

# Determinants of Public Health Care Expenditure in Nigeria: An Error Correction Mechanism Approach (1981-2014)

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## Abstract

Investment in human capital through health could bring about economic growth in Nigeria. Health enhances worker effectiveness and the productivity of an individual through increase in physical and mental capacities which are necessary for economic growth and development. Base on this paradigm, the Nigeria government has devoted huge budgetary allocation to the health sector but this huge health expenditure fails to translate into better health status of Nigerian and to meet World Health Organization(WHO) recommended budgetary allocation to the health sector. The main focus of this study is to empirically analyze the determinants of public health expenditure in Nigeria using the error correction techniques and time series data spanning from 1981 to 2014 to evaluate the factors that influence public health expenditure in Nigeria, the results show that demand for health in Nigeria is price inelastic. It also shows that total population, Unemployment rate and the Tuberculosis are the major determinants of health expenditure in Nigeria while gross domestic product per capita, Sickle-Cell Anemia and the Human immuno-deficiency Virus are insignificant. To this end, the study recommends that government should put in place adequate spending on health at all level (primary, secondary and tertiary institution). Government budgetary allocation to health sector should be increased to the prescribe of 15% of its annual budgetary allocation to the health sector. This will make government health expenditure to have a robust effect on Nigerians health status and meet WHO report(2004) recommended budgetary allocation to the health sector. The study also recommended that there is need for government to take cognizance of the growth population of her citizenry, prevalent rate of deadly diseases and the rate of unemployment in health care expenditure and allocation policies and also, government should form synergy with the private sector in providing quality and quantitative health facilities to meet the demand of Nigerians in line with the Millennium Development Goal (MDGS).

**Keywords:** Determinants, Public Health Care, Health Sector, WHO, Nigeria

## 1.0 Introduction

There is increasing empirical evidence that health matters for economic growth and development. Literature on economic growth has clearly showed the role of health in influencing economic performance, at least at the micro level. It is suggested that, all things being equals, healthier workers are more likely to be able to work longer, be generally more productive than their relatively less healthy counterparts, thus able to secure higher earnings than diseases ridden workers. Babatunde (2012) posited that poor health infrastructure, illness and diseased shorting the working lives of people thereby reducing their life time earnings.

Schultz (2010) postulated that good health has positive impact on the learning ability of children which lead to better educational outcome, school completion rate, higher means of years schooling, achievement and increases the efficiency of human capital formation by individuals and households. Lawanson (2009) asserted that health is one of the major components of human capital formation. While Todaro (2007) reveals that human resources constitute the ultimate basic for the wealth of a nations, capital and natural resources are passive factors of production, human beings are the active agents who accumulate capital, exploit natural resources, build social economic and political organization and carry forwards national development. Clarity, a country which is unable to develop the skills and knowledge of its people and to utilize them effectively in the national economy will be unable to develop any things else. Most countries strive to attract good health because of its acknowledged advantages as a basic component of economic growth and development.

Africa Nigeria in particular joined the rest of the world in seeking improvement in the health status of Nigerians as evidence by the kind of government policies intervention in the development of the health sector to enhance the nation economic output. In realization of this, successive Nigerian governments have been making serious effort in budgeting allocation to the health sector. According to CBN (2010) the total government expenditure to health as at 1986, 1990, 2000 and 2010 was ₦360.4M, ₦558.1M, ₦1818.8M, and ₦149269.8M respectively. The capital expenditure also show same continuous increase in trend in 1986, 1990, 2000 and 2010 recorded ₦18.2M, ₦157.0, ₦6569.2M and ₦46649.8M respectively. Similarly, the recurrent expenditure also reveals continuous increase in value from 1986, 1990, 2000 and 2010 are ₦279.2M, ₦401.1M, ₦11612.60M and ₦102620M respectively. However, Alabi, Adams, Chime, Abu and Aiglomudu (2010) reveal that in Nigeria less than 1% of GDP was allocated to health care provision, and about 2% of government oil revenue was allocated to health sector in Nigeria between 1981 and 2006. The fact that this low financial commitment will result in inequality in access to health care resources and since majority of Nigerian are poor and pay for their health care out of their pocket money may be left of health care provision. Nigerian project Agenda (2007) has shown that

accessibility to health care facilities in Nigeria is low. It was revealed that only 3 out of 5 Nigerians have access to health care facilities.

A critical look into the share of public expenditure on health in the national budget revealed that the share of health is rather low. The percentage of public health expenditure on total government expenditure according to world health organization in 1995, 2000, 2005, and 2010 was 7.05%, 4.22%, 6.41% and 4.4% respectively. This suggests that Nigerian health care situation still needs some improvement in budget allocation mostly in the area of planning and execution. As reported by Bakare and Sanmi (2011) that in spite of all these increases, much impact has not been made in the area of reduction of infants, under five and maternal mortalities since 1970. For instance, the Nigerian rate of infant mortality (91 per 1000 lives births) is among the highest in the world, and the immunization coverage has dropped below thirty percent while mortality rate for children under age five is 192 death per one thousand by year 2007, it was also reported that more than one hundred and thirty-four thousand (134000) women died from pregnancy complications.

In addition, the life expectancy ratio on the average has been on the decline over the study period and the world bank 1999 ranked Nigerian 74th out of 115 countries based on the performance of some selected health indicators while the general health system performance was also by the 187th among the 191 member states by the world health organization while Ogunjuyigbe and Laisu (2010) reveals that Nigeria is one of the countries lagging behind in all the millennium development goals (MDG'S) to which 191 countries including Nigerian signed at the turned of the millennium in 2001.

