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Effect of Health Infrastructures on Economic Growth in Nigeria

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Abstract

The study explores the impact of health infrastructures on the economic growth in Nigeria between 1985 and 2022. The study extract data from on health infrastructures and economic growth from World Development Indicators (WDI). The methods utilised in the investigation includes unit root test, ARDL model, and Granger causality test. In the short term, the analysis revealed that the current level of health expenditure in Nigeria has an insignificant but adverse effect on the country's economic growth. Conversely, over time, the present health spending had a favourable albeit inconsequential effect on the economic growth. The impact of domestic government health expenditure on economic growth in Nigeria is found to be significantly negative, both in the short and long term. Also, the allocation of resources towards capital health expenditure yielded a statistically modest yet favourable effect on economic growth, both in the short and long term. The study thus recommends that efforts should be made to increase capital expenditure on trained personnel, health facilities, machinery and equipment, as well as manpower training in the health sector, in order to enhance economic growth: Focus should be on improving the operational efficiency, implementation, maintenance, efficient utilisation of existing health infrastructure as well as redistribution of the infrastructure in a manner that ensures maximum benefits for all.

Keywords: Health Infrastructures, Domestic Government Health Expenditure, Capital Health Expenditure, Economic Growth
JEL Classification: H51; I15; O40

1.0 Introduction

The health of the people is affected by the healthcare system, which includes basic, secondary, and tertiary care. Elola (2015) was of the opinion that a country's health care system can be better than others if the country gets improved health infrastructures or the same results with less health infrastructure. Here, health infrastructure refers to the quality of the human resources, technology, and real resources that can be used to provide healthcare services. For example, Mohammed (2017) believed that health infrastructure includes but not limited to buildings and other long-term structures like roads that are well-kept and water pipes in healthcare centres. On the other hand, technological health infrastructure is the equipment that is only used in hospitals and for surgical treatments. A lot of different types of healthcare workers, like doctors, chemists, nurses, midwives, laboratory techs, managers, accountants, and others, work together to make sure that in each community there are enough healthcare services.

People's health and happiness are very important because they have a big effect on how productive a country is. This means that healthcare is an important requirement for both short-term and long-term growth of an economy. The total well-being of a person includes their mental, physical, and social state, as well as their emotional state. Ogundipe and Lawal (2011) opined that a healthy life is one without sickness, disability, or injury. Not being healthy makes it harder for people to make a real difference in the growth of their neighbourhood and the country as a whole. Making improvements to health facilities is a big part of boosting economic growth because it helps build a strong population.

The current state of health infrastructures in Nigeria is a serious bone of contention. The United Nations Population Division (2019) says that approximately 63.7 percent of the Nigerian population lives in rural areas where there are not many or any general health infrastructures. The Sustainable Development Goals (SDGs) laid out the necessary steps to improve the general welfare of a population. One way to do this is to make sure that everyone has access to affordable healthcare services that are of high quality (NDHS, 2018). Making sure that people of all ages are happy and healthy is an important part of achieving sustainable growth. Nigeria will not be able to reach its Sustainable Development Goals (SDGs) unless there are enough health facilities in both rural and urban places. More importantly, Borola (2017) asserted that high-performing health outcomes depend on strong infrastructure, while weak infrastructure slows down the growth of health outcomes. The strong health infrastructures according to him includes the availability and comfort of beds, doctors, and medical dispensaries in government hospitals, as well as the level of training given to staff, have a big effect on health results. A number of empirical studies have suggested that building up health infrastructure is a good way to change people's health and therefore the economic growth of a country. Based on the idea that health infrastructure is a policy tool that the government uses to have an effect on the health sector and achieve its goals, this claim is supported.

