ABUAD Journal of Social and Management Sciences (AJSMS),
Vol. 3, No. 1, 2022, pages 12-29 https://doi.org/10.53982/ajsms.2022.0301.02-j

Published by the College of Social and Management Sciences (SMS), Afe Babalola University, Ado-Ekiti (ABUAD), Nigeria.
E-mail: ajsms@abuad.edu.ng

ISSN: 2714-3740

The Link between Government Health Expenditure and Health Outcome in Nigeria, 1981-2019

Aishat Princess UMAR[1]
Mathew Ekundayo ROTIMI[2]
Naphtali Watramarhyel JOHN[3]

Abstract

This study examines the relationship between government health expenditure and health outcome in Nigeria using time series data on infant mortality, government health expenditure, school enrollment ratio and the gross domestic product for the period covering 1981 to 2020. The study sourced data from the World Bank data base and Central Bank of Nigeria (CBN) statistical bulletin. Infant mortality rate was used as a proxy for health outcome based on data availability and the literature. As dictated by the data, the study used Vector Autoregressive model (VAR) to analyse the relationship between government health expenditure and health outcome in Nigeria for the period under study. The variables in the model were all integrated of order one and were cointegrated using the Johansen's cointegration test. Government health expenditure is found to have a negative relationship with infant mortality in Nigeria; an indication that an increase in health expenditure has the tendency to decrease infant mortality in Nigeria. The study finds school enrollment to be significant. Therefore, the study recommends among other things that government expenditure should be increased to diminish infant mortality as well as enhance school enrolment.

Keywords: VAR; Government; Mortality; Health Expenditure; Health Outcome; Nigerian.
JEL Code: H51, H75, I11, I12

Background to the Study

Central to the growth and development of a nation is the quality of its human capital. A healthy population produces a well-equipped human capital which in turn gives rise to an increase in

[1] **Aishat Princess Umar** lectures in the Department of Economics, Federal University Lokoja, Nigeria. **Corresponding author's e-mail**: aishat.umar@fulokoja.edu.ng

[2] **Mathew Ekundayo Rotimi** is a senior lecturer in the Department of Economics, Federal University Lokoja, Nigeria.

[3] **Naphtali Watramarhyel John** is a professor of Economics at Federal University Lokoja, Nigeria

economic growth. This claim is well documented in the literature underpinning the study. For instance, Obi and Obi (2014) opine that great social changes in an economy can be traced to the quality of citizens. By implication, healthy and educated citizens translate to an increase in the gross domestic product (GDP) of a nation. In support of the assertion above, Ogunjimi and Adedeji (2018) argue that healthy citizens are productive and as such represent an important force that drives the level of economic growth. The study further states that only a healthy labour force can make significant contributions to GDP. Therefore, a continuous rise in the level of public health expenditure would translate into positive health outcomes, positive educational outcome and economic growth. The existing literature examines the relationship between government health expenditure and health outcome (see Oladosu, Chanimbe and Anaduka, 2022; Azuh, 2020; Ogunjimi and Adeddeji, 2018). Findings from the relationship between government expenditure and health outcome have generated some controversies in the literature. While some believe that the relationship is positive (see Oladosu et al, 2022), others see the relationship to be negative (See Adewunmi et al, 2018). However, buttressing the relevance of the health sector and how it could impact economic growth, Victoria, Barros, Silva, Vaughan and Tomasi (2000) identify health problems and challenges as factors that could bring differences on the impact of health sector on economic growth.

Nigeria and other developing countries are faced with lots of health challenges such as malaria, HIV/AIDS, typhoid, diarrhea, measles, and pneumonia, among others. The United Nations (2004) reports that of the diseases and health challenges mentioned above, five of them, namely: malaria, pneumonia, diarrhea, HIV/AIDS and measles have caused about 50% of child mortality and 20% of infant mortality. The World Malaria Report (2020) states that Nigeria is rated to be the country with the highest case of malaria, which was at 27% in 2020 and accounted for 23% of deaths in the world in 2019. Apart from the five diseases mentioned by the United Nations, other health challenges are claiming lives in Nigeria. For instance, during the Ebola outbreak, 8 out of the 12 infected patients died (Otu, Ameh, Egbe, Alade, Ekuri and Idris, 2017). Similarly, the coronavirus pandemic has also claimed the lives of 3,009 people in Nigeria (NCDC, 2022).

Table 1: Diseases and Death

Year	Diseases	Deaths
2014	Ebola	8
2010-2018	Malaria	95,800
2020-2022(January, 14)	Coronavirus	3,092
	Total	98,900

Source: NCDC (2022)

Table 1 presents the loss incurred by Nigeria owing to three health challenges only. This reveals that the contribution of 98,900 Nigerian citizens have been taken from the GDP of the country. This excludes the deaths caused by other diseases like pneumonia, HIV/AIDS, Typhoid, among others.

The infant mortality rate reported by the World Bank (2019) in Nigeria has not been impressive either (see Table 2). However, there has been a downward trend in the rate of infant mortality except in 1990 when the rate increased marginally. Specifically, the rate as at 2020 was 77%, which is considered unreasonable.

