Health Indices and Nigerian Economic Growth

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Abstract

The investment in health is expected to contribute to economic growth through improvement in the life expectancy, reduction in absentees at work due to ill health of children and mothers, higher productivity, higher disposable income due to reduction in health expenses and reduction in mortality rates. However, empirical literature on the health and economic growth in Nigeria are mixed. Some studies reported inverse relationship while many others established direct impact. This, therefore, encouraged many attentions on the issue of Nigerian health in the literature. This study examined an impact analysis of health indices on the Nigerian economic growth. An empirical investigation was conducted using time series data on Gross Domestic Product, Infant mortality rate, Maternal mortality rate, Human Development Index, Neonatal Mortality rate, Under-5 Mortality rate and Life expectancy from 1986 - 2018. The technique of estimation employed in the study was Ordinary least square (OLS) method. A significant relationship between infant mortality rate and economic growth in Nigeria was established while an inverse relationship among neonatal mortality rate, under-5 mortality rate, life expectancy, human development index and economic growth in Nigeria was recorded. The study revealed that health indicators have a significant impact on economic growth. It was therefore, recommended that on-job training, seminars and workshops can be used to increase the Human Development Index of Nigeria as this can lead to sustainable economic growth. Also, proper public enlightenment and education of mothers on best health care practices is imperative for infant and child survival.

Keywords: Economic growth, Infant mortality rate, Under-5 mortality rate, Life expectancy, Neonatal mortality rate, Human Development Index, OLS.

Introduction

Health, according to the World Health Organization (WHO) in 2000 is the state of being free from physical or psychological disease, illness or malfunction. It is a state of well-being or balance. The WHO further defines it as a state of complete physical, mental and social wellbeing and not merely the absence of disease or infirmity. The WHO, however, confirmed that many components are entrenched in good health which has deep meaning different from least disease, as this is more in keeping with poor health. In fact, the definition of health has been modified to include the ability to live a socially and economically productive life.

The growth of health in the development process of any economy cannot be overemphasized and according to Salami *et al* (2017) opined that only well-educated and healthy people produce optimally and contribute to national output. Also, according to Weil (2014); the simplest channel of casualty running from health to economic growth is through workers' productivity. Individuals who are healthier are able to work more effectively both physically and mentally. Further, adults who are healthier as children will have acquired more human capital in the form of education which will optimally use in further production of goods and services.

Health indices are crucial part of an economic development, especially in developing countries. Health Indices such as quality of life, life expectancy, infant mortality rate, maternal mortality rate, under 5 mortality rate, human development index (HDI) of an economy are being provided solution through three basic health sectors of an economy which are: primary health care, secondary health care and tertiary health care. All these sectors through their functions provide adequate measure to increase the labour force of the nation and invariably the level of production of the country. Therefore, it is necessary to appraise the health indices as an important factor in the Nigerian economic growth process.

Nigeria's HDI value for 2017 is 0.532 while for 2018 is 0.534 - which put the country in the low human development category - positioning it at 157 in 2017 and 158 out of 189 countries and territories. Between 2005 and 2017, Nigeria's HDI value increased from 0.465 to 0.532, an increase of 14.4 percent. Between 1990 and 2017, Nigeria's life expectancy at birth increased by 8.0 years, mean years of schooling increased by 1 year and expected years of schooling increased by 3.3 years. Nigeria's GNI per capita increased by about 87.4 percent between 1990 and 2017 (Human Development Indices and Indicators: 2018 Statistical Update).

The study derives its importance from the policy point of view since the identification of these factors is necessary to enable the governments to make proper changes in their policies in respect of distribution of resources that will help reduce the mortality rates with consequent increase in the length of life. The next section focuses on literature review, the third segment emphasizes on theoretical framework, the fourth part present the results and the last segment focuses on conclusion and findings.

Review of Literature

In the study of Ogungbenle, Olawunmi and Obasuyi (2013), a vector autoregressive (VAR) model approach was employed in analyzing the data. The results of the study revealed that there is no bi-directional causality between life expectancy and public health spending in Nigeria. In the same vein, the study also revealed that there is no bi-directional causality between life expectancy and economic growth in Nigeria over the years. However, the study confirmed that there is bi-directional causality between public health spending and economic growth in Nigeria.

In the logistic regression analysis, Adetoro and Amoo (2014) confirmed that, education of both parents and occupation of mothers' were found statistically significant to reduction in child mortality rate. The result also revealed that mothers' wealth index, age at first birth and usual of place of residence have substantial impact on child mortality in Nigeria. The cross tabulation analysis result indicated that child mortality rate was highest (49.14%) among the illiterate mothers and lowest (13.29%) among mothers with tertiary education.