Economic growth is when an economy's productivity is steadily raised, which leads to either a rise in national income or a steady rise in total production. Health facilities are important for boosting economic growth, which is something that the government has paid attention to and which has made a big difference in the country's economic progress over the past few years. Over the past few years, Nigeria has consistently invest resources into the health sector, mostly for infrastructure. Based on the available information, Nigeria's output has changed over the years, and it is still not clear where these changes came from. For example, the gross domestic product growth rate was 0.8 in 2017, 1.9 in 2018, 2.2 in 2019, -1.8 in 2020, 3.6 in 2021, and 3.3 in 2022. According to the World Bank (2023), the current growth rate of health spending was 3.7% in 2017, 3.1% in 2018, 3.0% in 2019, and 3.4% in 2020. This shows that there was a big difference between the rate of growth in health spending and the rate of growth in the economy. For example, health care spending as a share of GDP went up by 0.4% in 2020 compared to 3.0% inflation in 2019. On the other hand, the GDP growth rate went from 2.2% in 2019 to -1.8% in 2020. This means that the rate of growth in health care costs is higher than the rate of growth in income. And because of this and some other reasons, Nigeria witnessed more brain drain as skilled medical workers moved to industrialised countries with better access to health infrastructures to work more efficiently and keep up with medical advances. Because of this, fewer people are working in the healthcare industry, which makes it less able to improve health results and add to the national productivity as a whole. In view of this, this study aims at investigating how health infrastructure affects Nigeria's economic growth from 1985 to 2022.

In spite of massive investments in healthcare infrastructure, including the establishment of medical facilities and the hiring of medical personnel, Nigeria's healthcare system continues to underperform. The components of Nigeria's health system and economic growth are intricately interdependent, notwithstanding the country's substantial investments in healthcare infrastructure. There is a disparity in the distribution of health benefits because people face barriers to accessing adequate healthcare services, such as a lack of healthcare facilities and problems with transportation. Since then, problems with staffing, equipment, and training have reduced the efficiency of healthcare delivery, which puts the population's health at risk, puts a strain on the healthcare system, and slows down economic output. Consequently, this study looked at health infrastructure in the Nigerian economy and how it relates to GDP growth. The uniqueness of this study is in two folds. First, this study uses health expenditure as a proxy for health infrastructures and considered this with economic growth for a test of the causal relationship. Second, the study uses Autoregressive Distributed Lag (ARDL) bounds testing approach to cointegration proposed by Pesaran et al. (2001) to analyse long-run relationships between the variables of interest. This procedure is adopted because it has better small sample properties than alternative methods. Moreover, it can be used irrespective of the order of integration of the regressors.

2.0 Literature Review

2.1 Conceptual Review

Health Infrastructures and Economic Growth

The relationship between health infrastructures and economic growth is fundamental since improvement in health infrastructures promotes efficiency at work which enhances labour productivity, skills and aptitude. All these will eventually leads to high life expectancy and higher economic growth in the economy. A country's health infrastructure refers to the availability and quality of its health care services. The quality of the available physical, technological, and human resources at a specific period is used to judge it. In healthcare settings, physical structure refers to the buildings and other fixed features like piped water, decent access roads, power, and so on; technology, on the other hand, refers to the tools and machinery designed for use in hospitals, such as surgical instruments (Omorodion, 2022).

Human resources include medical personnel such as physicians, chemists, nurses, midwives, laboratory technicians, administrators, accountants, and a host of other occupations, while physical resources include things like computers and related consumables. When taken as a whole, these factors determine the infrastructure of every society and provide the groundwork for healthcare delivery within it. All things considered, infrastructure consists of two parts: the "substructure" that supports the "superstructure" and the "intrinsic framework" of a system or organisation. A society's health infrastructure determines the quality and accessibility of its health care delivery, as well as the system's capacity and capability to carry out its primary duties and mandates (Ibrahim, 2017). Nigeria, like the rest of sub-Saharan Africa, has a diverse and patchwork system of health care facilities (Daniel, 2018). Because of their impact on the system's results, they have been classified as either "hard infrastructure" (i.e., components supporting the economy) or "soft infrastructure" (i.e., components supporting the system's social reaction and capabilities) (Wilson, 2017).

2.2 Theoretical Review

Andersen's Health Behaviour Theory

The theory underpinning this study were well-suited to Andersen's health behaviour theory. In his theory of health care utilisation, Andersen (1968) classified three factors that influence people's decisions to use health service. These encompass predisposing characteristics, enabling characteristics, and need based characteristics.

Predisposing Characteristics: People who are likely to seek medical attention fall into this category. Predisposing factors that determine health care use include demographic factors (for example, age, and sex) and social structure elements (for example, education, occupation, ethnicity, social network, social interactions, and culture). The utilisation and accessibility of health care are influenced by an individual's socioeconomic status in relation to the aforementioned elements. A person's health belief factors, which comprise their views, values, and understanding of the health care system, are another component of the predisposing traits. Health service is more likely to be utilised by individuals who have faith in its efficacy.