Table 2: Infant Mortality Rate

Year	Infant Mortality rate
1981	123.9%
1990	124.3%
2000	110.0
2010	99.1
2020	77.0

Source: World Bank Data

Figure 1: Graphical Illustration of Infant Mortality (IFM)

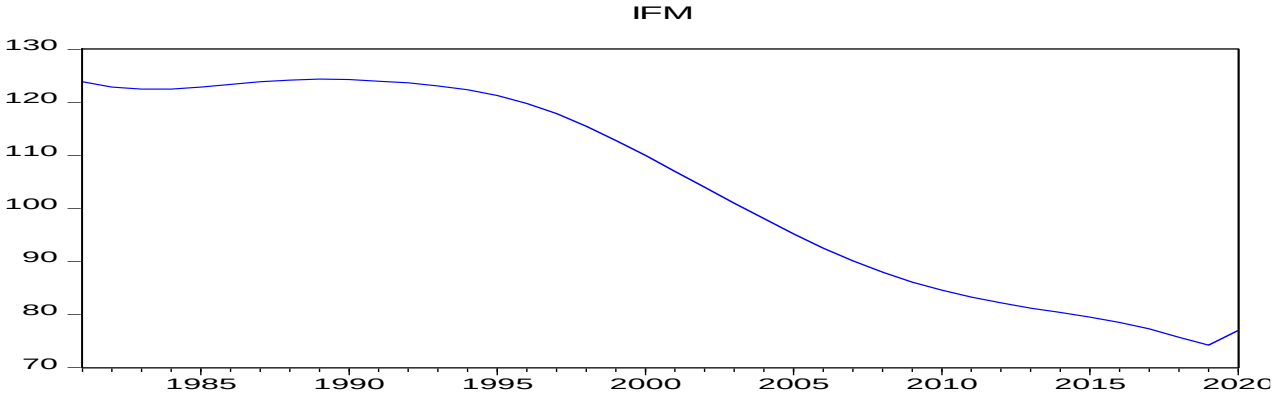


Figure 1presents the graphical illustration of infant mortality in Nigeria from 1981 to 2020. The graph gives a trend analysis of the rate of infant mortality in Nigeria over the years covered. The inefficiency of the health sector in Nigeria has had its impact on the health and educational outcomes as dead and sick children cannot enroll in schools to become better citizens that will give back to the country in the future. The implication of this is slow growth rate and development. The question remains, 'To what extent is the growth rate?' This could only be empirically investigated. Hence, the need for this study.

The trend of government health expenditure in Nigeria as reported by CBN statistical bulletin (2020) has shown that the expenditure incurred on the health sector from 1981 to 2020 has been on the increase (see Table 3). For instance, the government health expenditure in 1981 was approximately 0.1 billion naira and it became 0.1 billion in 1985. It increased again to 0.5 billion naira in 1990 and further increased to 3.3 billion in 1995, about 560%. On continuous basis, it significantly increased to 15.2 billion in 2000 and this continuation reached 55.22 in 2005. The upward trend continued in 2010 when it reached 99.1. In 2015 it was 257.7 and it reached 388.4 in 2019.

Table 3: Trend analysis of government health expenditure in Nigeria

Year	Government expenditure on health (naira in billions)
1981	0.1
1985	0.1
1990	0.5
1995	3.3
2000	15.2
2005	55.7
2010	99.1
2015	257.7
2019	388.4

Source: Author's Computation, based on data obtained from CBN (2020).

Table 3 presents the trend of government expenditure on the health sector from 1981 to 2020. This reveals that the trend of government health expenditure has been upward. This implies that the government has been increasing the budgetary allocation to the health sector.

The increase can be attributed to the preparations made by the Nigerian government to enhance the health sector to fight against the outbreak of different diseases and viruses such as bird flu, Ebola and in recent times, the coronavirus disease which largely affected China and other parts of the world. This explains why the scope of the study is extended to 2020. Despite the increase in government expenditure on health as shown in Table 3, Nigeria is still faced with high infant mortality. It is on this ground that this study is carried out to access the effect of government health expenditure on health outcomes, educational outcomes and economic growth in Nigeria from 1981- 2020.

Literature Review

Empirical Literature

Researchers around the world have attempted to empirically investigate the effect of government health expenditure on health outcomes, and they came out with different findings. Kim and Lane (2013) conducted a research on the relationship between government spending on health and national health outcomes among core countries, namely Australia, Austria, Belgium, Canada, Denmark Finland, France, Germany Ireland, Italy, Japan Netherlands, New Zealand, Sweden, Switzerland, the United Kingdom and the United States of America. The study revealed that a rise in government expenditure reduced infant mortality and increased life expectancy.

