THE EMPIRICAL ANALYSIS OF HEALTH-ECONOMIC GROWTH NEXUS IN NIGERIA (1980-2012)

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Abstract

The paper empirically investigates the relationship between health and economic growth in Nigeria between 1980 and 2012. It adopts quantitative research methodology to question the extent to which health affects economic growth in a developing economy like Nigeria. The paper draws on econometric technique, specifically unit root test and ordinary least square method to find the relationship between real gross domestic product and gross capital formation, total health expenditure and life expectancy.

The paper discovers that all the variables used were stationary, an indication that both dependent and explanatory variables behaved very well (i.e. the data do not exhibit any spurious effect). The paper also reveals thatan increase in gross capital formation, life expectancy, total health expenditure stimulatesreal gross domestic productin Nigeria. The experience from Nigeria suggests that it is necessary to design an economic policy which supports indigenous and foreign investments in the health sector, improves the governance in the management of allocated funds in the health sector and critically repositions our health personnel through modern training and re-training to enhance the life expectancy of Nigerians in order to stimulate sustainable economic growth.

Keywords: GDP**,**Gross Capital Formation, Life Expectancy and Total Health Expenditure.

I. Introduction

Developmenteconomists are of the view that health[1] availability in every economy isa fundamental policy element which stimulates broad-based economic growth. There can be no significant economic growth in any country without adequate human capital development (Armer, 2005, Yaqub, Ojapinwa&Yussuff, 2012). Sound health enhances workers' productivity through the spill -over effects on their physical and mental abilities. Ceterisparibus[2], it is reasonable to advance that healthy workers work harder and longer and reason more plainly than those who are less gifted with good health. Sound health reduces the incidence of poverty through higher labour participation and reduction in cost of medical services, thus releasing income for other welfare improving consumption. This condition holds irrespective of whether the worker is skilled or unskilled. Similarly, improved health enhances both the magnitude and quality of the labour force, thereby leading to economic growth (World Bank 1994; Barro& Lee 1994; Gallup & Sachs, 2000).

Following Yaqub, et al (2012), the implications of diseases such as HIV/AIDS are potentially harmful to the economic growth of developing countries. This position justifies huge allocation of public fund to health care provision in developing countries in order to improve the well-being of their citizenry for the promotion of economic growth and development.Despite the rising profile of budgetary allocation to social services in most of the developing economies, poorbudget management has been linked to weak availability of health infrastructure in many developing countries (World Bank, 1998, 1999).

This paper is significant in order to fill the gap in knowledge in areas involving the relationship between health and economic growth in Nigeria. This is particularly fundamental to unraveling the extent to which health indicators impact on growth in Nigeria. Apart from previous studies in the developed countries (see: Barro& Lee, 1994; Barro, 1996; Bloom & Williamson, 1998; Gallup &Sach, 2000), little work has been done on the impact of life expectancy on economic growth. The direction of this paper is to incorporate life expectancy into other indicators such as gross capital formation and total health expenditure which determine economic growth in Nigeria.Reflecting prior study by Akram,Haq, and Khan (2008) the inclusion of life expectancyinto the health indicators will provide clearer picture on how the health of the Nigerian workforce affects growth.

Therefore, the objective of this paper is to investigate the empirical relationship between health and economic growth in Nigeria. The rest of this study is structured as follows: section 2 presents a review of literature which comprises both conceptual and empirical linkages between health and economic growth. Section 3 indicates the methodology while Section 4 presents the analysis and results. Section 5 deals with conclusion and policy implications.

II. Literature Review

The relationship between health and economic growth has generated many debates by scholars in both developed and developing countries. In this paper, we shall focus on relevant conceptual and empirical linkages between health and economic growth in order to understand various interpretations that have shaped the health- growth nexus following divergent views of different scholars.