Abraham and Ahmed (2011) using an error correction model examined economic growth and human development index in Nigeria. Their results show that policies aimed at accelerating growth would have a negative impact on human development in the short run but in the long run, equilibrium will be restored by Human Development Index adjusting to correct the equilibrium error. This implies that economic growth leads to human development and that macroeconomic policies aimed at achieving sustainable economic growth should be maintained. In the work of Salami *et al* (2017), Life expectancy showed a negative effect on the economic growth being represented as the Gross Domestic Product and this negative effect can be explained as the direct effect that increase in life expectancy has on the Nigerian population.

In the study of Olalekan, Mubashir and Ismail, (2008), using the data obtained from the Nigeria Demographic and Health Survey 2003, they found that children born multiple births are more likely to die during the first year of life compare to children born singletons, independent of child's sex, birth order, pregnancy care and delivery care, maternal education and nutritional status, household access to clean water and sanitation, and other factors. They also found that the mother's education played a protective role against infant death. This evidence suggests that improving maternal education may be key to improving child survival in Nigeria. A well-educated mother has a better chance of satisfying important factors that can improve infant survival the quality of infant feeding, general care, household sanitation, and adequate use of preventive and curative health services.

In the study of Ayotunde, Obiyan, Agunbiade and Fasina (2009), it was observed that maternal education and antenatal visitation were important and significant predictors of childhood survival. In general, the results from the 2003 Nigeria Demographic and Health Surveys show that the risk of under-5 deaths in 1999-2003 reference periods was significantly higher among women with no education followed by those with primary education and the trend continued reducing as education increases among women (50%, 31.3%, 11% and 10% respectively). Despite the variation found in under-5 deaths when age at first birth was considered, it was discovered in the results that maternal education at birth was the only significant predictor of childhood survival. A likely explanation for this may be found in the beliefs and health-seeking behaviour patterns of child bearing women.

Aigbe and Zannu (2012) discovered that Infant and child mortality rates in Nigeria varied spatially among the geo-political zones of the country and between rural and urban residence. The Northeast and the Northwest recorded the highest under-five mortality rates

while the Southwest had the lowest rates among the geopolitical zones. Collectively, under-five mortality rates were relatively high for both 1999 and 2008 with even higher rates for 2008 except in the Southwest zone. The unevenness in the rates between rural and urban areas and among the geopolitical zones on one hand, the observed increase in the rates for 2008 over those of 1999 and the clustering of the rates call for more concerted efforts geared towards the reduction of childhood mortality rates.

Theoretical Framework

This study deviates from other research works using endogenous growth theory. The endogenous growth theorist hold that economic growth is primarily the result of internal and not external forces. It holds that investment in human capital, innovation, and knowledge are significant contributors to economic growth. The theory also focuses on positive externalities and spillover effects of a knowledge-based economy which will lead to economic development. The basic ideas of endogenous growth theory are quite simple. The first is that technological progress is the driving force behind long-run growth. This proposition follows inescapably from the fact of diminishing returns. That is, if people continued to produce the same products, of the same quality, using the same means of production and the same procedures, with no growth in knowledge, then sustained growth in per-capita output would require sustained growth in the amount of capital used per worker. But beyond some point increases in capital per worker would eventually reduce its marginal product to zero. This force would eventually reduce a country's growth rate (that is, the growth rate of its per-capita GDP) to zero. The only force that can prevent this eventual stagnation is increasing productivity, coming from new products, processes and markets; that is, technological progress.

The AK model which is the simplest endogenous model, gives a constant savings rate of endogenous growth and assumes a constant, exogenous savings rate. It models technological progress with a simple parameter (usually A). It uses the assumption that the production function does not exhibit diminishing returns to scale leads to endogenous growth. $Y = AK^a L^{1-a}$. This equation shows a Cobb- Douglas function where Y represents the total production in an economy. A represents total factor productivity, K is capital, L is labour, and the parameter measures the output elasticity of capital. For the special case in which a = 1, the production function becomes linear in capital thereby giving constant returns to scale.

Model Specification

The model used in this study is adapted from Idowu, (2014).