Becchetti, Conzo and Salustri (2015) examined the impact of government health expenditure on health outcomes, using a sample of Europeans of fifty years and above. Adopting individual and regional-level data, health expenditure and health expenditure per capita found a negative relationship on a number of chronic diseases. It also found that health expenditure led to heterogeneous impact on health outcomes. Furthermore, health expenditure was found to be more relevant to the aged people, females, middle class income group and for those with little education. The study only concentrated on the effect of an increase in government expenditure on the health of the people who are above fifty years of age and therefore cannot be used to generalise.

It is possible that the increase in government expenditure in the area under consideration was geared towards a particular category of people (in this case, 50 years and above), which led to improvement of their health. While the work of Becchetti, et al (2015) narrowed the impact of government expenditure on health to a particular segment of the society, the work of Kim and Lane (2013) holds some findings that may be used for generalisation. Kim and Lane (2013) opine that whenever government expenditure on health rises, infant mortality drops and life expectancy increases. The impact of government health expenditure as shown in the work of Kim and Lane (2013) covers both children and adults.

While the works of Becchetti et al (2015) and that of Kim and Lane (2013) notedthe impact of government expenditure on health and health outcome to be positive, Kulkarni (2016) had a different opinion. Kulkarni (2016) used panel data regression with fixed effects model to examine the difference in the health sector in Brazil, India, China, Russia and South Africa. The findings showed a positive relationship between health outcomes and the GDP per capita. Adult literacy rate, out of pocket expenditure, and environmental pollution had a negative impact on health sector outcomes and age dependency ratio, and government health expenditure also showed a positive relationship with infant mortality rate. This, by implication, means that both variables moved in the same direction. That is, when government health

expenditure increases, health outcomes such as infant mortality increase as well. Thus, it is implied that government spending on health should be reduced in order to save the lives of infants. However, this report contradicts the previous ones and exposes the disagreements that exist in the literature. It thus gives a cogent reason for another study to be carried out to ascertain the true relationship between the variables of interest.

In Africa, studies have been carried out to empirically investigate the effect of government health expenditure on health outcomes. In Ghana, for instance, Boachie and Ramu (2015) examined the relationship between public health expenditure and health outcomes from 1990 to 2002. Adopting the ordinary least square (OLS) approach, the study discovered a negative relationship between government health expenditure and health outcomes of which infant mortality was used as a proxy. It concludes that a rise in government expenditure reduced infant mortality in Ghana.

In Nigeria, researches have been carried out to examine the impact of government health expenditure on health outcomes, educational outcomes and economic growth. The results of these studies were not entirely different from the report of the researches conducted in other parts of the world. Sunday and Adeleye, (2017) investigated the impact of government expenditure on health outcomes in Nigeria. Using time series data spanning from 1981 to 2014, and adopting autoregressive lag (ARDL) model, the study concluded that health expenditure and health outcomes have a long run relationship and that government health expenditure positively and significantly affected health outcomes in Nigeria. This implies that an increase in government expenditure on health positively affected health outcomes for the period that was studied. Since only healthy people can enroll in schools and also contribute to the productivity of a nation, then a rise in health outcomes will increase educational outcomes and the economic growth of Nigeria.

Salami, Olabode, Atoyebi, Lawal and Danmola (2017) examined the impact of government health and education expenditure on health outcomes and economic growth in Nigeria from 1917 to 2013. Adopting the Ordinary Least Square method (OLS), the study found a positive relationship between economic growth and government recurrent expenditure on the health sector and the educational sector of Nigeria. Isaac et al (2017) and Salami et al (2017) have similarly findings. Both findings argue in favour of an increased government health expenditure on the health sector in Nigeria. The studies also supported the need for the government to spend on the health and educational sectors because the impact of these sectors which can be felt in the growth of the country through their effects on GDP.

Okeke (2014) examined the impact of government health and education expenditure in Nigeria on health outcomes and educational outcomes. Adopting the OLS method, the study discovered that government expenditure had a positive effect on the health outcomes in Nigeria. The study used secondary data from 1980 to 2010 and found that child mortality rate

was reduced, but government expenditure on education had no effect on school enrollment ratio. This study aligns with Isaac et al (2017) and Salami et al (2017) which shows that government expenditure on health has a positive impact on health outcomes in Nigeria, and by extension, increases economic growth (Ogunjimi and Adedeji 2018). A striking discovery made by Okeke (2014) was the fact that government expenditure on education had no significant effect on school enrollment in Nigeria. Regardless of the spending on education by the government, when citizens are unhealthy, they cannot be enrolled at the various levels of education; hence, the need to study the impact of government health expenditure on educational outcomes in Nigeria.

Against the argument of Okeke (2014), Isaac et al (2017) and Salami et al (2017), the work of Adewumi, Acca and Afolayan (2018) discovered that government health expenditure had a negative impact on health outcomes in Nigeria. The study examined the impact of government expenditure on health outcomes in Nigeria. Using the Engle-Granger approach to test for a longrun relationship, the study observed that government health expenditure and all the indicators of health outcomes were cointegrated. Adopting the OLS, the result showed that government health expenditure per capita had a positive relationship with neonatal mortality rate and child mortality rate in Nigeria against apriori expectations. It implies that as government expenditure rises, neonatal, child and infant mortality rate rise as well. Private health expenditure was seen by the study to have a negative relationship with infant mortality and neonatal rates, which showed that the private sector had a greater influence on health outcomes in Nigeria.