Premised on the foregoing, it has becomes imperative and worrisome to ask and provide answers to the following research questions which will be in tandem to achieve the broad and specific objectives of this study: (a) what has been the structure and pattern of government health expenditure in Nigeria? (b) What has been the trend of expenditure on health in Nigeria? (c) what are the factors that determine the public health care expenditure in Nigeria?. The scope of this study covers the period from 1980 to 2014. The choice of the time frame is informed by the following considerations:

- (i) The period is wide enough to enable good deductions to be made that will influence or redirect policy decisions.
- (ii) The relevant data for the study are available

Against this background, this study seeks to investigate the trends of health expenditure in Nigeria and what are the factor that determines public's health expenditure in Nigerian following this introduction, the remaining part of this study is structured as follows: section 2 will deal with the theoretical and empirical reviews. This was followed by the research methodology of the study in section 3. The empirical findings were analyzed in section 4 and section 5 contains the synthesis and policy recommendations of the study.

## 2.0 Theoretical Framework

### 2.0.1 Twin Model Of Health Expenditure

Kee (2009) Using provinces in Canadian economy developed what he called a twin model of health expenditure. One was based on homogeneity of slope of the model while the other was based on heterogeneity of the slope.

Before introducing the models, Kee (2009) identified some selected factors in the analysis of provincial health expenditures. According to him, the early studies on the determinants of health expenditures concluded that income is the major explanatory factor of health economics. The economic approach argues that other things being equal, the amount of health expenditure should depend on what an individual is capable of spending. Therefore, it is expected that provinces with higher income should be able to spend more on health given other decision factors as follows:

- (i) **The price of health care** is another influencing health expenditure. He opined that spending decisions concerning health are not solely affected by the income level but also by the price of health care. In the case of higher out of pocket payments, decisions rely on the price level. However, health care has special characteristics that are not similar to those of other goods. The government is heavily involved into the delivery of health and its supervision, attaching health sector a complex working mechanism. On the other hand, health is a non storable good and its delivery cannot be delayed. Such features blur the price spending relation and pose problems about our expectations of the magnitude of the price effect and its sign. This variable is particularly included in the analysis to separate income and price effects. From the economic point of view, the failure to include the price variable, if effective, results in misleading inference regarding policy prescriptions.
- (ii) **The share of publicly funded health expenditure:** With few countries being in exception, health care decisions and a considerable volume of health spending are driven by the governments and public institutions. However, as Roberts (2003) pointed out, that expenditure on physicians and other medical personnel constitute the bulk of government on health.
- (iii) **The share of senior population:** is considered to be another explanatory factor of health expenditures by the fact that elderly population consume health is an increasing function of age (Grossman 2005), especially for those of age 65 (regarded as the lower bound of ageing) and over higher and prolonged periods of cost are involved.

The treatment of senior population involves complexity and is not fully realized in most of the cases. Diabetes, cardiovascular diseases are few to mention that require relatively technical knowledge and equipment for treatment and diagnosis. The delivery of health services to elderly population is therefore associated with higher spending on health.

(iv) **Health status:** The relationship between health expenditure and health status indicator is much of a controversy. The reason to include health status indicator arises from the question whether there is correlation between expenditure and health level.

(v) **Life expectancy at birth** stands as an appropriate measure of indicator of health status for Canada which might also capture the efficiency of necessary health services for elderly population. The previous studies show that there appears to be correlation between health expenditure and health status in the OECD countries (Kyriopoulos and Soulotis, 2008).

(vii) **Federal transfers to provincial governments:** The last factor considered is federal transfers to provincial governments. This variable is included primarily to reconcile its significance presented by (Grossman 2005). It is expected that a higher volume of federal transfers increase health expenditures at the government level, its effect is likely to be smaller than what is found by Grossman (1972).

Kee (2009) presents the dynamics of provincial health expenditures. All the models presented are modeled One way Error component Model due to our focus on the provincial differences in health expenditures rather than differences across time. It is first assumed that these differences can be captured by the differences in the endowments. In this case, these differences in the intercepts cannot be thought as independent of other variables. I will only consider explicit models for governments health expenditures.

The dynamic models considered are of such form:

$$h_{it} = \alpha + \rho h_{it-1} + X_{it} \beta + \varepsilon_{it} \text{ with } \Sigma_{it} = \mu_i + U_{it}$$

$\rho$  is denotes the provinces and  $t$  denotes time,  $\beta$  is a  $K \times 1$  vector where  $K$  is the number of explanatory variables,  $X$  is a  $K \times NT$  matrix of income and a section of non income variables,  $\mu_i$  is the province specific parameter and  $U_{it}$  is the stochastic disturbance term.

## 2.1 Empirical Literature

A number of interesting empirical studies employed time-series data in analyzing the determinants of healthcare expenditure. Most of such studies were conducted using data from the OECD countries. In his study, Roberts (2012) employed techniques to analyze the properties of non-stationary variables over the period 1960-1993. The study adopted the Auto regression Distributed lag (ARDL) model to capture the heterogeneity across the OECD countries. Roberts regressed per capita total healthcare on per capita income, proportion of the population over the age of 65, relative price of health care, the proportion of publicly funded health spending and a time trend which captures technological change. The study found income, the proportion of publicly funded health spending and the relative price of health care to have long run significant effects of total healthcare spending. The study estimated the long-run income elasticity to be above unity.

Similarly, the Keynesian macro-economic thought which is some time called the demand side of the economy postulate that public spending can contribute positively to economic growth. Hence an increase in government expenditure is likely to leads to the same proportionate increase in employment, profitability and investment through multiplier effect on aggregate demand. Base on this background, government spending augment the aggregate demand, which provokes increases in output depending on expenditure multiplier (Saaded and kalakech 2009). However, Barro and Sala-I-Martin 2006) classify public expenditure as productive and unproductive and hypothesized that productive expenditure such as expenditure on education, health, road e.t.c have a direct influence on the rate of economic growth while unproductive expenditure such expenditure on salary, rent e.t.c have indirect or no effect. However, government spending on health play a crucial role in economic growth. Therefore, the healthier nature of population determined their ability to contribute to economic performance.