$RGDP = f(GF,HE,LE,FR)$ _____ (1)

$GDPt = \alpha GF^{\beta} tHE^{\delta} tLE^{\theta} tFR^{\eta} t$_____ (2)

The reduced equation after taking the natural logs of both sides is specified as follows:

$LGDPt = \alpha + \beta GFt + \delta HEt + \theta LEt + \eta FRt + \varepsilon t$_____ (3)

The variables (that formed the model) are expressed with respect to time, where;

GDP = real gross domestic product
GF = gross fixed capital formation
HE = health expenditure
LF = life expectancy at birth
FR= fertility rate
ε = error term
α = the intercept
β,δ,θ,η are coefficients of the independent variables.

The model was adapted basically because it seeks to capture the impact of health on economic growth in Nigeria and some variables used in the method are also likened to this study. Also, the variables used in this study are subject to data availability.

For the purpose of this study, a modified form of the adapted model is:

GDP = *f* (IMR, NMR, U5MR LE,HDI) _____ (4)

The econometric criteria of this study is

GDP = β0 +β1[IMR]+β2[NMR]+β3[U5MR]+β4[LE]+β5[HDI]+ ε__ _____ (5)

The variables that formed the model are expressed with respect to time, where;
GDP= Gross Domestic Product.
IMR= Infant Mortality rate.
NMR= Neo-natal Mortality Rate.
U5MR = Under-5 Mortality Rate.
LE= Life expectancy.
HDI= Human development Index.
ε = error term.

The parameters of estimation in the equation are β1, β2, β3,β4 and β5.

The choice of year picked span from 1986 to 2018 and are sourced from World Development Indicators, World Bank, United Nations Development Programme. The empirical result is presented as follows:

Result of the Findings

The result Table, the coefficient of the independent variable Infant Mortality Rate (IMR), Life Expectancy (LE) and Neo-natal Mortality Rate (NMR), are positively related to Gross Domestic Product (GDP) while Human Development Index (HDI) and Under-5 Mortality Rate (U5MR) are negatively related to Gross Domestic Product (GDP), as such it indicates that there is a positive relationship between Infant Mortality Rate (IMR), Life Expectancy (LE), Neo-natal Mortality Rate (NMR), and Gross Domestic Product (GDP); and a negative relationship between Human Development Index (HDI), Under-5 Mortality Rate (U5MR) and Gross Domestic Product (GDP).

Table 1: Ordinary least squares Result

Dependent Variable: GDP__CURRENT_US$_
Method: Least Squares
Date: 09/19/20 Time: 20:52

Sample: 1986 2018
Included observations: 33

Variable	Coefficient	Std. Error	t-Statistic	Prob.
HDI	-262.7427	875.7360	-0.300025	0.7665
IMR	8.840959	7.067475	1.250936	0.2217
LE	47.17333	26.33697	1.791145	0.0845
NMR	6.256143	33.71819	0.185542	0.8542
U5MR	-7.249630	6.190306	-1.171126	0.2518
C	-1926.887	1981.372	-0.972502	0.3394

R-squared	0.935672	Mean dependent var	195.8745
Adjusted R-squared	0.923760	S.D. dependent var	175.5389
S.E. of regression	48.46924	Akaike info criterion	10.76270
Sum squared resid	63430.22	Schwarz criterion	11.03479
Log likelihood	-171.5846	Hannan-Quinn criter.	10.85425
F-statistic	78.54489	Durbin-Watson stat	1.018414
Prob(F-statistic)	0.000000		

Source: Authors computation using e-views 9

Furthermore, the magnitude of the coefficient of the independent variables differs; with Human Development Index having -262.7427 which connotes that an increase in Human Development Index will bring about -262.7427 decrease in the Gross Domestic Product. Life Expectancy having 47.17333 indicates that an increase in the Life Expectancy will cause about 47.17333 increase in the Gross Domestic Product. Infant Mortality Rate having 8.840959 implies and a unit increase in Infant Mortality Rate will cause about 8.840959 increase in the Gross Domestic Product. Also, a unit increase in Neo-natal Mortality Rate will cause about 6.256143 increase in the Gross Domestic Product. Likewise, and a unit increase in Under-5 Mortality Rate will cause about -7.249630 decrease in the Gross Domestic Product.

The adjusted R^2 is given as 0.935672 measures a goodness of fit and it implies that the independent variables explain about 93.567% changes in the Gross Domestic Product and as such the independent variables are relevant to the Nigerian economy while the remaining 6.432 are the other variables that affect the Gross Domestic Product but not captured within the model. This 6.432% are called stochastic random error term.