Azuh, Osabohien, Orbhih and Godwin (2020) examined the impact of government health expenditure on under-five mortality in Nigeria, from 1985 to 2017. The study adopted the ARDL model and found that government expenditure had a positive relationship with the under-five mortality in Nigeria. By implication, a continuous increase in government expenditure would lead to an increase in under-five mortality in Nigeria. This result does not conform to apriori expectations. Oladosu, et al (2022) investigated the relationship between government health expenditure and health outcome in Nigeria and Ghana using data from 2000 to 2018. The study found a negative relationship between government health expenditure and infant mortality, maternal mortality, malaria mortality and HIV/AIDS mortality in Ghana. The study also found a positive relationship between government expenditure and infant mortality, maternal mortality, malaria mortality and HIV/AIDs mortality.

A critical analysis of the reviewed literature shows that there is a controversy that has not been resolved. On the global scene, this controversy exists in literature. For instance, the work of Kim and Lane (2013) reported that an increase in government health expenditure had a positive impact on health outcomes but the reverse was the case for Kulkarni (2016), who discovered that an increase in government expenditure increased infant mortality. In Nigeria, while some studies such as Isaac et al, (2017), Salami et al, (2017) among several others

discovered that government health expenditure had a positive impact on health outcomes, other studies argued against these findings. For instance, Adewunmi et al (2018), among others, observed that government health expenditure had a negative impact on health outcomes in Nigeria. This situation calls for more studies because of the inconclusive nature of the previous ones. The fact that there is a controversy in the findings of different studies exposes a gap to be filled.

Theoretical Framework

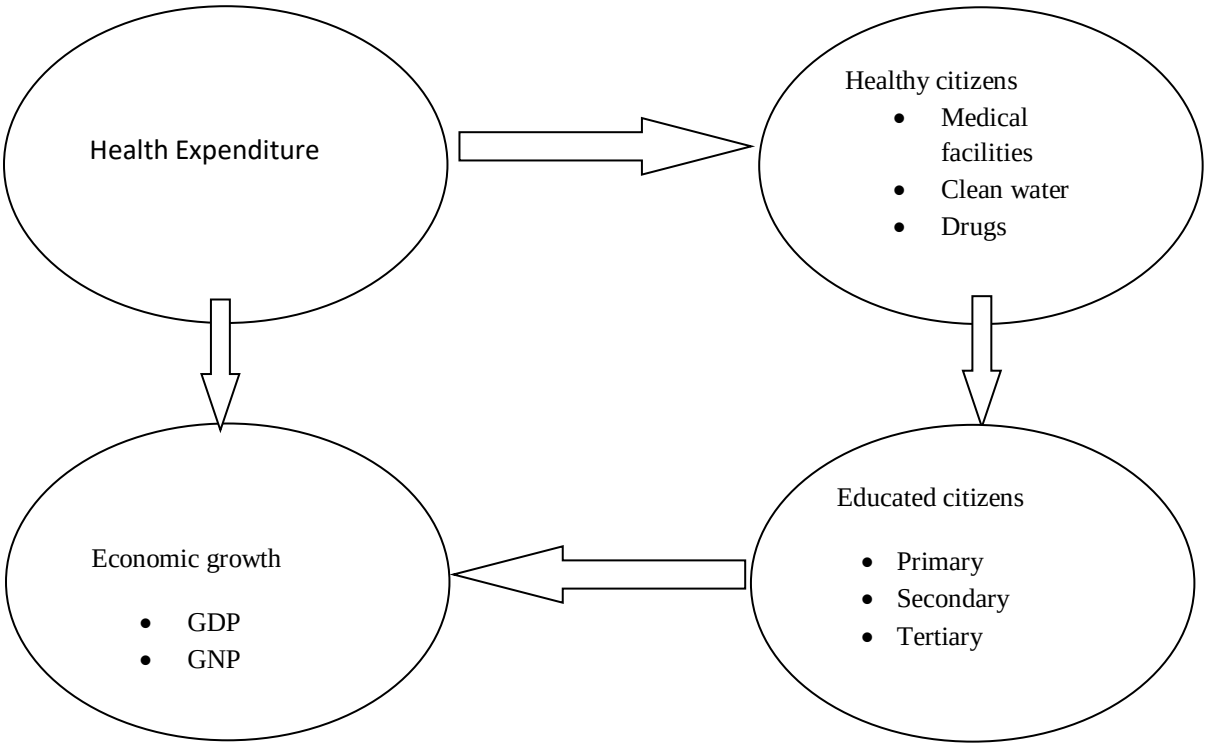
The study adopts the Keynesian theory of public expenditure which advocated government intervention in the economy, following the economic depression of the 1930. The Great Depression of the 1930's showed that the free market economy which was the economic theory that was in practice failed to bring the economy back to the state of equilibrium.