Conceptual linkages between Health and Economic Growth

Strauss and Thomas (1998) and Schaultz (1999) suggested that good health has positive effects on the learning abilities of children, which leads to better educational outcomes, school completion rates, higher mean years of schooling, achievements and increases the efficiency of human capital formation by individual and households. Bad health undermines job productivity and an individual's ability to learn and to grow intellectually, physically and emotionally. Through all these channels, ill health pushes the poor deeper into poverty. If diseases were controlled so that individuals could live longer and healthier lives, the pressure to have many children would abate and the family could invest more in the health of each child. These improvements in health would in turn translate into higher incomes, higher economic growth and reduced (and more sustainable) population growth. Therefore, better health can be both growth inducing and poverty reducing**.**

The World Health Organization (WHO) defined health as a state of complete physical, mental and social well-being. This implies that a nation whose citizens enjoy good health is not merely a nation where there is absence of disease or infirmity. While it is not practicable for every citizen of a nation to be healthy, the following are required for healthy community or nation: a substantial proportion of the population must be healthy, health facilities must be available if possible for everyone that needs them and information must be available on what our major health problems are and suitable provisions made for them (Ekpo&Umoh, 2004).

Case (2001) analyzed the strong possible relationship between income and health throughout the world, and found the important significant effect of water source and sanitation for improving health and avoiding diseases. Besides, he recommended transfer to the poor and pensions to the elderly in order to allow them to increase health expenditures. In the same vein, Ekpo (1987) maintained that the process of education produces health personnel of various levels and specializations. Moreover, according to him, only healthy people can produce and thereby contribute to national income. The interrelationship between health and education and output must not only be dynamic but also dialectical for an economy to grow and develop. In which case, good health and quality education enhance growth and development while the later reinforces the former. If the quality of health and/or education declines, the quality and quantity of national products decreases, ceteris paribus.

Health is important both as a source of human welfare and a determinant of overall economic growth (WHO, 2010).The effects of health on economic performance are usually discussed at both the micro and macro levels in the literature. Evidence of this link at the micro level has been discussed extensively elsewhere (see Schultz, 2002). Good health is a necessary condition for school attendance since a child has to be healthy to endure the physical stress of schooling. Also, healthier students, in contrast to their less healthy counterparts, have lower malingering and higher cognitive functioning and thus receive a better education for a given level of schooling which in turn guarantees higher earning over a longer period of time. Sound health enhances workers' productivity through the spillover effects on their physical and mental abilities. All other things being equal, it is presumed that healthy workers work harder and longer and reason more plainly than those who are less gifted with good health. Good health can also minimize the incidence of poverty through higher labour participation and reduction in cost of medical services, thus releasing income for other welfare improving consumption. This condition holds whether of the worker is skilled or unskilled (ibid)..

There is proven evidence that adult health depends on child health and itself directly influences labour productivity. In other words, improvements in child health for instance which implies reduction in child mortality rates, translate to improvements in adult health in subsequent years. Arising from this, several options are noticeable. First better adult health implies a reduction in middle age mortality and reduction in premature retirement. This improves the demographic transition by reducing dependency ratio in the economy with ultimate improvements in per capita income. Besides improved adult health means longer period of working life. This means higher savings with improvements in the saving investment ratio. The improved labour productivity emanating from this contributes to per capita income. The world health organization (1999) and Babatunde (2011) vividly captured the link between health and income as depicted in Figure 1 (see appendix). Evidence

abounds today about the potential symbiotic relationship between health and economic growth. The path through which health improvement can influence the economy as identified in the literature include its effect on child health, labour market participation, workers' productivity, saving, investment in human capital, education outcomes, fertility, dependency ratio and population age structure (Bloom & Canning 2000: World Health Organization 1998).

Empirical Review

In economic literature, several attempts have been made to investigate both the short run and long run relationship that exist between health and economic growth. However, evidence from different empirical literature on the nature of these relationships mentioned above has remained inconclusive.Behrman et al (2003), Alderman, Harold, John and Bill (2006), Maccini and Yang (2005), Chávez, Adolfo, Celia, and Beatrice (1995) examined the long-run effect of childhood nutrition using a variety of natural and man-made experiments that provide exogenous variation in nutrition leads to improvement in school completion, intelligence quotient (IQ), height and wages.

Barro (1996), following a Ramsey scheme, develops a growth model including a physical capital input level of education, health capital, and quantity of hours worked; by obtaining first order conditions. The researcher finds that an increase in health indicator raises the incentive to invest in education and a rise in health capital lowersthe rate of depreciation on health, adding there are diminishing marginal returns to investment in health (Gallego 2000).Lorentz, et. al. (2005) analyzed the impact of adult mortality rate on economic growth. Study finds that high mortality rate reduce economic growth by curtailing the time horizon.