The F-statistics is also used to test the significance of variables. From appendix 2, the probability value of the F-statistics must be less than the significant level for it to be statistically significant. The probability value of F-statistics is 0.0000; therefore, the independent variables are significant both at 1% and 5% respectively. The Durbin Watson value of 1.018414 shows that there is absence of serial correlation within the model since the rule of thumb is based on the observed R-squared.

This table explains the test of serial correlation using Breusch Greusch-Godfrey correlation LM Test. The study has no autocorrelation since the rule of thumb is based on the observed R-squared.

Test for serial Correlation

Table 2: Breusch-Godfrey Serial Correlation LM Test:

F-statistic	17.67119	Prob. F(2,25)	0.0000
Obs*R-squared	19.32802	Prob. Chi-Square(2)	0.0001

Conclusion

The wealth of a nation rests solely on the health sector. The regression result confirms that health variables plays a very significant role in determining the long run economic growth as all the health indicators have a significant impact on the long run economic growth. Analysis indicates that GDP and most of its determinants are significant, and that they are linked in the long run. The implication of this is that an economy that wants to achieve sustainable and rapid growth should invest in the health sector. Human capital formation should be properly taken care of. On-job training, seminars, workshops can be used to increase the human development index of Nigeria which later leads to sustainable economic growth. Also, proper public enlightenment and education of mothers on best health care practices is imperative for infant and child survival.

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Appendix 1: Data Presentation

Gross Domestic Product, Infant Mortality rate, Maternal Mortality Rate, Life expectancy,

Years	GDP (current US$)	IMR	NMR	LE	HDI	U5MR
1986	54,805,852,581.2	124.5	49.9	46.1	0.258	211.00
1987	52,676,041,930.6	125	49.9	46.0	0.269	211.90
1988	49,648,470,439.8	125.4	50	46.0	0.280	212.60
1989	44,003,061,108.3	125.7	50.1	45.9	0.291	212.90
1990	54,035,795,388.1	125.6	50.3	45.9	0.302	212.90
1991	49,118,433,047.6	125.4	50.6	45.9	0.313	212.50
1992	47,794,925,815.6	125	50.8	45.9	0.324	211.90
1993	27,752,204,320.2	124.5	51	45.8	0.335	211.20
1994	33,833,042,988.4	123.9	51	45.8	0.346	210.10
1995	44,062,465,800.0	122.9	51	45.9	0.351	208.30
1996	51,075,815,092.3	121.4	50.8	45.9	0.368	205.70
1997	54,457,835,193.9	119.5	50.4	45.9	0.379	202.10
1998	54,604,050,167.9	117.1	49.7	46.0	0.390	197.70
1999	59,372,613,485.9	114.5	49	46.1	0.401	192.80
2000	69,448,756,932.6	111.6	48.1	46.3	0.412	187.40
2001	74,030,364,472.4	108.6	47	46.5	0.423	181.70
2002	95,385,819,320.7	105.6	45.9	46.8	0.434	175.90
2003	104,911,947,833.9	102.5	44.8	47.2	0.443	169.90
2004	136,385,979,322.7	99.4	43.7	47.7	0.462	164.00
2005	176,134,087,150.5	96.2	42.6	48.2	0.465	157.90
2006	236,103,982,431.6	93	41.5	48.8	0.475	151.90
2007	275,625,684,968.9	89.9	40.6	49.4	0.479	146.00
2008	337,035,512,676.6	86.8	39.7	49.9	0.485	140.30
2009	291,880,204,327.6	83.9	38.8	50.4	0.490	134.80
2010	363,359,886,203.3	81	38	50.8	0.484	129.60
2011	410,334,579,160.6	78.3	37.1	51.3	0.494	124.11
2012	459,376,049,763.8	75.7	36.4	51.7	0.512	120.00
2013	514,966,287,334.4	73.3	35.6	52.1	0.519	115.60
2014	568,498,937,615.6	71	34.9	52.5	0.524	111.60
2015	494,583,180,777.2	68.7	34.2	53	0.527	108.00
2016	404,649,527,537.7	66.6	33.5	53.4	0.53	104.30
2017	375,745,486,520.7	64.6	32.9	53.9	0.532	100.30
2018	398,000,000,000.1	62.1	36.0	54.1	0.534	119.9

Human Development Index Indicators (1986-2018).

Source: World Development Indicators, World bank, United Nations Development Programme. Estimates developed by the United Nations inter agency group for Child Mortality estimation (UNICEF, WHO, World Bank) at: www.childmortality.org

Appendix 2: Ordinary Least square

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Source: Authors compilation using E-views 7