In order to drive the economy, Keynes advocated government intervention through direct expenditure in different sectors of the economy. This implies that the government of any nation must deliberately and consciously spend on certain sectors in order to stabilise the economy (Isaac et al, 2017). The implication of the intervention of the government in economic activities would necessitate the provision of public goods, which are rarely provided by the market economy due to the large capital involvement and the profit maximisation motive that drives the market economy. The market fails whenever it cannot allocate resources efficiently to the citizens due to the huge capital outlay that such goods and services may require (Isaac et al, 2017). When that becomes the case, then it becomes important for the government to step in and do the needful.

In most cases, the market economy cannot account for the negative externalities that result from its activities. These externalities can include pollution caused by the release of dangerous gases into the atmosphere and the release of waste products into water channels, thereby rendering the environment unhealthy. In the event of such occurrences, the government must directly step in to account for these negative externalities; thus making government intervention unavoidable.

Government spends on the health sector to ensure that the health of the citizens is not in jeopardy. All things being equal, direct government spending could enhance and affect the health sector positively. These positive effects, by extension, may increase educational outcomes and improve the economic growth of a nation.

Figure 2: Circular Flow of Resources



Source: Isaac et al (2017).

Figure 2 shows the flow of resources in an economy. When the government transfers resources to the health sector in form of expenditure, citizens get access to drugs, access clean water, and clean environment that boost the health of the citizens. Consequently, government spending on health generates healthy citizens and further translates into educated citizens because only healthy citizens can enroll in school, get trained and become skilled and employable. Enrollment into schools at various educational levels (primary, secondary and tertiary) is enhanced only when citizens are healthy. Central to the growth of any nation is the quality of the human capital. Health and education improve the human capital of a nation and when a country is blessed with healthy, skillful and educated human capital, economic growth increases. This suggests that the growth of the economy increases when the government increases expenditure on health and education. It is based on this conclusion that the study adopts the Keynesian theory of public expenditure.

Methodology

Data

The study employed secondary data on all the selected variables, namely: government health expenditure, infant mortality rate, total school enrollment ratio and the real gross domestic

product from 1981 to 2020. Infant mortality is used as a proxy to health outcomes based on data availability and total school enrollment ratio and, GDP were used as control variables in the model to determine growth. Data were sourced from the World Bank and Central Bank of Nigeria.

HLTH = Government health expenditure

IFM= Infant mortality

SCH= total school enrollment

GDP= Gross Domestic Product

Vector Autoregressive Model (VAR)

The study examines the impact of government health expenditure on health outcomes in Nigeria from 1981 to 2020. Vector Autoregressive Model (VAR) is employed for this study. The choice of this selection is influenced by both theory and previous studies (Kalli and Griffin, 2018). The study of Sim (1980) also argues in favour of the VAR model. VAR is also suitable when capturing the intertwined dynamics of time series data (Eric, 2021).

Unit Root Test

Time series data may not be stationary in their level form and when variables are non-stationary, they cannot be fit for proper analysis (Gujarati, 1995). The Augmented Dickey-Fuller test (ADF) was employed to test for stationarity to avoid spurious result. This procedure aligns with the literature (see Rotimi and Ngalawa, 2017; Kutu ang Ngalawa, 2016).

Cointegration

In examining the relationships that exist among variables in the long run, it is important to understand their long run relationships. This is crucial because, most economic relationships are said to hold in the long run, thereby showing the need to verify the long run relationships of variables in the model. The Johansen Cointegration is employed in this study. Johansen and Julius (1990) improved the cointegration test models of the Engel-Granger cointegration, which makes the Johansen approach more suitable than the Engle-Granger approach.

$$\gamma TRACE(r) = - \Pi \Sigma \, in(I - \gamma_t)$$

Π is the number of usable observations, and γ_t is the estimated Eigen value from the matrix Maximum Eigen value test (γ max). It is expressed as below:

$$\gamma MAX\ (r, r + 1) = - \Pi \, in(I - \gamma_r + 1)$$

Model Specification

$LnIFM_t = \alpha_0 + \sum^{k}_{m=1} \text{Ш} LnIFM_{t-p} + \sum^{k}_{i=1} \beta lnHLTH_{t-1} + \sum^{k}_{j=1} € lnSCH_{t-j} + \sum^{k}_{n=1} ¥ lnGDP_{t-n} + \mu_{1t}$ ..... (1)

$LnSCH_t = ɜ_0 + \sum^{k}_{j=1} ϱ lnIFM_{t-j} + \sum^{k}_{i=1} ʊ lnHLTH_{t-I} + \sum^{k}_{i=1} й LnSCH_{t-k} + \sum^{k}_{n=1} Ϫ lnGDP_{t-n} + \mu_{2t}$ ..... (2)

$LnGDP_t = Θ_0 + \sum^{k}_{z=1} \tilde{o} lnIFM_{t-z} + \sum^{k}_{i=1} ℌ lnHLTH_{t-I} + \sum^{k}_{j=1} Ω lnSCH_{t-j} + \sum^{k}_{i=1} д LnGDP_{t-h} + \mu_{3t}$ ..... (3)