Babatunde(2012) asserted that better health enables better earning ability for both workers and enterprises which in turn enhance the tax based of the government leading to better fiscal posture. These interactions, all things being equals, will lead to better economic performance. Thus the manner in which growth is shared also influence the rate of poverty reduction. Health is one of the significant factors that determine the quality of human capital which is a necessary factor for economic growth. Based on this paradigm developing countries have attempted to enhance the human capital through public health expenditure as well as government spending on education and other social services.

Al-Yusuf 2000) and Lawson 2009) noted that education, health care, training and investment in social services enhances and improves the human capacity which has a spill-over effect on economic growth. Public health expenditure consist of recurrent and capital spending from government (federal, states and local government) budgets, external borrowings, and grants (including donations from international agencies and non- governmental organizations), and social (or compulsory) health insurance funds. While, total health expenditure is the sum of

public and private health expenditure. It covers the provision of health service (preventive and curative) family planning activities, nutrition activities and emergency aid designated for health but does not include the provision of water and sanitation WHO(2010).

Graffian and Mckinley 1999) revealed that most developing countries suffer from poor expenditure on health care and the majority of public health care expenditure on hospital and expensive medical care that benefit a small minority of the population living in the cities. A high proportion of the poor is far from this service especially those living in rural areas. They usually rely on home remedies and traditional medicine.

Chaabouni and Abednnadher (2010) examine the determinants of health expenditures in Tunisia during the period 1961-2008, using the Autoregressive Distributed Lag (ARDL) approach by Pesaran et al. (2001). The results of the bounds test show that there is a stable long-run relationship between per capita health expenditure, GDP, population ageing, medical density and environmental quality. In fact, on the one hand there are the short-run and long-run results which reveal that health care is a necessity, not a luxury good. On the other hand, results of the causality test show that there is a bi-directional causal flow from health expenditures to income, both in the short and in the long run. They recommended that policies aiming at encouraging health expenses are required to build up a healthier and productive society to support the Tunisian's economic growth and development. In addition, the Ministry of Health should minimize the gap of inequality distribution of health care among people considering the spread of emerging chronic diseases and assuring the quality and performance of public health supply. Moreover, the external cooperation of the World Health Organization is also required to make an exchange of expertise and health care information.

Olaniyan, Onisanwa and Oyinlola 2013) examine health care expenditures and GDP in sub-Saharan African countries: evidence from panel data. They postulated that Understanding the extent of the linkage between the share of health expenditure in GDP and change in standard of living is important for several reasons. First, it enables a proper accounting of the notable growth in the health care sector over the last half century. Secondly, it is necessary for forecasting how health care spending is likely to evolve in the coming years. Finally, it is a crucial step towards an assessment of the optimality of the growth of the health care sector. In particular, if health spending is strongly increasing in income, so that rising income can explain most or the entire rising health share, it would be more likely that the increasing share of GDP allocated to health is socially optimal. Their analysis indicates that health care expenditure and most of its determinants are non-stationary, and that they are linked in the long-run. The findings shows elasticity is below unity for Sub –Sahara Africa countries, it is significantly lower than 1, indicating that health care is a necessity good. The majority of the countries presents an income elasticity lower than one, confirming that health care is, overall, a necessity good in Sub-Sahara Africa. They noted that the 16 countries, display negative significant coefficients, while 16 other Countries(Burundi, Botswana, Cote d'ivoire, Cape Verde, Djibouti, Ghana, Guinea Bissau, Liberia, Malawi, Mozambique, Rwanda, Senegal, Togo, South Africa, Democratic Republic of Congo, Zambia) show statistically insignificant coefficients. One reason behind these results might be that there exist unobserved cross border movements of recipients that alter the relationship between health spending and income at country level.

Kamiya 2010) examines the determinant of health in 14 developing countries using GMM to estimate the determinants of under-five mortality rate with a cross country of 141 developing countries. The empirical results show that GDP per capital and access to improve sanitation have statistically significant in reducing child mortality while health factor which are measured by government health spending, immunization coverage and physician density do not significantly impacted on child mortality reduction.

Abbas and Heimenz 2011) empirically examine the determinants of public health expenditure in Pakistan for the period which span between 1972 and 2006. Using co-integration and error correction methodology, the study reveals that health care in Pakistani is a necessity commodity. Urbanization and unemployment have negative effect on health care expenditure which implies that it is costly to provide health care to resident of remote rural area of Pakistan.

Agbatogun and Taiwo 2010) empirically examine the determinants of health expenditure in Nigeria. They show that improvement in health sector is sine-qua-non to sustainable economic growth and development. They found that gross domestic product is the most important determinants of health allocation and literacy rate and population's growth rate are insignificant determinant of health expenditure in Nigeria. They recommended that there is need for health sectors reformed in order to improve the health of the people and reduce the burden on the government by encouraging more private sector participation.

### **3.0 Research Methodology**

#### **3.1 Theoretical Framework and Model Specification**

The literature identifies four alternative approaches to determining general expenditure: Cost Accounting, Demand-side argument, Supply side factors, and Development theory (Ayanwu 2009). The cost accounting approach involves government programmes, including health, education, and social security and separates the effects of demographic influence, changes in coverage and increases in real benefits (Sanders and Klau 2008).

According to (Anyanwu 2009) the demand-side approach includes Wagner’s Law, preference-based explanations and public choice theories.

First, it is argued that price or unit cost of government output affects growth on government spending.

Secondly, Wagner Law postulated that there are inherent tendencies between growths of economic and government activities with the result that governmental sector grows faster than the economy. This implies that as income rises, the demand for government increases more than in proportion, primary because of the technological requirements of industrialization and the urbanization that accompanied it, that is the income effects.

Thirdly, it is opined that prevailing ideologies or other political economy explanations that reflect different attitude about the role of government, and hence different “tastes” account for some variance in government spending. The public choice school embraces a number of demand oriented model of government expenditure growth, including theories of bureaucracy and median voter and public employees voting models.

However, Anyanwu 2009 asserts that public voting models fail to apply in nationals without demographic institutions.

