ANALYSIS OF SOME SELECTED HEALTH INDICATORS ON ECONOMIC GROWTH IN NIGERIA

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Abstract

The study employs the ARDL (bounds test) approach to co-integration and error correction analysis to investigate the long run and short run effects of health indicators on economic growth in Nigeria in the period from 1990 to 2021, while controlling for the effects of capital health expenditure, recurrent health expenditure and life expectancy rate. Data were sourced from CBN Statistical Bulletin, NBS Data and World Bank Data Bank. The result validates the Mushkin's health-led growth hypothesis as total expenditure on health is observed to have had positive and no significant long-run and short-run effects on the GDP. Further evidence from the analysis is that life expectancy also impacts negatively on GDP in the long- and short-run and highly significant. The effect of life expectancy is observed to be positive in the short-run, but negative statistically not significant in the long run. The paper recommends, inter alia, increased budgetary allocation to the health sector to enhance its contribution to the growth of Nigeria's economy. It also recommends creation of more investment opportunities and improvement on the welfare of the people.

Keywords: Capita Health Expenditure, Recurrent Health Expenditure, Economic Growth, Bounds Test

1. Introduction

The relationship exists between health and economic growth in Nigeria has received great and tremendous attention in the academic, other related fields and global literature The impact, and the significance of health, human capital, maternal health and many other indicators in achieving sustainable socio-economic growth has also been established and well documented. A lot of theories such as neoclassical growth theories and Augmented Solow growth models suggest the role of human capital in achieving significant growth in the economy. However, the widely proclaimed economic view of human capital encompasses education, health, training, migration, and other investments that promotes individual's productivity.

W.H.O. (2008) the productivity and growth of any society to an extent depends on the health status of the country or the people. The more improved the health conditions, the higher the productivity and economic growth. Both private and public sector provides health services, where the private sector constitutes the non-governmental organization, religious and traditional care givers. While the government takes the responsibility of health care service for the public sector.

The provision of health services by the government in the public sector is classified into three categories which are the primary, secondary and tertiary. The primary category provides services at the door step of communities for preventive, curative and pre-referral of any diseases or sickness. Those that carries out these services are the nurses, environmental health officers, community health officers etc, the facilities available for such services includes health centres, dispensaries and health. While the secondary category compromises of general hospital, laboratories where services like surgery, paediatric etc are been offered by the nurses, doctors, midwives, pharmacist and other health staffs. The tertiary health care service provides the highest health care service in the country, it services are rendered at the federal medical centres, specialist and teaching hospitals which are well equipped with the latest and more advanced technology in order to supply a better health services and also serve as resource centre for knowledge generation. The Nigeria health status is ranked low when compared with other developing Nations of the world. The life expectancy rate of Nigeria is at 54years in 2021(Vanguard news) and crude death rate in the year 2020 is 11.4% per 1000 population.

2. Literature Review

2.1 Conceptual Review:

2.1.1 Gross Domestic Product: Economic Growth is measured by real gross domestic product (GDP), this is the total monetary value of all final goods and services produced in a country. This serves as the dependent variable in the specified regression form. Since economic growth is strongly affected by the macro economic conditions, some economic factors which may influence the connection between financial development and economic growth are included in this study.

According to Investopedia (2022), The calculation of a country's GDP captures all private and public consumption, government outlays, investments, additions to private inventories, paid-in construction costs, and the foreign balance of trade which when Exports are added to the value and imports are subtracted.

Among the various components that make up a country's GDP, the foreign balance of trade is very important. The GDP of a country tends to rise when the total value of goods and services that domestic producers sell to foreign countries is greater than the total value of foreign goods and services that domestic consumers buy. When this occurs, a country is said to have a trade surplus.

However, if the reverse occurs—that is if the amount that domestic consumers spend on foreign products is greater than the total sum of what domestic producers are able to sell to foreign consumers—this is called a trade deficit. In this situation, the GDP of a country tends to decline.

GDP can be calculated on a nominal basis or a real basis, the latter accounts for inflation. In totality, real GDP is a better method for expressing long-term national economic performance since it uses constant dollars.

2.1.2 Health Indicator

According to Pan American Health Organization (2021), a health indicator is "a construct of public health surveillance that defines a measure of health (i.e., the occurrence of a disease or other health-related event) or a factor associated with health (i.e., health status or other risk factor) among a specified population.

2.1.3 Public Health Expenditure: Damian (2014), the concept of Health expenditure captures all expenditures for the provision of healthcare services, family planning activities, nutrition activities and emergency related services and aids budgeted for health care in any system. This expenditure does not include the provision of drinking water and sanitation.

Mushkin (1962), considers (expenditure in) health as an investment capable of spurring economic growth. Financing of healthcare services is a very critical component of health systems. The annual budget of the nation make provision for health accounts which provide a large set of indicators based on information about expenditure collected within an internationally recognized framework. These financial records are a synthesis of the financing and expenditure flows recorded in a health system's operation, from funding sources to the distribution of funds between providers and the various functions of health systems.

Public health expenditure is the total amount of money spent by the public authorities which is also referred to as the government (central, state and local government). This expenses incurred by the government are for the purpose of maintaining the government and also providing basic goods and services for the people in order to improve social welfare.

