a 1 percent increment in education resulted to an increase in household consumption by 67 percent holding all other factors constant. Education had a significant effect on household consumption since its t-value of 4.51 was greater than 1.96 at 5% significance level and this is confirmed by the p-value of 0.000 which is less than 0.05 This conclusion conforms to the human capital theory which argues that education as a factor input increases a stock of knowledge to a person which is likely to boost productivity both in the market and non-market sector leading to an increase in income (Michael Grossman, 1972). This finding is empirically consistent with Kolawale and Adebayor (2013), Himaz and Aturupane (2011), Wanka and Rena (2019) and Biswal (2001).

It is also observed that in the long run there was a positive and statistical significant relationship between income and household consumption since a 1 percent increment in income led to an increase in household expenditure by 22 percent holding all other factor constant. Income had a significant effect on household consumption since its t-value of 4.45 was greater than 1.96 at 5% significance level and this is confirmed by the p-value of 0.000 which is less than 0.05. This finding conforms to permanent income hypothesis which points out that consumption is a steady function of permanent income (anticipated

long term average income) and is still consistent with the findings of Christoph (2015), Sekhamphu and Niyimbanira (2013).

The study also finds that in the long run there is a negative and statistical significant relationship between population size and consumption since an increase in population by 1 percent leads to decline in consumption 177 percent holding other factors constant. Population had a significant effect on household consumption since its t-value of 4.37 was greater than 1.96 at 5% significance level and this is confirmed by the p-value of 0.000 which is less than 0.05.This finding makes economic sense in the context of least developed countries since high population growth in low income countries is anticipated to bring about social and economic problems (Wesley& Peterson, 2017) and still corresponds to the optimum theory of population which states that any rise or fall of population above or below optimum level will diminish income per head and this definitely translates to the consumption patterns. This research outcome is in line with the conclusions of Kim et al (2009), Mankiw et.al (1992) Bucci (2003).

CHAPTER FIVE: SUMMARY, CONCLUSION AND RECOMMENDATIONS

5.1: Summary

The paper investigated the effects of public health expenditure on Household consumption in Kenya and it utilized a time series data set for the period "between" 1988-2017 for the following economic variables: household consumption, public health spending, education, population size and income as guided by literature. As per the recommendations set by Vukenya (2015) this study used the number of public health facilities and the number of educational institutions as proxy variables for public health expenditure and education respectively. This study consistently used STATA statistical software for its empirical analysis. From the primary analysis of the series it is observed that all the series were normal distributed as the descriptive statistics depicts.

The Augmented Dickey Fuller Test checked for stationarity and it revealed that population size was stationary in level while household consumption, income, public health expenditure and education were stationary at their first difference. In regard to the mixed order of integration the ECM was utilized estimate the long run relationship between the series after confirming the presence of a long term interaction of the variables. Findings from the ECM revealed that in the long run there is a direct and a significant relationship between public health spending, income education and household consumption while population size exhibited an inverse and a meaningful relationship with household consumption. These conclusions drawn are desirable as they conform to economic theory and are more practical especially in the Kenyan context.

5.2: Policy Recommendations

Results from this investigation are vital information since they provide a basis for policy formulation. Public Health expenditure exhibited a positive relationship with household consumption regardless of the fact that the Health Sector is facinig so many challenges such as Corruption, substandard physician-population ratio, inadequate health facilities and frequent strikes of the Health Sector employees (Kimathi, 2017). This outcome implies that more funds should be allocated to the Health sectors however high measures of

transparency and accountability should be put in place for the realization of the Health Sector goals since corruption is rampant in this sector.

Findings from this study have also shown that a rise in population size adversely affects the welfare of the citizens, the authorities may address this by investing in preventive checks such as family planning, raising the level of educational attainment in Kenya especially for women as it changes cultural believes &attitudes and more importantly a well-educated population will raise productivity, finally increase security in old age as this will substitute the notion that having many children guarantees security in old age, this may be done by increasing membership in the National social security funds, National health insurance fund and provision of higher incomes in old age.