Supply-side model predicts that increase in the unit cost of public production is an important determinant of the growth in government expenditure. The other supply-side argument reflects ‘Says law of government spending’: public expenditure is driven by the availability of revenue (see also peacock and wise man 1963). This is analogous to the “Please effect”: public expenditure, especially for consumption, is driven by available resources (Please 1998).

Development theories explain growth of government expenditure in developing countries in terms of the fact that government spending accounts for higher shares of national income than it did when the now industrial economics were at comparable level of per capital income (Ayanwu 2009). Thus, it is opined that multilateral and bilateral aid with their requirement for public sector rather than private sector counterparts and the demonstration effects of successful capitalist and socialist countries with large and growing states sectors, affects government expenditure in developing countries.

However, in the specific case of health expenditure, three groups of independent variables are usually important: health stock variables, demographic variables and economic variables (Newhouse 1998; Karatzas 2006; Anyanwu 2009 ; Abbas and Hiemenz 2012). Anyanwu 2009) noted that the health stock variables explain the supply factors while the demographic and economic variables emphasize demand for health expenditure(Hansen and King 1999)

This study adapted an economic model previously used by Histiris and Posuet 2005; Hausen and King 2010; Ayanwu 2009; Abbas and Heimez 2012) to estimates the determinants of public health care expenditure. There work which had earlier been reviewed in the empirical studies made use of Total health expenditure, Gross domestic product per capita, Total population 14 years of Age and younger, health expenditure share in gross domestic product, unemployment rate, population per physician, consumer price index and political instability. This study however, tried to modify there work by employing three (3) additional independent variables: Tuberculosis, Sickle-cell Anemia and HIV/AIDS because according to Commission for Macroeconomics and Health (2001) revealed that the prevalent rate of communicable diseases are very crucial in determining health care expenditure especially in the sub Sahara African Countries Thus, the new model is of the general form that comprises the health stock, demographic and economic variables.

$$TGHE = f(GDPPC, UNR, POP, TBC, SCA, HIV) \dots \dots \dots (i)$$

Base on the foregoing, the econometric model of equation (i) can be expressed in log-linear form:

$$\ln TGHE = \lambda_0 + \lambda_1 GDPPC + \lambda_2 UNR + \lambda_3 POP + \lambda_4 TBC + \lambda_5 SCA + \lambda_6 HIV + G\mathcal{D}_t \dots \dots \dots (ii)$$

Premised on equation(ii), the parameter must satisfy the following sign restrictions:  $\lambda_0 \neq 0$ ;  $\lambda_1 > 0$ ;  $\lambda_2 < 0$ ;  $\lambda_3, \dots, \lambda_6 > 0$

Where:  $\lambda_0$  = Constant Intercept

TGHE = Total government health expenditure in Nigeria

GDPPC= Gross domestic product per capita

UNR = Unemployment rate in Nigeria

POP = Total population

TBC = Tuberculosis

SCA = Sickle-cell Anemia

HIV = Human Immuno-deficiency/Acquired Immune deficiency syndrome

$G\mathcal{D}_t$  = Error Term

$\lambda_1, \lambda_2, \lambda_3, \lambda_4, \lambda_5$  and  $\lambda_6$  = are parameters to be estimated

### 3.2 Sources of Data

This study will rely on secondary sources of data. The annual time series data from 1981 to 2014 used in this study were obtained from Statistical Bulletin and Annual Report and Statement of Accounts of the Central Bank of Nigeria, World Health Organization Publications as well as the Annual Abstracts of statistics (various issues)

published by the National Bureau of Statistics (NBS). Data on the diseases were sourced from the World Bank Tables (2014) edition.

### 3.3 Description/Identification of Variables

(i) **Total government health expenditure(TGHE):** Consist of recurrent and capital spending from government and this is expected to have positive sign on gross domestic product per capita, Unemployment rate, total population, tuberculosis, sickle-cell anemia and human immuno-deficiency syndrome in line with economic theory and determine in part the determinants of health expenditure in Nigeria.

(ii) **Gross Domestic Product Per Capita(GDPPC) :** This study takes the GDPPC as an important indicator of determinants of health expenditure in Nigeria, because a proportion increase in GDPPC will take in part the determinants of public health expenditure in Nigeria and also is the share of public health spending from GDP.

(iii) **Unemployment Rate(UNR):** This is the number of unemployed divided by the number of people in the civilian labour force and also shows how well a nation's human resources are used and serves as an index of economic activities. The a-priori expectation is that, they exhibit negative relationship with total government health expenditure in line with economic theory.

(iv) **Total Population(POP):** This is expected to have positive relationship with total government health expenditure based on economic theory. They also showed more influence on public health expenditure particularly when there is a rise in population of the country.

(v) **Tuberculosis(TBC):** This is caused by a bacterium called Mycobacterium tuberculosis usually attack the lungs or any part of the body and this is expected to have a direct relationship with total government health expenditure. This is achieved when there is improvement in health expenditure thus enhance proper and better treatment of the disease.

(vi) **Sickle-cell Anemia(SCA):** is an inherited form of anemia that causes red blood cells to change shape and cause problems in many parts of the body but based on economic theory, it is expected to exhibit positive relationship with public health expenditure of the country when there is improvement in health expenditure.

(vii) **Human Immuno-deficiency/Acquired Immune deficiency syndrome:** is a virus that gradually attacks the immune system which is our body's natural defence against illness. In line with economic theory, the a-prior expectation is positive relationship between both variables when there is improvement in public health expenditure, this will in turn enhance better treatment of the virus.

### 3.4 Method of Data Analysis:

The method of data analysis employed in this study is both descriptive and analytical. The descriptive tools include the use of tables and percentages. The analytical tool used the contemporary co-integration test in the analysis of data. This is premised on the fact that if the variable are non-stationary, the desirable properties of efficiency, consistency and un-biasedness will be lost if Ordinary Least Square (OLS) regression techniques used in the estimation of the equation. The estimation procedure adopted in this study is in three sequences.