Enabling Characteristics: Andersen defines this category as encompassing resources that are available at the family, community, and health facility levels. Family or personal resources encompass several factors such as income, health insurance coverage, geographical situation, and the calibre of social connections. The primary aspects of income and health insurance coverage are crucial as they directly impact the financial resources available for healthcare expenses, as they affect the level of family or personal income. Furthermore, the provision of health insurance coverage bolsters an individual's ability to get and utilise healthcare services. At the community level, resources encompass the presence of accessible health facilities, healthcare professionals, and medical apparatus. It is imperative that health facilities, encompassing health infrastructure, are readily available for utilisation. The presence of health staff and medical equipment within health facilities is essential for the efficient use of healthcare services. The provision of sufficient health infrastructure has been shown to decrease patient waiting times and enhance the utilisation of healthcare services.

Need-based Characteristics: Perceived and assessed needs for health services make up the third group in Andersen's theory of health-related activity. Perceived need is defined by Andersen (1968) as an individual's assessment of their own health and functional status, as well as their perception of the severity of their symptoms, pain, and concerns about their health, and whether or not they believe their problems are significant enough to warrant professional assistance. Evaluated perception of need is an expert's assessment of an individual's health status and the necessity of medical treatment.

The premise of Andersen's social theory of health care services aligns well with the primary objective of this research, which is to examine the impact of health infrastructure on economic growth. People cannot access health care unless they have personal, family, or community resources to do so. First and foremost, individuals should be able to access and make good use of their local health care facilities and the personnel that work there. Access to and utilisation of health care services is also essential for individuals and their families. Having access to standard means of payment, health insurance, and medical treatment all fall under this category. People are less likely to utilise health care services if these are absent or of poor quality.

2.3 Empirical Review

Amadi and Alolote (2020) worked on government expenditure on infrastructure as a driver for economic growth in Nigeria. The study adopted Unit root and co- integration tests using Augmented Dickey–Fuller and Phillip–Perron model. Weighted least square was also used to test the sample of 37-year annual time series using vector error correction model. It was thereafter revealed that government spending on transport, communication, education and health infrastructure have significant effects on economic growth whereas spending on agriculture and natural resources infrastructure recorded a significant inverse effect on economic growth in Nigeria. An element of fiscal illusion was observed in the government spending on agriculture and natural resources indicating that government is not contributing as much as the private sector in spending on agriculture and natural resources infrastructure in Nigeria.

Adesola (2019) examined the state of Nigeria's public health infrastructure and the efficiency of the health system, focusing on the country's potential for long-term economic development. Empirical results from the use of the ARDL model shows that the variables included in both models have a stable relationship both in the long and short run. Theo-Mario (2021) investigated the connection between health infrastructures and health facilities. Spending on health at a certain era influences growth during that same period, according to OLS, but delayed health infrastructures do not seem to affect growth at all.

Rahan and Edu (2021) also looked at Nigeria's health infrastructure employing Ordinary Least Squares (OLS) analysis. It was discovered that health infrastructure had a negative correlation with life expectancy and literacy rate in the short and long run, and that the income elasticity of health infrastructure was less than one unit in both the short and long runs. Imoughele (2018) studied what factors affected Nigeria's health infrastructure. Using error correction techniques, the key determinants of health infrastructure in Nigeria are the total population of children aged 14 and below and the share of health infrastructure in gross domestic product, which is a proxy for the government's developmental policy on health. Okafor (2020) focused on the degree to which healthcare infrastructure has helped or hindered the implementation of National Health Insurance Scheme. It was discovered that people are not making use of most of health facilities due to a lack of proper infrastructure, such as enough beds in hospitals, and that health facilities have unstable power supplies, which makes it hard for medical staff to provide quality care, hence serious negative effect on the economic growth in Nigeria.

Imoughele, Lawrence Ehikioya, and Mohammed Ismaila (2018) used an error correction mechanism technique to study the factors that affected Nigeria's public health infrastructure. By applying error correction techniques, it was found that GDP per capita, population per physician, unemployment rate, consumer price index, and political instability are not significant determinants of Nigeria's health infrastructure, but health infrastructure shares in GDP (a proxy for the government's health developmental policy) are the most important.