Arora (2001) uses the life expectancy at birth, at ages; five, ten, fifteen, twenty and structure of adulthood as health indicators for ten industrial countries. The study concludes that improvement in health status has increased the pace of long-term economic growth by 30-40 per cent.Akram*et al* (2008) investigated the impact of different health indicators on economic growth in Pakistan. Co-integration and error correction techniques were applied on the time series data of Pakistan for the period of 1972-2006.The study finds that per capita GDP is influenced by health indicators in the long run and health indicators cause per capita GDP. However, in the short run the health fail indicators to put significant impact on per capita GDP .Their empirical findings also reveal that indicators have a long run impact on economic growth. This suggests that the impact of health is only a long run phenomenon and in the short run there is no significant relationship between health variables and economic growth.

Duraisamy and Maha (2005) point out that to the extent that improvement in health status of the work force leads to improvements in national income, also better health for the poor has the capacity to contribute more directly to poverty reduction which in turn can be used as an element of pro-poor growth strategy.Fogel (1994) demonstrates that close to 33% of the increase in real income in Britain during the 19^{th} and 20^{th} century is accounted for by improved health and good nutrition.

Mayer (2001) observed that there is a significant causal relationship running from improvement in adult survival rate and growth performance in Brazil and Mexico, while Weil (2001) demonstrates that health (measured by life expectancy at birth) explains about

17% of variation in real income per capita of countries.Also in another study, Gyimah-Brempong and Wilson (2004) observed that about 20% and 30% of the growth rate of per capita income in sub-Sahara Africa and OECD countries respectively, can be attributed to health. Most of the studies examining the relationship between incomes, health and productivity have been done using household data.

III. Methodology

The methodology adopted in this study is quantitative because the research draws heavily on time series data to examine the behavior of a number of macro-economic aggregates that are germane to developing a structural model which can pragmatically capture the relationship between health and economic growth in Nigeria. The paper employs econometric technique (ordinary least squares) and specifically draws on unit root test and OLS to estimate the coefficients of different variablessuch as: GCF(Gross capital formation), LE(Life Expectancy), THE(Total Health Expenditure) and RGDP(Real Gross Domestic Product) for the period between 1980 and 2012. Following the methodological framework, the paper presents the sources of data, model specification, analysis and results as follows:

Sources of Data

Time series data on: gross domestic product, health expenditure, capital formation and Labour force were used in the study and they are entirely secondary data. The data were obtained from the Central Bank of Nigeria (CBN) statistical bulletin and the national Bureau of statistics. Health expenditure data were obtained from background to the budget reports and approved budget estimates at the ministry of finance as well as annual Health sector strategic report from the ministry of health of Nigeria.

Model Specification

The modelspecification in this paper was derived from the works of Solow,Odusola(2002), Bloom, Canning and Sevilla(2004) andOlubokun and Bakare (2011) .In line with Bloom *et al* (2004), this study uses life expectancy to represent the health of Nigerian workers. In this paper, life expectancy will replace secondary school enrolment earlier included in the work of Olubokun and Bakare (2011) because life expectancy has more bearing with health indices.

Also reflecting on Solow's formulation, economic growth is a function of capital accumulation, an expansion of labour force and an"exogenous" factor, technological progress which makes physical capital and labour more productive.

That is:

$Yt = (Kt, At, Lt)$ …… (1)

Where

Yt = Aggregate real output.

K = Capital stock

A = Efficiency factor

t = Time dimension

L = Labour

In line withOdusola (2002), 'human capital influences economic growth and hence the model can be modified by adding Human capital (Ht1-L-β), such that:

$Yt=K \alpha t Ht\beta$

(At Lt)…… (2)