(i) The time series properties of the data employed in the study is first carried out to determine if they are stationary. Most time series data are non-stationary and using non stationary variable in the model might lead to spurious regression (Granger and Newbold 1974). To stem the problem of spurious regression, it is important that the time series properties of the data set employed in estimation of equation 1 is ascertained. The general model used in testing the presence of a unit root is specified thus:

$$\Delta y_t = \lambda_0 + \delta y_{t-1} + \sum \lambda_1 \Delta y_{t-1} + \epsilon_t \dots \dots \dots (iii)$$

Where: y is the series, t is (trend factor),  $\lambda_0$  is the constant term,  $\epsilon_t$  is the Gaussian white noise and  $\beta$  is the lag length. the Philip-Perron (PP) unit root test is employed to test the integration level.

(ii) The second step is the testing of presence or otherwise of co-integration between the series of the some order of integration through forming a co-integration equation. Aremu (2009) asserts that the fundamental assumption when experimenting with co-integration is that the variable is integrated of the same order. The set of variable X<sub>t</sub> is said to be co-integrated if a linear combination of the variable will result in stationary process i.e. I(0). For a regression relation to be robust and meaningful the various series must be co-integrated; if otherwise, the equation retains its unit's roots properties and hence misleading regression. In this study the approach adopted is the maximum likelihood test procedure established by Johansen and Juselius (1990) and Johansen (1991). The Johansen's technique is chosen because it is vector auto-regression based and there are clear evidence that it performs better than single equation and alternative multivariate method (Olusanyu and Oyaromade 2009). Specifically, if Y<sub>t</sub> is a vector of n stochastic variables, then there exist a P-lay vector auto regression with Gaussian error of the following form:

Johansen's methodology takes its starting point in the vector auto regression (VAR) of order P given by

$$Y_t = \mu + \Delta_1 y_{t-1} + \dots + \Delta_p y_{t-p} + \sum \epsilon_t \dots \dots \dots (iv)$$

Where: y<sub>t</sub> is an n x 1 vector of variables that are integrated of order commonly denoted (1) and  $\sum \epsilon_t$  is an n x 1 vector of innovation.

This VAR can be re-written as

$$\Delta y_t = u + n y_{t-1} \sum_{i=1}^{p-1} r_i \Delta y_{t-i} + \sum_{i=1}^{p-1} \dots \dots \dots (v)$$

Where:  $\pi = \sum_{i=1}^p A_{i-1}$  and  $T_i = - \sum_{j=i+1}^p A_j$

To determine the number of co-integration vectors Johansen (1988, 1989) and Johansen and Juselius (1990) suggested two statistic tests, the first test is the trace test (trace). It test the null hypothesis that the number of distinct co-integrating vector is less than or equal to q against a general unrestricted alternative q=r. the test calculated. Thus:

$$\lambda \text{ trace } (r) = - T \Sigma \ln(1 - \lambda_t) \dots \dots \dots (vi)$$

T is the number of usable observations, and  $\lambda_t$ 's are the estimate eigen value from the matrix. The second statistical test is the maximum eigen value test ( $\lambda \text{ max}$ ) that is calculated according to the following formula:

$$\lambda \text{ Max } (r, r+1) = -T \ln (1 - \lambda_{r+1}) \dots \dots \dots (vii)$$

The test deals with a test of the null hypothesis that there is r of co-integrating vector against the alternative that r + 1 co-integration vector.

(iii) If co-integration is proven to exist the next step require the construct of error correction mechanism (ECM) to model dynamic relationship short run dynamic with long run equilibrium. The ECM incorporated the (short-run) dynamic of the model:  $Y_t = a \beta y_t + \sum t \dots \dots \dots (viii)$

### 3.5 Empirical Results and Analysis

The analysis of the regression results is in different versions namely: analysis of unit roots, co-integration test results and the analysis of parsimonious error correction estimations. The unit root tests were conducted to ascertain the adequacy of stationarity and order of integration of each variable shown in table 4 below. All the variables in the study are stationary using the Phillips-Peron(PP) test statistics at 5% level of significance. The study tested for co-integration of residuals generated from OLS estimates and this passes the stationary test portraying co-integration among the variables studied.

**Table 1. Result of stationarity Test on variables using Philip-Perron**

Variable	@ Level PP-Test	1 <sup>st</sup> Diff. PP-Test	2 <sup>nd</sup> Diff. PP-Test	C.V 5%	C.V 1%	Order of Integrat	RMK
THE	2.696650	-7.011168	-	-2.957110	-3.653730	1(1)	S
GDPPC	-0741022	-7.102246	-	-2.957110	-3.653730	1(1)	S
UNR	-12.22150	-	-	-2.954021	-3.646342	1(0)	S
POP	22.30645	-	-	-2.954021	-3.646342	1(0)	S
TBC	-1.051386	-4.280316	-	-2.957110	-3.653730	1(1)	S
SCA	-3.164004	-	-	-2.957110	-3.653730	1(0)	S
HIV	-1.336018	-2.192797	-8.270122	-2.963972	-3.670170	1(2)	S

Source: Author's computation from PP output on E-views 7.1 2015

The Philip-Perron (pp) test was conducted on all the variables at levels, first difference, and second differences as shown in table 4 above. The results show that UNR, POP and SCA are stationary at levels except TGHE, GDPPC, TBC and HIV which were non-stationary at their levels as confirmed by the values of the Mackinnon (1976) associated one sided-p-values in each series. A further test for unit root at first differences made TGHE, GDPPC and TBC to be stationary while at 2nd difference, HIV became stationary. This result confirms that UNR, POP and SCA are integrated of order zero, 1(0); TGHE, GDPPC, TBC and HIV are integrated of order one, 1(1) and HIV is integrated of order two, 1(2) respectively. The properties exhibited by the time series variables above created the necessary condition for co-integration test.