Public health expenditure is classified into various categories or groups namely the capital health expenditure and recurrent health expenditure, the developmental and non-developmental expenditure and lastly the planned and un-planned expenditure. The capital expenditure is the amount of money spent by the government on building durable assets, it is non-recurring in nature but this type of expenditure is cost incurred by government in building hospitals or clinics, buying of health equipment's and machineries. On the other hand, recurrent expenditure is that type of expenditure incurred by the government yearly, this expenditure is also called consumption expenditure (i.e expenses on drugs, salaries of health staff etc).

The second classification of public health expenditure is based on developmental and non-developmental expenditure and this expenditure depends on whether a particular expenditure by the government promotes development or not, developmental expenditure are expenses made by the government to promote economic growth. This expenditure includes building of hospitals, clinics or dispensaries and buying of medical equipment and machineries, developmental expenditure is another type of capital expenditure. Non-developmental expenditure are expenses on public debt, salaries of health staffs and purchases of drugs. It has been observed from further studies that expenditure on health and education are classified under non-developmental expenditure and the expenses on health and education promotes economic growth.

Thirdly, public health expenditure can also be classified into planned and un-planned expenditure. The planned expenditure is another example of capital expenditure while the un-planned expenditure falls under the recurrent expenditure. Un-planned expenditure is made up general services such as health and education. This expenditure includes expenses on drugs and salaries of health staff. While expenditure on hospital, clinic buildings and purchases of machineries and equipment are also classified under capital expenditure

2.1.5 Life Expectancy: Bezy (2021), life expectancy, shows the estimate of the average number of additional years that any particular person of a given age can expect to live. The commonest measure of life expectancy is life expectancy at birth. Life expectancy is a hypothetical measure. The assumption is that the age-specific death rates for the year in question will apply throughout the lifetime of every individual born in that year. The estimate, as a matter of fact, gives a projection of the age-specific mortality (death) rates for a given period over the entire lifetime

of the population born (or alive) during that time in question. The measure also differs considerably by sex, age, race, and geographic location. As such, life expectancy is commonly given for specific categories, rather than for the population in general. For instance, the life expectancy for black Indian females in the India who were born in 2003 is 70.5 years.

Life expectancy is a reflection of local conditions. In developing countries, life expectancy at birth is relatively low, as against when it's being compared with the developed countries. In some developing countries, life expectancy at birth may be lower than life expectancy at age 1, because of high infant mortality rates i.e. those commonly as a result of infectious disease or lack of access to portable water supply.

Life expectancy is analyzed by constructing a life table. A life table incorporates data on age-specific death rates for the population in focus. This needs enumeration data for the number of people, and the amount of deaths at each age of the specific population. The number of population we have are derived from the national census and some very important statistical data and from them the average life expectancy for each of the age groups within the population can therefore be calculated.

Bezy (2021), the effectiveness of the estimated life expectancy is subject to the potential accuracy of estimated life expectancy depends on the completeness of the census and death data available for the population in question and this data also varies from country to country. For example, in the United States, official complete life tables based on documented deaths that have been prepared since 1900, linked with the decennial census. Since the year 1945, annual abridged U.S. life tables have been published subject to the annual death registration and estimates of the population. Full life tables expose life expectancy for every year of age, and abridged tables show life expectancy for 5- or 10-year age groups, rather than for single-year groups. National life tables for many countries are published by the United Nations in its Demographic Yearbook.

2.2 Empirical Literature

Past studies that investigate the effect of health expenditure on economic growth or the relationship between both variables include scholars like of Bakare and Olubokun, 2011, Mehrara et al (2012), Nasiru and Usman (2012), Mehrara et al (2012) and, Elmi and Sadeghi (2012). Most of the studies give clear evidence in support of the health led growth hypothesis.

Boache (2015) investigated the growth effect of health in Ghana in the period 1982 to 2012 using the ARDL Bounds test approach to cointegration. Controlling for the effects of education, international trade, FDI, inflation and physical capital accumulation, the investigation finds that economic growth is significantly driven by health in both the long- and short-run, however, the favourable growth effect in the short-run is less, which implies that improvement in the health status of Ghanaians increases the level of output in the economy.

Oziengbe (2019), carried out an empirical analysis on the effect of total health expenditure, which comprises both public and private expenditure in health on economic growth in Nigeria in the period from 1995 to 2013. He employed the ARDL-based Bounds test approach to cointegration and error correction mechanism. The study discovered that total health expenditure positively and significantly affected economic growth in the short- and long-run. It also found a positive and significant short- and long- run impacts of gross capital formation on economic growth.

Elmi and Sadeghi (2012), studied the relationship between health care expenditure and economic growth in developing countries during the period from 1990 to 2009 using panel cointegration and causality with a vector error correction (VECM) framework. The study reveals short-run causality from GDP to health expenditure, and no short-run causality from healthcare expenditure to GDP. Further evidence from the investigation is that bidirectional long-run relationship exists among the variables, this indicates that income is an important factor explaining healthcare expenditure in developing countries as well as upholding the health-led growth hypothesis.