The reduced equation for the above will appear as:
Log Yt = αlogKt + βlogHt + βlog (At, Lt)……. (3)
Where
Log Yt = log of real output proxied as Log of GrossDomestic Product (LGDP)
Log Kt = log of capital stock proxied as Log of Gross
Capital Formation (LGCF)
Log Ht = log of human capital proxied as Log of
Health Care Expenditure (LHCE)
Log Lt = Log of labourproxied as Log of Secondary
School Enrolment (LSSE)
By inference from the above formulations, the model is restructured as follows:
LGDP = α0 + α1LGCF + α2LTHE + α3LSSE…… (4)
The a *priori* economic expectations are:
α0> 0, α1 > 0, α2 > 0, α3 > 0
The modified structural model adopted from empirical work of scholars above is then specified in its log form as:
$LRGDP_t=\alpha_o+\alpha_1 LGCF_t+\alpha_2 LTHE+\alpha_3 LLE+U_t$.....(5)
The a priori expectations are;
$\alpha_0> 0$, $\alpha_1> 0$, $\alpha_2> 0$, $\alpha_3>0$. Where;
$LRGDP_t$– log Real Gross Domestic product,
$LGCF_t$ - log of Gross Capital formation,
$LTHE_t$– log of Total Health Expenditure,
LLE_t– log of Life expectancy,
U_t-Error term
With inference to economic theory, it follows from the modified model that public health expenditure, the level of capital formation and labour productivity affect economic growth in Nigeria. Therefore, all the variables are expected to have positive sign and as such the explanatory variables move in the same direction as the dependent variable.
Secondly, the modified model is different from Bloom*et al* (2004) and Olubokun and Bakare (2011) because it subjected all the variables used to rigorous econometric scrutiny in order to test their behavior. This effort reveals the level of stationarity of both dependent and explanatory variables.The discussion that follows captures the results and analysis of the result.

IV. Analysis and Results
Prior to the estimation of equation 5, the characteristics of the data were examined to determine whether the data are stationary or not at levels, first difference or second difference. In order to achieve this objective, the Augmented Dickey-Fuller (ADF) test was used. The result of the stationarity test with intercept is presented in table 1. With the exception of LOGRDGP which was stationary at second difference, other variables (that is,LOGGCF, LOGTHE and LOGLE) were stationary at levels. This is evident from the comparison of the ADF test statistics for the variables used which were found to be less than their critical values at 5% level of significance. By implication, thestationarity of the data makes the dependent and explanatory variables free from any spurious effects.On the basis

of the above, the paper estimated the co-efficient of the variables used in order to analyse the performance of the regression results (see table 2 in appendix).

From Table 2 above, the magnitude of the signs reveals that gross capital formation (GCF), total health expenditure (THE), and life expectancy (LE), all have positive relationships with real gross domestic product (RGDP). It follows that an increase in GCF, THE, and LE will cause an increase in RGDP. By this estimate, a unit increase in gross capital formation (GCF) will cause an increase in RGDP by ₦*1872.61* billion. A unit increase in total health expenditure (THE) will cause an increase in RGDP by ₦*2.24* billion and a rise in life expectancy age by 1 unit will cause an increase in RGDP by ₦*18798.74* billion.

The coefficient of determination (R2) for the model is 0.946215. This indicates that there is a very strong positive linear relationship between the dependent variable (GDP) and explanatory variables (GCF, THE & LE).The explanatory variables accounted for 94.62% of the variation in the RGDP in Nigeria from 1980 to 2012, while the remaining 5.38% variation in the real GDP is explained by other exogenous variables that are excluded in the model a (error term) or stochastic disturbance. Therefore the model is good fit as only less than 6% of systematic variation is left unaccounted for by the model.

Also, a brief look at the adjusted R-squared value of 94.62% indicates that after removing the effect of insignificant regressor's (explanatory variable), about 5.4% variation in the real GDP is still accounted for by the explanatory variables.

The standard error test is carried out to ascertain the correctness, statistical significance and the reliability of the parameters estimated. The test is done by comparing half of the value of the coefficient (½α) of each parameters with its corresponding standard error (S(α)) that is the estimates of the parameters (,α_o α_1,α_2 and α_3) are termed significant if half of the value of the coefficient is greater than their standard error With respect to GCF (α_1): ½ (α) = ½ (1872.61) = 936.305 and S (β) = 2633.795. Since, 936.305 < 2633.795, we will reject the alternative hypothesis (H1), this shows that gross capital formation has no significant effect on economic growth within the period of the study. With respect to THE (α_2): ½ (α_2) = ½ (2.239030) = 1.119515 and S (α) = 0.179033. Since 1.119515 > 0.179033, we will accept the alternative hypothesis (H1), this shows that government expenditure on health has significant effect on economic growth in Nigeria within the period of study. With respect to LE (α_3): $^1/_2(\alpha_3)$ = $^1/_2$(18798.74) = 9399.37 and S (α) = 7780.559. Since 9399.37 > 7780.559 we will accept the alternative hypothesis (H1) this shows that Life Expectancy has significant effect on economic growth in Nigeria.