#### 3.5.1 Co-integration Test

Co-integration tests enable us determine whether the variable in the model are co-integrated. If there is evidence of co-integration, theory tells us a long-run relationship exists among the variables in the model. Also, it rules out the possibility of spurious correlation among the variables. We follow the approach of (Johansen 1988; Juselius 1990), two likelihood ratio test statistics- the trace and maximum eigen value statistics in carrying out the test. Johansen method detects a number of co-integration vectors in non-stationary time series. It allows for hypothesis testing regarding the element of co-integrating vector and loading matrix. This procedure is used to determine the long run relationship between the variables. There is growing evidence in favour of the robustness of the trace statistics (Hassan 2011), we accept the trace test result as presented in Table 3. below

From the table, the trace test statistics indicates there is at least five co-integrating equations among the variables as the null hypothesis of no co-integration equation is rejected at 5%.

**Table 2. Johansen co-integration Test**

Hypothesis no. of CE(s)	Eigen Values	Trace Statistic	5% Critical value	Prob.**
None *	0.962834	236.8916	125.6154	0.0000
At most 1 *	0.849361	134.8285	95.75366	0.0000
At most 2 *	0.530077	76.14957	69.81889	0.0143
At most 3 *	0.500177	52.73881	47.85613	0.0162
At most 4 *	0.427618	31.24027	29.79707	0.0339
At most 5	0.237888	13.94388	15.49471	0.0845
At most 6	0.163176	5.522369	3.841466	0.0188

(L.R)Trace test indicates 5 co-integrating equation(s) at 0.05 level

\*denotes rejection of the hypothesis at the 0.05 level

\*\*Mackinnon-Haug-Michelis(1999) p-value

**Source: Author's computation from PP output on E-views 7.1 2015**

The result shows that there exist five (5) co-integrating equations at 5% level of significance. This is because the trace test statistic is greater than the critical value at 5%. This shows that there is long run relationship between total government health expenditure and all the explanatory variables.

### 3.5.2 Parsimonious Error Correlation for the determinants of government health expenditure in Nigeria.

The results of parsimonious estimations model are presented in table 3 below, in which all the regressors passed the test of significance by gradually deleting insignificant variables out of over-parametized model (Engel-Granger 1987)

**Table 3: Parsimonious Error Correction for Determinants of Government Health Expenditure in Nigeria Modelling DGTHE by OLS.**

Variable	Coefficient	Std Error	t-statistic	Probability
C	-59976.76	21087.51	-2.844184	0.0104
D(GDPPC)	-2.51E-05	2.31E-05	-1.088336	0.2901
D(UNR)	42722.85	23464.48	1.820745	0.0844
D(POP)	0.020644	0.005636	3.662809	0.0017
D(TBC)	2805.022	1245.679	2.251801	0.0364
D(SCA)	7049.066	4600.998	1.532073	0.1420
D(HIV)	-54348.29	33039.40	-1.644954	0.1164
D(GDPPC(-1))	-8.67E-05	2.76E-05	-3.144904	0.0053
D(UNR(-3))	-32236.78	18950.54	-1.701101	0.1052
D(SCA(-3))	9536.807	4148.629	2.298785	0.0330
ECM(-1)	-0.875656	0.168744	-5.189272	0.0001

$R^2 = 0.776895$ ;  $R^2 = 0.659$ ;  $F = 6.616$ ;  $D.W = 2.645$

**Source: Author's computation**

## 4.0 Interpretation of Results

The parsimonious model result above shows that the coefficient of the error correction term (ECM) is negative and the same time significant with a very low probability value of 0.001. Its value in absolute term is about 0.8757 indicating that about 88% percent of the disequilibrium in the total government health expenditure in the previous year is corrected in the period. This is also appears significant demonstrating the fact that dependent and explanatory variables go a long way in explaining government total health expenditure in Nigeria.

In the result, there exists a negative insignificant relationship between gross domestic product per capita and total government health expenditure in Nigeria contrary to the a-priori expectation. This implies that one percent increase in gross domestic product per capita will lead to 2.510% decrease in total government health expenditure. The coefficient value is not significant at 5% significance level which is confirmed by the very high probability value of 0.290. While the lagged value of GDPPC bears negative coefficient and statistically significant at 5% significance level. The implication of this study is that the elasticity of less than one of the variable indicates that health care expenditure in Nigeria is a normal good. The low value of the variable is a pointer to the fact that income in Nigeria is not equitably distributed and the government lack the political will to prioritize the health care sector. This findings is consistent with Omotor (2009), Reman, Basse and Edu (2011) and Abbas and Hiemenz (2011) in their studies of determinants of health expenditure. They noted that health care expenditure is a normal good. But contrary with Ayanwu (1998) who noted that health care expenditure is a luxury good. The discrepancy in findings may be attributed to various health policies put in place by government to enhance the growth and development of this sector.

From table 3. it could be observed that the Total Population has positive and significant effect on



government health care expenditure. This in line with the a-priori expectation, this shows that an increase in Total Population will lead to 0.020644 percent increase in total government health expenditure in Nigeria. The coefficient of Total Population is also significant at 10% significance level with a very high probability value. The implication of this result is that proportionate increase in the Total Population will lead to high demand of public health expenditure in terms of provision of basic equipments into the hospital in Nigeria so as to tackle some vital deadly diseases for any group of population. This result conforms to Khorassani and Paskawych (2009) who reported that the proportion of the population of 15 years old / younger have the largest effect on per capita healthcare expenditures in the United States. They concluded that children are the ones highest in demand for healthcare.

The Unemployment rate has positive sign and significant at 10% significance level and also is not consistent with the a-priori expectation of negative sign. The value of the coefficient is 42722.85. This implies that one percent increase in Unemployment rate will leads to 42722.85percent increase in government health expenditure. While the lagged value of UNR exerts negative coefficient and not significant even at 10% significance level. The positive and significance of this variable is attributed to the positive effect of employing people in productive jobs and thereby increasing national income as well as individual income. These findings also reveal that unemployment lead to increase in provision of public demand of health facilities in Nigeria.