Sede and Ohemeng (2015), in their analysis of socioeconomic determinants of life expectancy in Nigeria discovered that unemployment has a statistically significant impact on life expectancy in Nigeria. Time series data ranging from 1980- 2011 was utilized for the work while vector autoregressive (VAR) and vector error correction (VEC) method was applied for the analysis. Anthony Orji et al (2020), mentioned Iyabo (2016), investigated the psychological impacts of unemployment and underemployment on the mental health of Nigeria youths and the place of good governance and agricultural revolution as a solution. A self-designed 25 item questionnaire was applied to gather information from 167 targets for the research. Findings shows that unemployment is a stressful life event. The results also concluded that the perceived rate of stress as a result of unemployment among both male and female were not significantly different. The discovery of the study is in tandem with the outcomes of wang (2015) and Sede and Ohemeng (2015). It therefore shows nothing less than the fact that unemployment is detrimental to health.

Bakare and Olubokun (2011) investigates the relationship between health care expenditure and economic growth in Nigeria in the 1970-2010 by using the ordinary least squares multiple regression analysis. The analysis indicates positive significant relationship between health care expenditure and economic growth in the country. They suggest annual increment in budgetary allocation to the health sector.

Mehrara et al (2012), investigate the relationship that exists between health expenditures and economic growth in Middle East and North Africa using panel cointegration analysis. The study revealed that health expenditure and GDP are cointegrated and that the share of expenditure in GDP decreases as the GDP rises, which implies that health care is not considered a luxury good.

Nasiru and Usman (2012) investigated the health expenditure-economic growth nexus in Nigeria in the period 1980-2010 period using the Bounds test approach to Cointegration and Granger causality test. The results indicate that both variables are cointegrated and that bidirectional causality exists between them.

Sadr (2012) applied VAR analysis to investigate the effect of e-health expenditure on economic growth of Iran in the 1970-2011 period. The analysis revealed inter alia that e-health expenditure as percentage of GDP positively impacts the growth of Iran's economy.

Ayuba (2014) analyzed the causal relationship between public social expenditure which is education and health and economic growth in Nigeria in the period from 1990 to 2009 using a vector error correction (VEC)-based causality model. The study also finds unidirectional causality between economic growth and health expenditure, with causality running from economic growth to health expenditure. This upholds the Wagner's law.

Aluko & Aigbedion (2018) carried out this study in order to examine the impact of health expenditure on the economic growth in Nigeria during the period between 1995 - 2016. The time series data and Econometrics tools were used to test the stationarity, cointegration and causality including the ordinary least square (OLS) and the Error correction model (ECM) were also applied to determine the long run and short run impact of public health expenditure on economic growth in Nigeria. The outcome from the OLS estimation indicates that there exists a positive relationship between public health expenditure and economic growth in Nigeria in the long run. Furthermore, the Error correction model (ECM) estimate indicate that in the short run public health expenditure has impact on the economy. From the result of the estimation above it means that public health expenditure has the ability to foster economic growth. However, due to the level of corruption in the country most especially in the health sector, government expenditure on health have little or no meaningful impact on the economic growth in Nigeria. To the researchers, this is as a result of unequal distribution of health care services, poor public and private partnership, poor health infrastructures and health equipment, inadequate drug supplies etc. The study recommends the government of Nigeria to ensure that the money spent to improve health services and delivery are rightly utilized and implemented in order to achieve a sustainable economic growth in the country.

Stanley (2019), applied the ARDL technique in determining the impact of public health expenditure on the economic growth of Nigeria within (1981 - 2017). The result revealed that public health expenditure has a positive and significant impact on the economic growth of Nigeria. It is also showed from the analysis that environmental pollution as proxied by per capita CO2 emission has a negative and significant impact on the health performance of the people living in the country i.e. labour force. It therefore suggested that government should sustain investment on the health sector and also improve on environmental practices by formulating policies guiding those practices.

Adedoyin et al. (2020), researched to determine if life expectancy, death rate and public health expenditure matter is sustaining economic in Nigeria amidst Covid-19. The study adopted the ARDL model and Granger causality. The result from the findings revealed that health expenditure has negative impact on the economic growth of Nigeria amidst Covid-19 and its impact is insignificant. The results gotten from the Granger causality test indicate there is an existence of unidirectional causal relationship between health expenditure and economic growth. Also the result indicates that health expenditure is an important factor that must be undertaken to improve economic growth and development of the Nigerian economy. The outcome further explains that Nigeria will benefit from her labour force if more money is invested to improve the health sector.

Ayoade et al. 2021, also investigated the assessment of public health expenditure, health outcome and economic growth in Nigeria between 1980 - 2019. The study showed that there is relationship between public health expenditure, health outcome and economic growth using the ARDL technique to estimate the specified model. The study indicates that health and education on human capita results were not encouraging as their P- value have insignificant effect on the economic growth of Nigeria. Having establishing the fact that health and education has a mutual interaction to economic growth in the introduction of the study, it should however be noted that these sectors are the major means of developing human resources of any nation for sustainable growth to be achieved.