$LnHLTH_t = \sigma_0 + \sum^{k}_{z=1} ϰ lnIFM_{t-z} + \sum^{k}_{i=1} Þ LnHLTH_{t-f} + \sum^{k}_{i=1} Ə lnSCH_{t-I} + \sum^{k}_{j=1} ϕ lnGDP_{t-j} + \mu_{4t}$ ..... (4)

where:

K = the maximum lag length

α_0 Þ$_0$, Θ_0, $\sigma_{0\ and}$ = the constant intercept

β, €, ¥, Ʊ, ϱ, Ϫ , ℌ , Ω, õ, Ə , ϕ, й, õ, д, ϰ, Þand ω= vector of parameters

Ln= Log

$\mu_1, \mu_2, \mu_3, \mu_4$ = Error term

t= time.

Definition of Variables

Infant mortality rate: means the number of deaths of infants, that is, the number of babies who are less than one year (see Osawe, 2014).

School enrollment ratio: means the number of students or pupils enrolled at various levels of education regardless of the age and sex, divided by the population of the age group that officially matches the various levels of education (UNICEF, 2017).

Gross Domestic Product (GDP): is the value of goods and services produced in a nation minus the value of goods and services used up in the production process (BEA, 2015).

Government health expenditure: refers to the direct spending of the government for the enhancement of the health status of the people and for the distribution of health care services and goods among the population (Isaac et al, 2017).

For the sake of simplicity, all the variables are used in their log forms except the infant mortality rate.

Presentation of Results

Table 4: The Results of the ADF Unit Root Test

Variables	ADF Test Statistic	Critical Values at 5%	Remarks	Order of Integration
LnHLTH	-6.187080	-3.544284	Stationary	I(1)
LnIFM	-4.530683	-3.580623	Stationary	I(1)
LnSCH	-6.897744	-3.536601	Stationary	I(1)
LnGDP	-8.371607	-3.536601	Stationary	I(1)

Source: Authors' computation, based on the data obtained from CBN (2020).

Table 4 shows the results of the unit root test. All the variables in the model are integrated of I(1) at 5% level of significance. It further shows that in level form, they were non stationary which means they were random walk variables. After differencing them once, they became stationary. The test was also conducted on the assumption that the variables had constant and trend.

Table 5: The Johansens Cointegration Results

Hypothesized No. of CE(s)	Eigen value	Trace Statistic	0.05 Critical Value	Prob**
None*	0.921336	136.7614	55.24578	0.0000
At most I *	0.487074	45.22898	35.01090	0.0030
At most 2*	0.443088	21.19454	18.39771	0.0198
At most 3	0.003383	0.121985	3.841466	0.7269

Source: Authors' computation, based on the data obtained from CBN (2020).

Table 4.3 shows the result of the Johansen cointegration test. From the result, the trace statistic is greater than the critical value at 0.05 (5%) level of significance at none, at most 1 and at most 2. This means the variables have three cointegrating equations. The variables are cointegrated at the 5% level of significance. As a result of the cointegration, it is implied that the variables have a long-run relationship. That is, the variables can co-move in the long run. This further implies that for the null hypothesis, there is no long-run relationship among the variables to be rejected. Also, the cointegration test was conducted on the assumption that the variables possessed constants and trend.

Using the maximum Eigen value test under the Johannsen cointegration test, the variables were still cointegrated at the 5% level of significance. It shows how spread out the data is on the line. Table 4.4 shows the result of the maximum Eigen value test.

Table 6: Summary of the Maximum Eigen value Test

Hypothesized No. of CE(s)	Eigen values	Max-eigen Statistic	0.05 Critical Value	Prob**
None *	0.921336	91.53242	30.81507	0.0000
At most 1*	0.487074	24.03444	24.25202	0.0534
At most 2*	0.443088	21.07256	17.14769	0.0128
At most 3	0.003383	0.121985	3.841466	0.7269

Source: Authors' computation, based on the data obtained from CBN (2020).

Table 4.4 shows that at none, the null hypothesis was rejected at the 0.05 level of significance because the max-eigen critical value was less than the Max-eigen statistic, which shows that there is cointegration among the variables contrary to the null hypothesis. This implies that government health expenditure, infant mortality, total school enrollment ratio, and real gross domestic product have a long-run relationship. The study proceeds to the estimation of the VAR.

VAR Results

The VAR model gives an explanation of the relationship between the variables in the model namely, IFM, HLTH, SCH and GDP.