The Human Immuno-deficiency syndrome variable coefficient bears a negative sign, contrary to a-priori expectation and is not statistically significant at 5% significance level. This implies that no direct relationship exists between Human Immuno-deficiency syndrome and total government health expenditure in Nigeria. The value of the coefficient of HIV is -54348.29. This implies that one percent increase in HIV will lead to 54348.29 percent decrease in government health expenditure. This finding is a pointer to the fact that the Nigerian health sector is short fall of inadequate provision of health expenditure which will lead to reduction in total government health expenditure in Nigeria. This findings is consistent with (Kamiya 2010) findings that HIV has no significant impact on health expenditure in the sub Saharan Africa countries.

The coefficient of Sickle-cell Anemia is 7049.07. This implies that a one percent increase in Sickle-cell Anemia will leads to 7049.07 percent increase in total government health expenditure. This variable was found to be not statistically significant at 0.05 percent level of significant judging from the pro-value estimate of 0.1420. Also, the lagged value of SCA is positive and significant 5% significance level. The positive nature of Sickle-cell Anemia indicates that cost of health care does not discourage Nigerians for the demand of health resources. This confirmed to the findings of (Havemann and Vander Berg 2002) in South Africa that the amounts charge in hospital is not statistically significant in demand for health care services. This is conforming to the theoretical view and empirical findings that health care demand is reasonably price inelastic. Ailemen, Asokhia and Okojie (2011) postulated that the reason is that most people can borrow to obtained health care services.

The estimated coefficient of Tuberculosis (TUB) was found to 2805.02. Thus, a direct relationship with total government health expenditure was established and significant at 5% significance level. This is consistent with the a-priori expectation. This implies that one percent increase in Tuberculosis will leads to 2805.02 percent increase in government health expenditure. The positive and significance of this variable is attributed to better health budget for health sector that brought about positive response to prevalent rate of deadly diseases like Tuberculosis. These findings also reveal that Tuberculosis lead to increase in provision of public demand of health facilities in Nigeria.

$R^2$  = The coefficient of multiple determination is 0.776895. This result shows that the model has a good fit.

The overall goodness of the model as shown by the adjusted coefficient of determination ( $R^2$ ) is 0.659, which shows that about 66 percent of the variation experience in total government health expenditure of Nigeria for the period being investigated may be explained by the independence variables included in our model.

The F-statistic which measure the joint statistical influence of the explanatory variable in explaining the dependent variables was found to be statistically significant at 5 percent significance level. The F-statistic value of 6.616 shows that the explanatory variables are important determinants of Nigeria total government health expenditure.

The value of Durbin Watson (DW) statistic is 2.645111 for the model. This implies that there are absence of serial auto-correction among the explanatory variables in the model. Thus, there is no evidence of positive first order serial correlation.

#### 4.1 Pairwise Granger Causality Test as Evidenced in Appendix N

The pairwise granger causality test was used to assess the causal relationship between the level of Total Government health expenditure (TGHE) and the rest of the determinants of public health care expenditure. The test results show that there is no causality between TGHE and the following variables: UNR, TBC, SCA, and HIV; between GDPPC and the following variables: UNR, POP, and HIV; and also between UNR and the following variables: TBC, SCA and HIV in the model. However, the result revealed that there is a two-way causality between TBC and POP and also, between HIV and POP in the model. In the same vain, unidirectional causality exists

between HIV and TBC; GDPPC and TGHE, SCA and POP; and between POP and TGHE, TBC and GDPPC, GDPPC and SCA, UNR and POP, UNR and SCA, and also between HIV and SCA at 1%, 5% and 10% level of significance respectively without a feedback as shown in appendix N.

## 5.0 Summary, Conclusion and Policy Implications

### 5.1 Summary

This study empirically x-rays the determinants of public health expenditure in Nigeria between 1981 and 2014. The study was conducted to identify those factors that can promote health expenditure in Nigeria. In order to achieve the aims of the study, an econometric model was formulated. Total government health expenditure was regressed on Gross domestic product per capita, Unemployment rate, Total Population, Tuberculosis, Sickle-cell Anemia and Human immunodeficiency Virus (HIV). These variables were included in our econometric model based on review of past studies.

The study uses error correction mechanism to estimate the total government health expenditure and all independent variables after conducting stationarity and co-integration test. The result shows that all variables included in the model are stationary at levels  $I(0)$ , first difference  $I(1)$ , and second difference  $I(2)$ . Also the co-integration test showed presence of long-run relationship between dependent and explanatory variables in the model. The major findings of the study are summarized as follows:

There exists a negative but insignificant relationship between gross domestic product per capita and total government health expenditure in Nigeria. The implication of this study is that the elasticity of less than one of the variable indicates that health care expenditure in Nigeria is a normal good. The low value of the variable is a point to the fact that the income in Nigeria is not equitably distributed and the government lacks the political will to prioritize the health care sector. This finding is consistent with Abbas and Hiemenz (2011) in Pakistan.

The result also shows that the Total Population has positive and significant effect on government health care expenditure. The implication of this result is that proportionate increase in the Total Population will lead to high demand of public health expenditure in terms of provision of basic equipments into the hospital in Nigeria so as to tackle some vital deadly diseases for any group of population.

Tuberculosis (TUB) result assumes direct relationship with total government health expenditure and has positive significant. This is consistent with the a-priori expectation. The positive and significance of this variable is attributed to better health budget for health sector that brought about positive response to prevalent rate of deadly diseases. These findings also reveal that Tuberculosis lead to increase in provision of public demand of health facilities in Nigeria.

The Unemployment rate has positive and significant impact on total government health expenditure and this is not consistent with the a-priori expectation of negative sign. This finding reveals that unemployment lead to increase in provision of public demand of health facilities in Nigeria.