Kareem et al. (2021,) in a research on the impact of health and agriculture financing on the economic growth of Nigeria within (1981 to 2019). The study applied time series data and unit root test was carried out with the use of Augmented Dickey Fuller test to determine the stationarity of all variables and the variables are stationary at order 1

in the two specified models. Error correction model (ECM) was also used to analyze data in order to determine the speed of adjustment from the short to the long run equilibrium state. Causality test was also utilized to check the relationship between variables and it showed that public expenditure on health has a significant impact on the economic growth of Nigeria. The Federal government capital expenditure on health is positive and significant while that on recurrent is also positive and insignificantly impacting the economic growth of Nigeria.

2.3 Theoretical Review

Some theories are adopted for this study as highlighted below, however the most appropriate and related theory to this research is the neoclassical growth model. This because it identifies human capital which captures education and health as important factors that determines growth.

Keynesian expenditure theory considers government expenditure as a key growth stimulant particular during recession. The Keynesian view is upheld by Ram (1986) through the Ram's Growth Accounting Model, wherein it is shown that government expenditure positively affects growth. Considering that expenditure in health constitutes part of total expenditure, this paper investigates the effect of health expenditure component of total expenditure on economic growth of Nigeria.

The Neoclassical growth models attribute economic growth to capital, labour and technical knowledge. The Augmented Solow Growth Model identifies human capital (education and health) as important factors determining the growth of an economy. Thus the model is also referred to as the Human Capital Augmented Solow Growth Model. Mushkin's (1962) health-led growth hypothesis considers health as a form of capital and sees health expenditure as an investment which can engender increase in income. We build on the Augmented Solow Growth model also referred to as the Human capital augmented growth model. This model shall be modified to capture the effect of health expenditure component of human capital investment to test the validity of Mushkin's hypothesis for Nigeria. The augmented Solow model and Mushkin hypothesis predict positive relationship between human capital and economic growth, thus underscoring the importance of human capital investment of which health expenditure is a part in the development of all economies.

3. Methodology

3.1 Sources of Data

Data are sourced from the CBN Statistical Bullettin, NBS Data Bank and the World Bank Data Base.

3.2 Method of Analysis

The method of analysis adopted for this study is The ARDL based Bounds test approach to cointegration and error correction modeling. The choice of this methodology is informed by the need to investigate the long run and short run relationships between the explanatory variables and the dependent variable. This method of error correction modeling has three distinct advantages over other error correction models. First it is applicable to modeling involving data that are of mixed order of integration; second, it is relatively more efficient in cases of small and finite data sizes and third, it yields unbiased estimates of the long-run model. (Harris & Sollis, 2003).This method involves unit root test for variables using one or more of the unit root test methods (Augmented Dickey Fuller test, PhillipsPerron test, etc), the cointegration test which is conducted to test the possibility of existence of level relationship or long run (equilibrium) relationship between the variables (dependent and explanatory variables) and, if the variables are found to be cointegrated, that is if the cointegration test indicates existence of level relationship between the variables, then an error correction model shall be estimated, as cointegration is a condition for error correction representation according to the Granger Representation Theory.

The ADF test adopted to test for unit root entails estimating the regression equation (Gujarati, 2004):

$$\Delta Y = \beta^{1} D_t + \pi Y_{t-1} + \sum_{j=1}^{p} \varphi \Delta Y_{t-1} + \varepsilon t \qquad (1)$$

Where $\pi = \phi - 1$ under null hypothesis Δyt is I(0) which implies that $\pi = 0$, D is a vector of deterministic terms (constant, trend), p lagged difference terms, $\Delta yt\text{-}j$, are used to approximate the ARMA structure of the errors, and the value of p is set so that the error εt is serially uncorrelated. The error term is also assumed to be homoscedastic.

The model which will be employed in this study is built based on the modification of the model in Ogundipe & Lawal (2011). The model specifies the endogenous variable (Gross Domestic Product) as a function of capital expenditure on health, recurrent expenditure on health, general expenditure on health, life expectancy at birth and fertility rate in the structural form of the model is expressed as follows:

RGDP = f (CHE, RHE, GEX) (1)

The structural form of the model is expressed as:

$$\text{RGDP} = f(\text{CHE}, \text{RHE}, \text{LER}) \qquad (2)$$

Where:
GDP = Gross domestic product, CHE = Capital Health Expenditure, RHE = Recurrent Health Expenditure, LER = Life Expectancy Rate
Transforming the above equations into natural log and true regression form,

$$\Delta LnR\text{GDP} = \beta_0 + \beta_1 \Delta \text{CHE} + \beta_2 \Delta \text{RHE} + \beta_3 \Delta \text{LER} + \varepsilon_t \quad (3)$$

The ARDL model of any identify cointegrating vector is re-parameterized into ECM, which result gives short run dynamics and long run relationship of the variables of a single model.
However, when there are multiple cointegrating vector, ARDL approach to cointegration cannot be used. For the sake of this study, the cointegration process pertaining to health indicators, economic development entry starts with the re-modification of equations above into ARDL framework. The model is adopted from Aluko O.O. (2017)

$$\Delta LRGDP = \beta_0 + \sum_{l=i}^{P} \beta_1 \Delta \ln RGDP_{t-i} + \sum_{l=i}^{Q} \beta_2 \Delta CHE_{t-i} + \sum_{l=i}^{R} \beta_3 \Delta \text{RHE}_{t-i} + \sum_{l=i}^{S} \beta_4 \Delta LER_{t-i} + \varphi_1 \Delta \ln RGDP_{t-i} + \varphi_2 \Delta CHE_{t-i} + \varphi_3 \Delta \text{RHE}_{t-i} + \varphi_4 \Delta LER_{t-i} \quad (4)$$