Table 7: Result of the VAR Model

Variable	**Coefficient**	**Std. Error**	**t-Statistic**	**Prob.**
LIFM(-1)	2.01789	0.04636	43.5261	0.0000
LIFM(-2)	-1.04232	0.05413	-19.2539	0.0000
LHLTH(-1)	-0.00159	0.00151	-1.05544	0.2935
LHLTH(-2)	-0.00022	0.00146	-0.15214	0.8793
LSCH(-1)	0.00705	0.00295	2.38718	0.0187
LSCH(-2)	0.003036	0.00317	0.95643	0.3409
LGDP(-1)	-2.65E-06	1.48E-06	-1.78725	0.0766
LGDP(-2)	3.79E-07	1.47E-06	0.25832	0.7966

C	2.001623	1.813461	1.10375	0.2721

Source: Authors' computation, based on data obtained from CBN (2020).

The result of the VAR estimates of the first equation in the model reveals that there is a positive relationship between the IFM_{t-1} and IFM_t. That is, the infant mortality of the previous year positively affected the infant mortality of the current year by 2.017%. IFM_{t-2} was seen to be negatively related to IFM_t implying that the infant mortality rate at time, $t-2$ was negatively affected by the infant mortality of the current year. Therefore, the infant mortality at time $t-2$ reduced the infant mortality rate at time t by 1.042%.

The second variable in the equation is government health expenditure (HLTH). The result shows that there is a negative relationship between government health expenditure and infant mortality rate at time $t-1$ and time $t-2$. This, by implication, means that a rise in government expenditure by 1% caused infant mortality to fall by 0.16% at time $t-1$ and 0.02% at time $t-2$. The negative relationship between government expenditure and infant mortality rate conforms to apriori expectations and the literature. Specifically, it also conforms to Okeke (2014), Isaac et al (2017) and Salami et al (2017), who found that government health expenditure caused health outcomes to increase.

The third variable is the school enrolment ratio (SCH). School enrolment ratio was found to have a positive relationship with Infant mortality rate at time $t-1$ and time $t-2$ implying that a rise in school enrolment ratio by 1% caused infant mortality rate to increase by 0.71% and 0.30% respectively. The relationship between the variables was expected to be negative, implying that a decrease in the school enrolment ratio would be as a result of a reduced infant mortality which was not the case. Hence, the result did not conform to the apriori expectation.

The fourth variable is the Real Gross Domestic Product (GDP). The result revealed that the GDP at time $t-1$ had a negative relationship with the infant mortality rate at the current period. That is a 1% increase in GDP_{t-1} caused infant mortality to drop by 265.00%, while GDP_{t-2} had a positive relationship with infant mortality rate, implying that a 1% increase in GDP_{t-2} caused infant mortality rate at time t to rise by 379%. While the result of GDP_{t-2} conformed to the apriori expectations, that of GDP_{t-2} did not conform to apriori expectations.

The constant intercept is 2 and it is insignificant. A critical look at the probability values of the coefficients of the variables reveals that only infant mortality at time $t-1$, $t-2$ and school enrolment ratio at time $t-2$ are significant because they are below 5%. The remaining probabilities are insignificant because they are above 5%. These findings imply that both infant mortality and school enrollment could impact economic and government expenditure. Thus, a fall in mortality rate will cause the school enrolment to increase and vice versa. Consequently,

output will improve arising from improved labour, produced from the educational sector, in term of quantity and quantity, thereby earning better income. In another word, a decrease in mortality rate would translate to more school enrolment, thus leading to more educated citizens, and a better trained, more skilled and employable individuals. Furthermore, the findings also suggest that if Nigeria could get over her health sector challenges, then it would become easy to bridge the gap between Nigeria and the developed world. This finding conforms to other findings (see Victoria et al, 2000; Oladosu et al, 2022).

Conclusions and Recommendations

The fact that the health sector in developed countries is far ahead of Nigeria can be attributed to the attention they have given to the health sectors in their countries over time through direct and conscious spending on that critical sector. This existential reality has enhanced new research to discover new ideas, the purchase of sophisticated medical machines, and good remuneration for health workers. The results of the VAR Model show that health expenditure has the tendency to reduce health outcomes in Nigeria, if the spending on health sector can be enhanced by the government. A negative relationship between government health expenditure and infant mortality implies that, as government increases its expenditure on the Nigerian health sector, the infant mortality rate would ultimately reduce. A continuous increase of the health expenditure can improve health outcomes. Hence, the study recommends enhanced government expenditure to reduce child mortality and improve school enrolment.

References

Adewumi, S.B, Acca, Y.A, & Afolayan, O. (2018). Government health expenditure and health outcomes in Nigeria: The challenge to underdevelopment economy. *International journal of Research and Innovation in Social Science (IJRISS),* 11(12), 463-471.

Azuh, D. E., Osabohien R., Orbih, M. & Godwin A. (2020). Public health expenditure and under-five mortality in Nigeria: An overview for policy intervention. *Open Access Macedonian Journal of Medical Sciences*, 8(E), 353-362.

BEA, (2015). Gross Domestic Product, 4th quarter and annual 2015 (third estimate). www.bea.gov>news>gross domestic- product-4th-quarter-and-annual-2015.

Becchetti, L., Conzo, p., & Salustri F. (2015). *The wealth of Nations: the impact of health expenditure on the number of chronic diseases.* Center for studies in econometrics and finance working paper 406f.