Sickle-cell Anemia proxy for prevalent rate of deadly diseases has direct and insignificant impact on Nigeria total government health expenditure. This variable was found to be not statistically significant at 0.05 percent level of significant judging from the pro-value estimate of 0.1420. Also, the lagged value of SCA is positive and significant 5% significance level. The positive nature of Sickle-cell Anemia indicates that cost of health care does not discourage Nigerians for the demand of health resources. This confirmed to the findings of Havemann and Vander Berg (2002) in South Africa that the amounts charge in hospital is not statistically significant in demand for health care services.

### 5.2 Synthesis

Investment in human capital through health could bring about economic growth in Nigeria. Health enhances worker effectiveness and the productivity of an individual through increase in physical and mental capacities which are necessary for economic growth and development. Based on this paradigm, the Nigeria government has devoted huge budgetary allocation to the health sector but this huge health expenditure fails to translate into healthier health status of Nigerians and meet World Health Organisation recommended budgetary allocation to the health sector.

On the basis of this, the study examines the factors that determine health expenditure in Nigeria. Conclusively, the general lesson that emerges from the study is that total population, Unemployment rate and the Tuberculosis are the major determinants of health expenditure in Nigeria and that health demand in Nigeria is a normal good.

### 5.3 Policy Implications

Based on findings of this study the following policy recommendations are put forward: There is need for increase in government spending on health at all levels (primary, secondary and tertiary institution). Government budgetary allocation to health sector should be increased to the prescribe of 15% of its annual budgetary allocation to the health sector. This will make government health expenditure to have a robust effect on Nigerian health status and meet WHO report(2004) recommended budgetary allocation to the health sector.

There is also the need for investment in health and nutrition. Adequate investment in the health sector will improve educational outcome and induce the nation economic growth. It is also necessary that Government health policies that support provision of facilities are induced in the country.

There is need for government to take cognisance of the growth population of her citizenry, prevalent rate of deadly diseases and the rate of unemployment in health care expenditure and allocation policies because these are the major determinants of health expenditure in Nigeria. Government would need to form synergy with the private sector in providing quality and quantitative health facility to meet the demand of Nigerians in line with the Millennium Development Goal (MDGS). There is need for proper implementation and monitoring of our national health policy such as national health insurance scheme (NHIS). This will improve the health status and reduced health burden on household and the government.

Findings from our study have shown that deadly disease such as HIV-AIDS, SCA e.t.c are underfunded. This has contributed to increase in some of these deadly diseases which might lead to reduction in the life expectancy at birth (UNICEF 1999) the results have shown that the money allocated for the reduction in the prevalent rate of these deadly diseases are grossly inadequate. Based on the forgoing, effort should be made by the Nigerian government to improve on the funding of reduction in these deadly diseases. **Finally**, adequate Machinery should be put in place by all sectors of government to arrest corruption and penalize those who divert and embezzled public health fund. This will enhance the mobilization of resources to furnish primary, secondary and tertiary health institutions and this will induced the Nation economic growth.

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## Appendix A

### Table 4.Pairwise Granger Causality Tests

Date: 09/27/15 Time: 02:48

Sample: 1981 2014

Lags: 2

Null Hypothesis:	Obs	F-Statistic	Prob.
GDPPC does not Granger Cause TGHE	32	11.5998	0.0002
TGHE does not Granger Cause GDPPC		0.54512	0.5860
UNR does not Granger Cause TGHE	32	0.10946	0.8967
TGHE does not Granger Cause UNR		0.32914	0.7224
POP does not Granger Cause TGHE	32	5.65025	0.0089
TGHE does not Granger Cause POP		1.55992	0.2285
TBC does not Granger Cause TGHE	32	0.85316	0.4372
TGHE does not Granger Cause TBC		0.83721	0.4438
SCA does not Granger Cause TGHE	32	0.32390	0.7261
TGHE does not Granger Cause SCA		0.85495	0.4365
HIV does not Granger Cause TGHE	31	1.14205	0.3347
TGHE does not Granger Cause HIV		0.02525	0.9751
UNR does not Granger Cause GDPPC	32	0.26868	0.7664
GDPPC does not Granger Cause UNR		0.08659	0.9173
POP does not Granger Cause GDPPC	32	2.38938	0.1108
GDPPC does not Granger Cause POP		0.42379	0.6588
TBC does not Granger Cause GDPPC	32	2.69733	0.0855
GDPPC does not Granger Cause TBC		0.60684	0.5523
SCA does not Granger Cause GDPPC	32	0.41922	0.6618

GDPPC does not Granger Cause SCA		2.83988	0.0760
HIV does not Granger Cause GDPPC	31	2.22268	0.1285
GDPPC does not Granger Cause HIV		0.28287	0.7559
POP does not Granger Cause UNR	32	0.53693	0.5907
UNR does not Granger Cause POP		2.80915	0.0779
TBC does not Granger Cause UNR	32	0.58960	0.5615
UNR does not Granger Cause TBC		0.35903	0.7016
SCA does not Granger Cause UNR	32	0.24557	0.7840
UNR does not Granger Cause SCA		2.54493	0.0972
HIV does not Granger Cause UNR	31	0.38717	0.6828
UNR does not Granger Cause HIV		2.05261	0.1487
TBC does not Granger Cause POP	32	4.90605	0.0152
POP does not Granger Cause TBC		12.3310	0.0002
SCA does not Granger Cause POP	32	3.53430	0.0433
POP does not Granger Cause SCA		2.22772	0.1272
HIV does not Granger Cause POP	31	9.20520	0.0009
POP does not Granger Cause HIV		13.9991	7.E-05
SCA does not Granger Cause TBC	32	1.81525	0.1821
TBC does not Granger Cause SCA		4.35860	0.0229
HIV does not Granger Cause TBC	31	13.3985	0.0001
TBC does not Granger Cause HIV		0.26960	0.7658
HIV does not Granger Cause SCA	31	5.92502	0.0076
SCA does not Granger Cause HIV		0.70678	0.5025