The probability values of T-statistic for $\boldsymbol{\alpha_0}$**-** $\boldsymbol{\alpha_3}$ are less than 5%. By implication, GCF, THEand LE have significant impact on real gross domestic product (RGDP) in Nigeria at 5% significance level. Similarly, the probability value of F-statistic which is less than 0.05indicates that the explanatory variables are statistically significant at 5% significance level. This result suggests high goodness of fit and denotes that the overall model could be relied upon in making useful inferences.

The Durbin-Watson statistic is a test statistic used to detect the presence of autocorrelation from a regression analysis. As a rule of thumb, if D-W is less than 2.0, there is an indication that the successive error terms are on average, close in value to one another and positively correlated.It therefore means there is presence of auto correlation and if greater than 2.0, there is no autocorrelation. The Durbin- Watson statistic for the models is 0.503969 which shows that there is presence of auto correlation because it is less than 2.

V. Conclusion and Policy Implications

The paper questioned the empirical relationship between Health and economic growth in Nigeria. In doing this, the paper reviewed several conceptual and empirical literatures that have shaped health and economic growth linkages over time, in developed and developing countries.

The paper ensured that all the variables used were properly scrutinized by subjecting the variables to unit root test. The paper found that thestationarity of the data makes the dependent and explanatory variables free from any spurious effects. The paper also discovered that gross capital formation (GCF), total health expenditure (THE), and life expectancy (LE), all have positive relationships with real gross domestic product (RGDP). This revealed that an increase in GCF, THE, and LE was responsible for higher RGDP in Nigeria. Further,the paper found that the explanatory variables accounted for 94.62% of the variation in the RGDP in Nigeria from 1980 to 2012, while 5.38% variation in the real GDP was accounted for by other exogenous variables within the (error term). Unlike the findings of GCF in Bakare and Olubokun (2012), this paper realized that both THE and LE had more significant impact on real GDP in Nigeria. Further, the paper also differed from Bloom *et al* (2004) and Olubokun and Bakare (2011) because it subjected all the variables used to rigorous econometric test which revealed the level of stationarity of both dependent and explanatory variables. It then follows that health indicators are critical for accelerating the growth process in Nigeria.

Based on the findings which emerged from this paper, the following policy recommendations are germane for rapid transformation of health sector for the sustainability of economic growth in Nigeria:

- More investment both local and foreign should be attracted into the health sector to improve the quality of health infrastructure at the local, state and national levels in Nigeria. This policy is capable of enhancing life expectancy of the people, management of diseases that will reduce the death rate at all levels.This policy, if genuinely implemented has a potential implication for robust economic growth in Nigeria.
- From experience, increasing the yearly budgetary allocation in the health sector may not guarantee the much expected impact of the health sector on economic growth in Nigeria. Rather, effective governance mechanism is required to monitor, manage and steer the utilization of yearly budgetary allocation to the health sector if such allocation is to be productively relevant to economic growth in Nigeria. In this regard, accountability, transparency and answerability is required from the officials managing our health institutions.
- In order to improve the life expectancy of Nigerians, the government should invest heavily on regular training of our medical personnel from time to time to be able to offer better medical services which is comparable to those available in advanced and developing countries (such as South Africa). This policy will reduce the leakages which flow out of Nigeria from private and public sectors to handle medical bills abroad.

However, it is strongly suggested that further studies be undertaken in this area, particularly at the local level wherequalitative and quantitative research methodologies willbe adopted in

order to question the governance challenges of health provisions by local institutions. This approach will enable researchers to combine methodological framework in order to improve the quality of findings on the relationship between health and economic growth. Besides, the combined methodological framework will enhance micro-macro dichotomy such that the gaps in using quantitative methodology will be bridged by qualitative methodological framework and vice-versa.

The main contribution of this paper to knowledge lies in unraveling the conceptual and empirical linkages between health indicators and economic growth which was inadequately investigated in previous studies, particularly in Nigeria. Another significant contribution of this paper to knowledge is revealed in the linkages between health outcomes and economic growth, which was modified by the scholars but derived from world health report (1999) and Babatunde (2011). The framework becomes significant in the light of the importance of good health in stimulating life expectancy, higher earnings, access to natural resources and the global economy. These linkages enhance our understanding about various interpretations which have shaped health and economic growth both in theory and practice.