Education exhibited a positive relationship with household consumption implying that increased allocations to the education sector will improve the well-being of Kenyan citizens.Finally the positive relationship between income and consumption explains how growth in income will improve the welfare of Kenyans. Therefore it is desirable if the government will expand the current pro poor income generating projects and also invest in new financial empowering initiatives as it guarantees raising the standard of living for Kenyans.

5.3: Strength and Weakness

Regardless of the fact that the sample estimates were economic sensible i.e. conformed to economic theory and matched the expected sign, still they may not be true reflection of the entire population since the study utilized a small sample size due to unavailability data. This has the danger of misleading policy makers when drawing conclusion regarding economic issues in the country.

5.4: Contribution to Knowledge

This research adds to literature since to the best of my knowledge it is the first attempt to empirically determine the relationship between public health spending and household consumption. More importantly this study fills the knowledge gap as per Vukenya's (2015)

recommendations which suggested that future studies in this particular field of interest to use the number health and education facilities as proxies for public health expenditure and education respectively since they are thought of giving a true reflection of the existing situation both in the health sector and education sector.

5.3: Recommendations for Future Research

The researcher recommends that subsequent studies to utilize larger sample sizes for analysis purposes if accuracy is desired.

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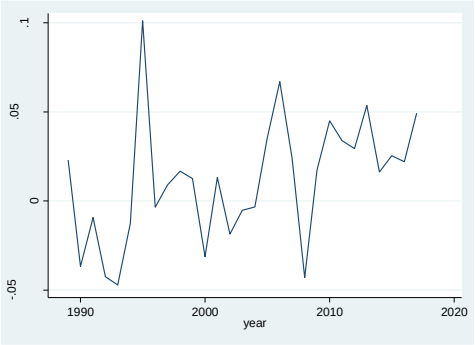
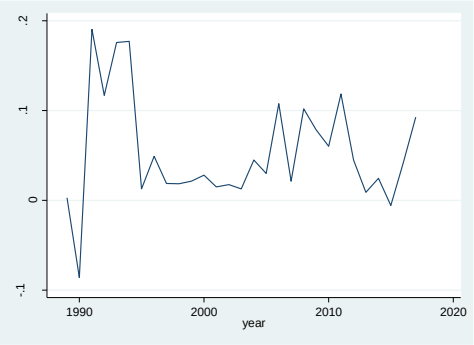
APPENDICES

Appendix 1: Graphic Plots of Variables in First Differences

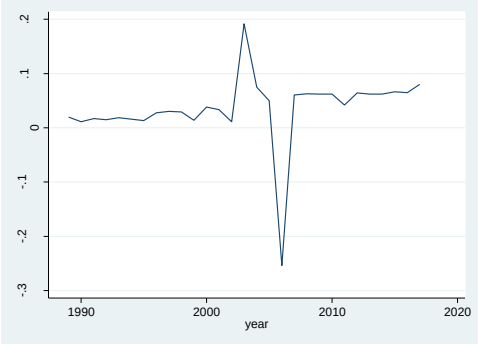
Differenced Log HC



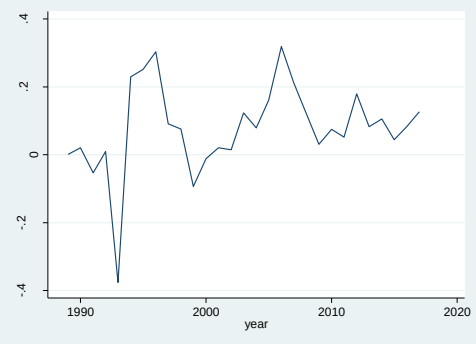
Differenced Log PHE



Differenced Log ED



Differenced Log I



Appendix II: Diagnostic Results

Table 1: Test for Autocorrelation

Breusch-Godfrey LM test for autocorrelation

lags(p)	chi2	dfProb> chi2
1 2.768	1	0.0962

H0: no serial correlation

Table 2: Test for heteroscedasticity

Breusch-Pagan / Cook-Weisberg test for heteroskedasticity

Ho: Constant variance

chi2(1) = 2.85

Prob> chi2 = 0.0911