Boachie, M., K. & Ramu, K. (2015). *Public health expenditure and health status in Ghana.* Munich personal RePEc (MPRA) paper 66371.

Central Bank of Nigeria Statistical Bulletin, 2020.

Cloackbackward Essay (2009). Ordinary Least Squares Linear regression: Flaws, Problems and Pitfalls. https://lcn.people.uic.edu/classes/che205s17/docs/che205s17_reading_06c.pdf

Deluna, R & Peralta, T., F. (2014). *Public Health expenditure, income and health outcome in the Philipines*. Munich Personal RePEc. Archive (MRPA) paper 60115.

Erick (2021). *Introduction to the Fundamentals of Vector Autoregressive Models*. Aptech Data Analysis blog published 15th April.

Gujarati, D. N. (1995). *Basic Economic.* Singapore. New Delhi: McGraw Hill Companies Inc.

Gujarati, D. N (2009). *Basic Econometrics*.5th Edition. Singapore. New Delhi: McGraw-Hill Companies Inc.

http://www.worldmap.com/Nigeria

https://www.severemalaria.org/

Isaac, I., Sunday, S.O., & Adeleye, B.M. (2017). An empirical analysis of public health Expenditure on life expectancy: evidence from Nigeria. *British Journal of Economics Management & Trade*, 17(4), 1-17.

Johansen, S. and Juselius, K. (1990). Maximum Likelihood Estimation and Inference on Cointegration with Applications to Demands for Money. *Oxford Bulletin of Economics and Statistics*, 52, 169-210.

Kali M. and Griffin J (2018). Bayesian nonparametric vector autoregressive model. *Journal of Econometrics*, 203(2), 267-282.

Kim, K. K. and Lane, S. (2013). Government Health Expenditure and Public Health Outcome: A Comparative Study among 17 Countries and Implications for US Health Care Reform. *American International Journal of Contemporary Research*, 3(9). 8-13.

Kulkarni, L. (2016). Health inputs, health outcomes and public health expenditure: evidence from BRICS. *International Journal of Applied Economics,* 31(1), 72-84.

Kutu, A. A., & Ngalawa, H. (2016). Monetary policy shocks and industrial output in BRICS countries. *SPOUDAI-Journal of Economics and Business*, 66(3), 3-24.

National Center for Disease Control data base, 2022.

Obi, Z. C. & Obi, C. O. (2014). Impact of government expenditure on education: the Nigerian Experience. *International Journal of Business and Finance Management Research*, 2, 42-48.

Ogunjimi, J. & Adedeji, A. (2018). *Health expenditure, health outcomes and economic growth in Nigeria*. University of Ibadan, MPRA Paper no. 94989, 1-16.

Okeke, B., C, (2014). Impact of public health sector spending on health and education outcome in Nigeria (Unpublished Master's thesis). Economics Department, University of Nigeria, Nsukka.

Oladosu, A. O., & Anaduaka, U. S. (2022). Effect of public health expenditure on health outcome in Nigeria and Ghana. *Health Policy Open*, 3, 100072. https://doi.org/10.1016/j.hpopen.2022.100072

Otu, A., Ameh, S., Egbe,O., Alade, E., Ekuri, S and Idris, J. (2017). An account of the Ebola virus disease outbreak in Nigeria: implications and lessons learnt. *BMC Public Health*, July 10, 18(1), 3. https://pubmed.ncbi.nlm.nih.gov/28693453/

Osawe, S., W. (2014). Determinant of Infant Mortality Rate: A Panel Data Analysis of African Countries. *Developing country* Studies, 4(18), 111-114.

Rotimi, M. E., & Ngalawa, H. (2017). Oil price shocks and economic performance in Africa's oil exporting countries. *Acta Universitatis Danubius Economica*, 13(5). https://fulokoja.edu.ng/assets/publications/448_oil-price-shocks-and-economic-performance-in-africa%E2%80%99s-oil-exporting-countries.pdf

Salami, K., D., Olabode, O., S. Atoyebi, O. K, Lawal A., S., & Danmola R. (2017). Effects of Government health and education expenditures on economic growth in Nigeria. *Journal International Journal of social & management sciences,* Madonna university, 1(1), 118-130.

Sims, C. (1980). Econometrics and reality. *Econometrica,* 48(1), 1-48.

United Nations. (2004). Progress towards the Millennium Development Goals, 1990-2004. Discussion Paper. Statistics division, Department of Economic and Social Affairs of the United Nations Secretariat. http://unstats.un.org/unsd/mi/mi coverfinal.htm.

United Nations International Children's Emergency Fund (UNICEF) 2017

Victoria, C.G., Vaughan, J. P., Barros, F. C., Silva, A.C., & Tomasi, E. (2000). Explaining trends in inequalities: evidence from Brazilian child health studies. *The Lancet,* 356(9235), 1093

World Malaria Report (2020).

World Health Organization (2021). WHO data base.

World Bank data (2019).

World Bank data, (2020).