Where Δ is the difference operator, while φ is the parameter for the growth rate of real GDP. β_1- β_4 represent the short run parameters, the terms with the summation signs represent the error correction dynamics, and φ_1 - φ_4 are the long run parameters. The cointegration test requires setting up the two hypotheses (null hypotheses against the alternative hypothesis as follows:
$H_0 = \varphi = \beta_1 = \beta_2 = \beta_3 = \beta_4 = \beta_5$ …… Null hypothesis
$H_0 = \varphi = \beta_1 = \beta_2 = \beta_3 = \beta_4 = \beta_5$……..... Alternative hypothesis
If the F-statistic is greater than the upper critical bound value, the null hypothesis is rejected confirming the existence of the long run relationship and vice versa. After establishing the long run relationship, the next step is to estimate the long run model started as follows:

$$\Delta RGDP = \beta_0 + \varphi_1 \Delta RGDP_{t-i} + \varphi_2 \Delta CHE_{t-i} + \varphi_3 \Delta RHE_{t-i} + \varphi_4 \Delta LER_{t-i} \quad (5)$$

After estimating the ARDL long run specification and the connected long run multipliers, the error correction model need to be estimated too. Thus, the error correction model mainly formulated to estimate the short run dynamics. This is started as follows:

$$\Delta LRGDP = \beta_0 + \sum_{l=i}^{P} \beta_1 \Delta \ln RGDP_{t-i} + \sum_{l=i}^{Q} \beta_2 \Delta CHE_{t-i} + \sum_{l=i}^{R} \beta_3 \Delta \text{RHE}_{t-i} + \sum_{l=i}^{S} \beta_4 \Delta LER_{t-i} + \varphi_1 ECM_{t-i} \quad (6)$$

Where β_1- β_4 represent the short run parameters and φ_1 is the speed of adjustment parameter which is expected to be less than zero. ECM is the lagged error correction term obtained from the estimated cointegration model equation above.

3.3 A Priori Expectation

According to economic theory, it is expected that Capital Health Expenditure (CHE), Recurrent Health Expenditure (RHE) and Life Expectancy Ratio (LER) will have a positive impact on the growth of the economy. This a priori expectation are expressed mathematically below:
β_0<0 or β_0>0,
β_1>0, β_2<0, β_3 <0

4. Data Analysis

4.1 Descriptive Statistics

This gives a glimpse of the data used in terms of distribution of the variables.

Table 1: Descriptive Statistics

	RGDP	CHE	RHE	LER
Mean	43355.8	86.35069	114.9371	49.2653
Median	39541.24	70.08076	58.97681	48.524
Maximum	72393.67	303.6626	423.3298	55.12
Minimum	21462.73	1.4917	0.150161	45.841
Std. Dev.	19550.83	81.34137	129.6805	3.286815
Skewness	0.250399	0.909218	1.00792	0.386305
Kurtosis	1.425441	3.110349	2.829315	1.631857
Jarque-Bera	3.640046	4.42518	5.456988	3.291654

Probability	0.162022	0.109417	0.065318	0.192853
Sum	1387385	2763.222	3677.988	1576.49
Sum Sq. Dev.	1.18E+10	205109	521328.2	334.8977
Observations	32	32	32	32

Source: Authors Computation using E-view 10, 2022

From table 1, the skewness of the RGDP is positive with value of 0.250399 which tends towards the right. Also, the CHE, RHE and LER are skewed towards the right because their values are all positive. The kurtosis of a normal distribution is 3. If it exceeds 3 it means the distribution is leptokurtic. On the other hand, if less than 3, it indicates the distribution is platykurtic relative to the normal distribution. From table 1, the kurtosis value of RGDP, CHE, RHE and LER which are 1.425441, 3.110349, 2.829315 and 1.631857 respectively shows that RGDP, RHE and LER are less than 3, while CHE is a little above 3. These mean that CHE is leptokurtic, while both RGDP, RHE and LER are platykurtic relative to the normal distribution.

For the Jarque-Bera statistics, the Null Hypothesis which states that the distribution is normally distributed is rejected at 5% level of significance. From table 1, the probability values of the Jarque-Bera show that RGDP and CHE, RHE are normally distributed with their probability values of 0.162022, 0.109417, 0.065318 and 0.192853 are all greater than 5%, thus normally distributed because its probability value is greater than 0.05%

4.2 Unit Root Test Result

The Augmented Dicker-Fuller (ADF) unit root test is used to conduct a pre-diagnostic test to ascertain the underling properties of the time series variables. This test is important because estimating a model in the presence of non-stationary time series variable usually leads to spurious (meaningless) regression output with biased and inconsistent estimates of the standard errors of the coefficients, which could lead to misleading inference. Table 2 shows the summary of the computed Augmented Dicker Fuller Unit Root test for each of the variables.