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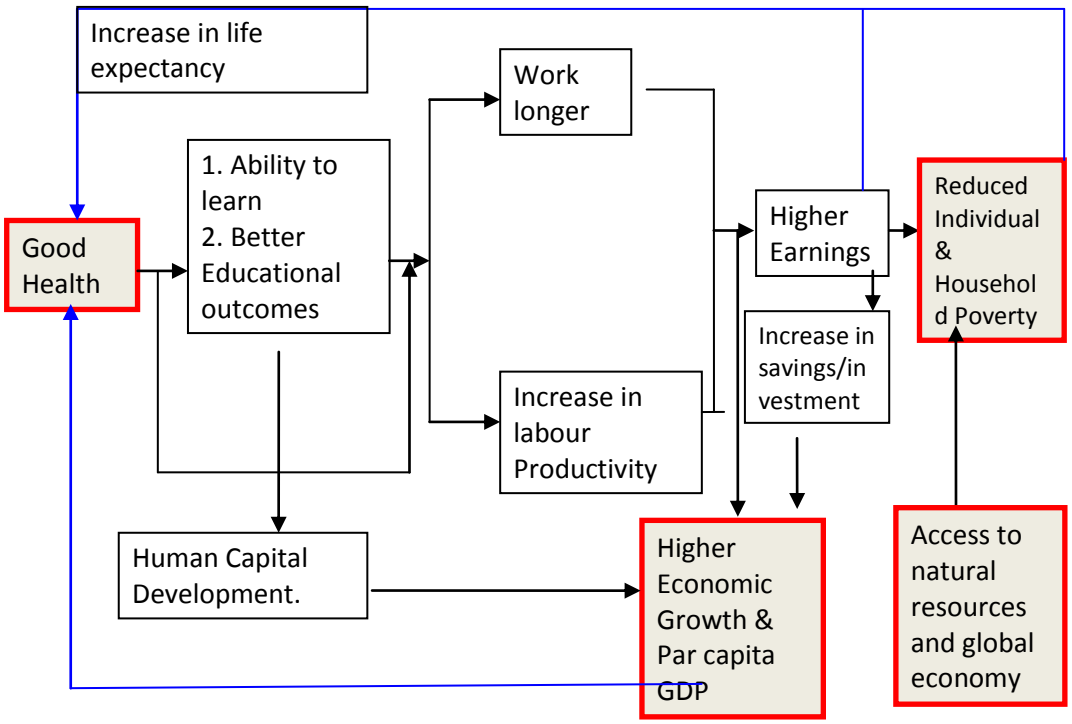
Figure 1: The Relationship between Health Outcome and Economic Growth in Nigeria



Sources: Authors Framework derived from World Health Report (1999) p 11 and Babatunde (2011).

TABLE 1: UNIT ROOT TEST (AUGMENTED DICKEY-FULLER)

VARIABLES	ADF TEST STATISTICS	CRITICAL VALUE @5%	Series of stationarity	REMARKS
LOGGCF	-3.846339	-2.960411	I(0)	Stationary
LOGTHE	-5.860551	-2.957110	I(0)	Stationary
LOGLE	-3.171111	-2.981038	I(0)	Stationary
LOGRGDP	1.927317	-2.960411	I(0)	Non Stationary
DLORGDP	-1.991722	-2.960411	I(1)	Non Stationary
(DLOGRGDP,2)	-7.408842	-2.963972	I(2)	Stationary

Source: Data Analysis (2014)

TABLE 2 REGRESSION OUTPUT

Variable	*Coefficient*	*Std. error*	*t-statistic*	*Prob.*
C	***-647553.5***	***358642.4***	***-1.805569***	***0.0000***
GCF	**1872.606**	**2633.795**	**0.710991**	**0.0000**
THE	**2.239030**	**0.179033**	**12.50625**	**0.0000**
LE	**18798.74**	**7780.559**	**2.416117**	**0.0000**
	R-square		**0.946215**	
	Adjusted R-square		**0.940651**	
	F-statistics		**170.0614**	
	Prob(F-statistics)		**0.00000**	
	Durbin Watson		**0.503969**	

Source: Data Analysis (2014)

Endnote

1. Health is a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity (WHO, 2005).
2. It is a Latin phrase which means al things being equal.