Health infrastructure and its determinants are co-integrated, according to Hu's (2020) examination of Malaysian health infrastructure from 1967 to 2007. This finding is consistent with economic theory. Reman, Bassey, and Edu (2011) examined Nigeria's healthcare infrastructure. It was revealed that health infrastructure had a negative correlation with life expectancy and literacy rate in both the short and long run, and its income elasticity was below unit in both the short and long run, according to their use of Cobb-Douglas production and ordinary least squares.

The examined literature makes it very clear that the effect of health infrastructure on GDP growth has been consistently mixed with their findings. This could however be justified based on the uniqueness of each study in terms of approach, time frame, and the explanatory variables. This is why this study set out to use a new set of variables and an unconventional methodology to delve deeper into the relationship between health infrastructure and economic growth in the modern era.

3.0 Methodology

The study employed ex-post facto research design. The decision to use this research design is based on the fact that the data from the World Bank from 1985 to 2022 on health infrastructures and economic growth cannot be easily changed or altered. The framework of this study is Andersen's theory of health-related behaviour. Among the factors that influence people's decisions to use health care services, Andersen's theory of health behaviour identifies enabling features. The document outlined community-level resources, which encompass existing healthcare facilities, infrastructure, staff, and equipment. Patients experience shorter wait times and better utilisation of health care services when there is sufficient infrastructure available. When the government allocates a substantial portion of its money to health, this can be accomplished. The following is the functional structure of the model based on the theoretical framework that underpins this study and in line with Andersen, R.M. (1968):

$$GDPt = f(CEXPt, DGHEt, CHEt) \qquad 1$$

The econometric equations representing the aforementioned is as follows:

$$GDPt = \alpha 0 + \alpha 1 CEXPt + \alpha 2\, DGHEt\ + \alpha 3 CHEt + \mu \qquad 2$$

Where:

GDP = Gross Domestic Product growth rate

CEXP = Current Health Expenditure

DGHE = Domestic Government Health Expenditure

CHE = Capital Health Expenditure

α0, α1, α2, and α3 = Coefficients of the independent variables

μt = Error Term

3.1 Model Specification

The ARDL model specifications of the functional impact of current health expenditure, domestic government health expenditure and capital health expenditure on economic growth as expressed by Equation (2) can be written as follows:

The ARDL model specifications of the functional impact of current health expenditure, domestic government health expenditure and capital health expenditure on economic growth as expressed by Equation (2) can be written as follows:

$$GDP = \alpha + \sum_{i=1}^{N1} \Omega_i \, CEXP_{t-i} + \sum_{j=0}^{N2} \phi_i \, DGHE_{t-j} + \sum_{k=0}^{N3} \varphi_i \, CHE_{t-i} + \varepsilon_i \quad 3$$

The generic form of Equation (3) in the context of the ECM is expressed as Equation (4):

$$\Delta GDP_t = \alpha + \sum_{i=1}^{N1} \beta_i \, \Delta CEXP_{t-i} + \sum_{j=0}^{N2} \gamma_j \, \Delta DGHE_{t-j} + \sum_{j=0}^{N3} \gamma_j \, \Delta CHE_{t-j} + ECM_{t-1} + \mu_t \quad 4$$

The symbol Δ denotes the first difference, whereas ∅ represents the coefficients of the Error Correction Model (ECM) for short-run dynamics. The ECM demonstrates the rate at which the long-term equilibrium adjusts following a short-term shock.

3.2 Estimation Technique

Descriptive statistics: This test is used to understand the time series analysis adopted. The mean, median, minimum and maximum values, standard deviation, skewness and kurtosis of the model.

Unit root test: A unit root test checks for the presence of a unit root in a time series. If the null hypothesis of the unit root test is rejected, it implies that the series is stationary or trend-stationary. Once the presence of a unit root is identified, further analysis, such as differencing the series or applying transformations, might be necessary to achieve stationarity. Stationary time series are generally easier to model and analyze because their statistical properties remain constant over time, allowing for more reliable forecasts and inferences.