Table 2 Summary of Augmented Dicker Fuller Stationarity Test

Variable	ADF Test Statistics	Critical ADF Test Statistics	Probability Value	Order of Integration
RGDP	-2.9707	-2.964	0.0493	I(1)
CHE	-6.7851	-3.5684	0.0000	I(1)
RHE	-4.8382	-2.9678	0.0005	I(1)
LER	-4.8503	-2.9919	0.0007	I(0)

Source: Authors Computation using E-view 10, 2022.

From the summary of table 2, it could be seen that the RGDP, CHE and RHE are stationary at first difference while LER is stationary at levels. Based on the combination of the order of integration of I(0) and I(1) without any integrated at I(2), we shall proceed to estimate the variables using the Auto-Regressive Distributive Lag (ARDL) model.

4.3 ARDL Bound Test for Cointegration

The bound test is performed to show the levels of Cointegration among the variables. It helps to show if there is a long run relationship among the variables.

$$\Delta LRGDP = \beta_0 + \sum_{l=i}^{P} \beta_1 \Delta \ln RGDP_{t-i} + \sum_{l=i}^{Q} \beta_2 \Delta CHE_{t-i} + \sum_{l=i}^{R} \beta_3 \Delta RHE_{t-i} + \sum_{l=i}^{S} \beta_4 \Delta LER_{t-i} + \varphi_1 \Delta \ln RGDP_{t-i} + \varphi_2 \Delta CHE_{t-i} + \varphi_3 \Delta RHE_{t-i} + \varphi_4 \Delta LER_{t-i}$$

Table 3.

Test Statistic	Value	Signif.	I(0)	I(1)
F-statistic	13.3412	10%	2.72	3.77
K	3	5%	3.23	4.35
		2.50%	3.69	4.89
		1%	4.29	5.61

Sources: Authors Computations using E-views 10, 2022

The bound test null hypothesis states that no level relationship. If the value of the F-statistics is lower than the value of the lower and upper bound, we cannot reject the null hypothesis but if it is greater than the lower and the upper bound, we can reject the null and accept the alternate that there is a long run relationship amongst the variables. From table 3, the bounds test value of the F-statistics which is 13.3412 is higher than the values of the upper and lower bound limit which are 3.23 and 4.35 at 5% critical level of significance. This means that there is a long run equilibrium relationship between the variables RGDP, CHE, RHE and LER. Having established that there is long run relationship between the variables, the next step is estimate the Error Correction Model.

Long Run Coefficients
Table 4

Variable	Coefficient	Std. Error	t-Statistic	Prob.
CHE	0.001132	0.00069	1.640629	0.1353
RHE	0.004486	0.000609	7.362491	0
LER	-0.05286	0.028364	-1.86354	0.0953

Sources: Authors Computations using E-views 10, 2022.

The long-run form of the model in terms of magnitude, the coefficient of CHE which gave a value of 0.001132 which implies Capital health expenditure positively affect RGDP. It means for every 1% increase or decrease in CHE will lead to 0.11% sustained increase or (decrease) in RGDP. It will on average, lead to 0.001132 percent increase (or decrease) in RGDP. With respect to the coefficient of RHE which gave a value of 0.004486 shows that for every 1 % increase (or decrease) in RHE, will on average lead to 0.4% decrease (or increase) in RGDP. Also with respect to the coefficient of LER which gave a value of -0.052857 shows that for every 1 % increase (or decrease) in LER, will on average lead to -5.2% decrease (or increase) in RGDP.

4.5. Error Correction Model (ECM)

Since there is long run relationship among the variables, we shall proceed to estimate the ECM.
The Error Correction Model is shown as follows:

$$\Delta LRGDP = \beta_0 + \sum_{l=i}^{P} \beta_1 \Delta \ln RGDP_{t-i} + \sum_{l=i}^{Q} \beta_2 \Delta CHE_{t-i} + \sum_{l=i}^{R} \beta_3 \Delta \mathrm{RHE}_{t-i} + \sum_{l=i}^{S} \beta_4 \Delta LER_{t-i} + \varphi_1 ECM_{t-i} \quad (6)$$

Table 5: Error Correction Model Regression

ECM Regression

Case 3: Unrestricted Constant and No Trend

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	27.1481	3.216842	8.439364	0
D(LRGDP(-1))	0.949509	0.119558	7.941841	0
D(LRGDP(-2))	0.521272	0.155877	3.344132	0.0086
D(CHE)	5.39E-05	0.000147	0.365549	0.7231
D(CHE(-1))	-0.00275	0.000392	-7.01138	0.0001
D(CHE(-2))	-0.00264	0.000354	-7.45662	0
D(CHE(-3))	-0.00114	0.000197	-5.79137	0.0003
D(RHE)	0.000757	0.000163	4.633633	0.0012
D(RHE(-1))	-0.00723	0.000833	-8.68127	0
D(RHE(-2))	-0.00492	0.000609	-8.07048	0
D(RHE(-3))	-0.00192	0.000272	-7.0507	0.0001
D(LER)	0.013683	0.016752	0.816803	0.4351
D(LER(-1))	0.21271	0.028801	7.385572	0
D(LER(-2))	0.579355	0.064881	8.929527	0
D(LER(-3))	1.30484	0.158711	8.22148	0
CointEq(-1)*	-2.18379	0.258889	-8.43523	0
R-squared	0.927909	Mean dependent var		0.040985
Adjusted R-squared	0.837796	S.D. dependent var		0.039482

Source: Author's computation using E-view 10, 2022

The Error Correction Model (ECM) shows the short run relationships between the dependent and the independent variables. The Error Correction Term (ECT) must be negative and less than 1 and should be statistically significant. In table 5 the probability value of 0.0000 of the F-statistics, indicates that there is a short run relationship between the RGDP, CHE, RHE and LER. The ECT shows the speed of adjustment from a disequilibrium states. Its value of -2.183788 indicates that it is negative, but greater than 1. This indicates there is an over convergence relationship between the dependent and the independent variable. This mean that, the speed of adjustment from the short run to the long run should is 218%. It also means that it will take 218% speed of adjustment for the model to adjust within a year from the short run to the long run. The R-square value of 0.927909 revealed that the CHE, RHE and LER jointly accounted for about 97 percent of the variation in GDP while the remaining 3 percent are accounted for by other factors outside the model. The Durbin-Watson (DW) statistic was used to test for the presence of autocorrelation or serial correlation among the error terms. The closer the DW is to 0, the greater the evidence of positive serial correlation, and closer the DW is to 4, the greater the presence of negative serial correlation (and the acceptable DW range of none serial correlation is between 1.50 and 2.40). Thus, the result show that there is no evidence of autocorrelation as indicated by DW statistic of 2.207912.

4.6 Serial Correlation Result

Table 6: Serial Correlation LM Test

F-statistic	**0.265667**	**Prob. F(2,7)**	**0.7741**
Obs*R-squared	**1.975395,**	**Prob. Chi-Square(2)**	**0.3724**

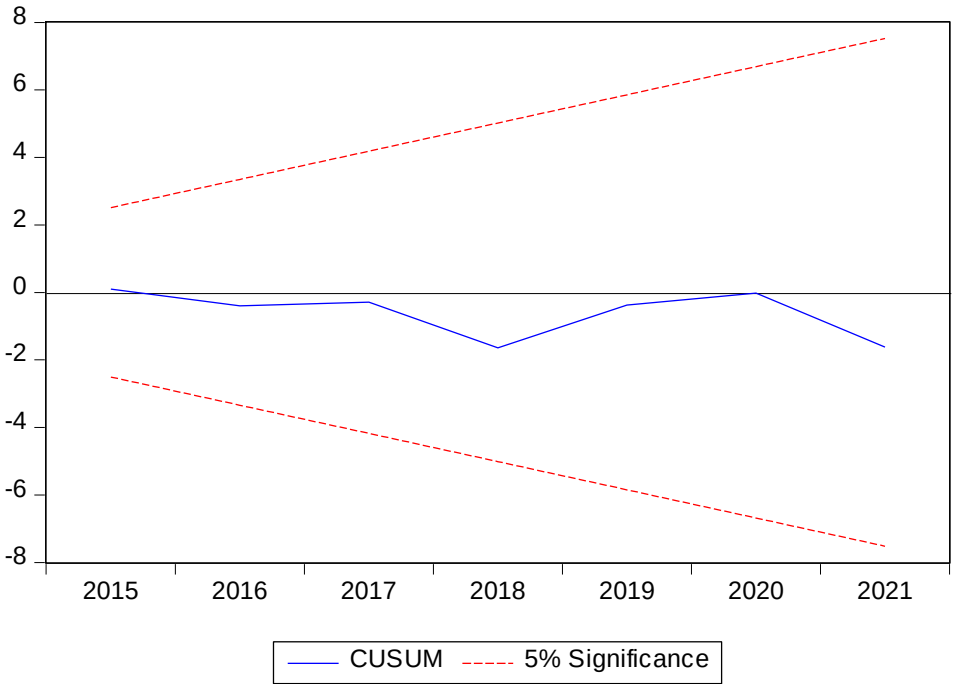
Sources: Authors Computations using E-views 10, 2022

In line with the rule of the Breusch-Godfrey Serial Correlation LM Test, the probability value of 0.7741 of the F-statistics indicates that the model is free from serial correlation because the probability value is greater than 5%.

4.7 Stability Test

A CUSUM test assesses the stability of coefficients whether there is a structural change in a model.

The CUSUM chart is shown in Figure 1



The null hypothesis for CUSUM test states that the parameters are stable while the alternate hypothesis states that the parameters are not stable. The guideline is that, if the blue line lies within the red line, we accept the null hypothesis that the parameters are stable. On the other hand, if the blue line crosses the red line, we reject the null and accept the alternative hypothesis that the parameters are not stable. From figure 1, it could be seen that CUSUM, the blue line lies between the two red lines. This means that the model is stable.

5. Discussion of results

The paper investigated the relationship between some selected health indicators and economic growth in Nigeria in the period from 1990 to 2021 using the ARDL-based Bounds test approach to cointegration and error correction. The study finds that health indicators capital health expenditure and recurrent health expenditure positively affected economic growth in the short- and long-run. However only recurrent health expenditure is significant short- and long- run, but the insignificant effects of capital health expenditure on economic growth and no significant impact in the long run. The short-run effect of LER on RGDP was found to be negative and insignificant, while the long-run effect was also negative but statistically significant.

5.1 Conclusion and recommendations

In light of the empirical evidence, the following are recommended for policy consideration:

I. There should be more priority on government spending, particularly on capital health expenditure such as building and equipping health centres in every community to enhance accessibility to health centres in the nation. This will promote growth in the economic growth of Nigeria.

II. There is need for the government through its institutions and agencies to put measures on ground to encourage and boost job creation in the country. These measures include infrastructural development, improving the security

condition in various remote healthcare facilities, improving on the welfare of health workers, setting the interest rate at levels favourable to domestic investment and foreign direct investment in the health sector, and creating an enabling environment for small and medium enterprises to thrive and providing a lot of incentives to boost the growth of healthcare industry.

III. Government should create policies that will enhance the life expectancy of the people. Improving in the welfare of the people will give them the confidence to stay in the country after their lives have improved. This is what can create a more positive impact on the economy in the long run.

References

Adelowokan, O.A. (2012). Growth effect of education and health expenditure in Nigeria. *African Journal of Scientific Research*, 10(1), 509-528.

Aluko, O. O. & Aigbedion, I. M. (2017). Public health expenditure and economic growth in Nigeria: An error correction model. *Journal of Economics, Management and Trade*, 21(6), 1-11.

Anthony O. (2020), Your Job or Your Health? Analysis of Unemployment Issues and Health Outcomes in Nigeria. *The Romanian Economic Journal, Year XXIII no. 77*

Ayuba, A.J. (2014). The relationship between public social expenditure and economic growth in Nigeria: An empirical analysis. *International Journal of Finance and Accounting*, 3(3), 185-191.

Bakare, A.S. & Olubokun, S. (2011). Health care expenditure and economic growth in Nigeria: An empirical study. *Journal of Emerging Trends in Economics and Management Sciences*, 2(2), 83-87.

Bloom, D.E. & Canning, D. (2008). *Population health and economic growth*. World Bank Working Paper, No. 24.

Boache, M.K. (2015). *Effect of health on economic growth in Ghana: An application of ARDL bounds test to cointegration.* MPRA Paper No. 67201.

Chinaemerem, O.C. & Chidiebere, A.B.A. (2013). Effect of foreign investment on the economic growth of Nigeria. *Information and Knowledge Management*, 3(1), 43-48.

Elmi, Z.M. & Sadeghi, S. (2012). Health care expenditures and economic growth in developing countries: Panel cointegration and causality. *Middle-East Journal of Scientific Research*, 12(1), 88-91.

Georgiou, M.N. (2013). *Health expenditure and economic growth: A worldwide panel data analysis*. Available at SSRN: http://ssrn.com/abstract=2250761.

Kurt, S (2015). Government health expenditures and economic growth: A Feder-Ram approach for the case of Turkey. *International Journal of Economics and Financial Issues*, 5(2),441-447.

Mehrara, M., Fazaeli, A.A., Fazaeli, A.A. & Fazaeli, A.R. (2012). The relationship between health expenditure and economic growth in the middle East and North Africa (MENA) Countries. International *Journal of Business Management and Economic Research*, 3(1), 425-428.

Mushkin, S. J. (1962). Health as an investment. *Journal of Political Economy*, 70(5), 129-157.

Nasiru, I. & Usman, H. M. (2012). Health expenditure and economic growth nexus: An ARDL approach for the case of Nigeria. *Journal of Research in National Development*, 10(3), 95-100.

Olugbenga, A.A. & Alamu, O.A. (2013). Does capital flight have a force to bear on Nigerian economic growth? *International Journal of Developing Societies*, 2(2), 80-86.

Onisanwa, I.D. (2014). The impact of health on economic growth in Nigeria. *Journal of Economics and Sustainable Development*, 5(19), 159-166.

Ram, R. (1986). Government size and economic growth: A new framework and some empirical evidence from cross-section and time series data. *American Economic Review*, 76, 191-203.

Sadr, S. M. H. (2012). Consideration of the Effect of E-Health Expenditure on Economic Growth with VAR Approach. *Asian Journal of Business and Management Sciences*, 2(3), 35-42.

Umoh, O.J., Jacob, A.O. & Chuku, A.C. (2012). Foreign Direct Investment and economic growth in Nigeria: An analysis of the endogenous effect. Current Research *Journal of Economic Theory*, 4(3), 53-66.

Umoru, D. (2013). Capital flight and the Nigerian Economy. *European Journal of Business and Management,* 5(4), 40-50.

Wang, K. (2011). Health care expenditure and economic growth: Quantile panel type analysis. *Economic Modeling*, 28(4), 1536-1549.

Weil, D.N. (2005). *Accounting for the effect of health on economic growth*. NBER Working Paper 11455, July.