Autoregressive distributed lag (ARDL): The ARDL models is employed to obtain numerical values of the model coefficient. The probability of the t-test statistics is used to evaluate the estimated numerical values of the coefficients of the regression for statistical significance at 5% level. The strength of the variables in predicting the impact of oil rent and health outcome in Nigeria is evaluated based on the R square and adjusted R-square. To check for robustness of the statistical relevance of the model, Wald test is used.

Granger Causality Test: Granger Causality Test is needful in testing whether changes in one variable are a cause of change in another. The theory of Granger Causality states that variable X Granger causes Y, if y can be better predicted using the histories of both X and Y than it can using the history of y alone. Testing causality in the granger sense involves using f-tests to test whether lagged information on a variable y provides any statistically significant information about a variable X in the presence of lagged X, if not, then y does not granger cause x (Granger, 1981).

Post Estimation Test: This is used to test for the robustness of the model and variable used in this study. To determine the linearity of the model, the Ramsey reset test will be employed; the null hypothesis state that the model is not linearly specified while the alternative state that the model is linearly specified. Heteroscedacity test is used to confirm the existence of constant variance and mean. To test for the existence of non-auto correlation, Breusch-Godfrey Serial Correlation LM Test will be conducted while CUSUM and CUSUM square test will determine the stability of the variables.

4.0 Results and Discussion of Findings

The descriptive statistics result is presented in Table 1 below:

Table 4.1: Descriptive statistics

	GDP	CEXP	DGHE	CHE
Mean	4.208496	3.602610	4.152227	0.151284
Median	4.212993	3.420693	3.881121	0.139314
Maximum	15.32916	5.053610	7.322345	0.335198
Minimum	-2.035119	2.490640	2.366820	0.001199
Std. Dev.	3.812218	0.594286	1.342110	0.088191
Skewness	0.484041	0.763746	0.876871	0.125572
Kurtosis	3.489985	3.424873	3.057055	2.785268
Jarque-Bera	1.864009	2.199532	2.694008	0.077338
Probability	0.393764	0.332949	0.260018	0.962069
Sum	159.9228	75.65480	87.19677	2.571821
Sum Sq. Dev.	537.7213	7.063509	36.02518	0.124441
Observations	38	38	38	38

Source: Authors' Computation, 2024.

The descriptive statistics in Table 4.1 indicate that the gross domestic product (GDP) has a mean of 4.208, a standard deviation of 3.812, and follows a normal distribution with a minimum of -2.04 and a maximum of 15.33. The current health expenditure (CEXP) has a mean of 3.603, a standard deviation of 0.594, and follows a normal distribution with a minimum of 2.49 and a maximum of 5.05. The domestic government health expenditure (DGHE) has a mean of 4.152 and a standard deviation of 1.342. It follows a normal distribution with a minimum of 2.37 and a maximum of 7.32. Finally, the capital health expenditure (CHE) exhibited a mean value of 0.151, a standard deviation of 0.088, and followed a normal distribution with a minimum value of 0.00 and a maximum value of 0.34.

The Augmented Dickey-Fuller test was employed to analyse the integration nature and order of the data series. The results are shown in the table below.

Table 4.2: ADF unit root test

Variables	ADF (level)	Prob.	ADF (1st diff.)	Prob.	Order	Remark
GDP	-4.102128*	0.00	-11.09310*	0.00	I(0), I(1)	Stationary
CEXP	-2.794378	0.08	-5.686219*	0.00	I(1)	Stationary
DGHE	-2.30879	0.18	-4.351971*	0.00	I(1)	Stationary
CHE	-3.646276*	0.02	-5.653642*	0.00	I(0), I(1)	Stationary

Source: Authors' Computation, 2024. Notes: The values - * and **, represent the significance levels of 1% and 5%, respectively.

Notes: The values - * and **, represent the significance levels of 1% and 5%, respectively, and "N" is used to indicate that it is not significant. According to table 4.2 above, at a significance level of 5%, GDP and CHE were stationary at level. On the other-hand, CEXP and DGHE became stationary at first difference. Since the variables were stationary at a mixed order, ARDL model was used to determine their long-term relationship.

Table 4.3: Johansen Test of Cointegration

Unrestricted Cointegration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.740809	115.7969	88.80380	0.0092
At most 1	0.590805	63.13953	63.87610	0.0576
At most 2	0.311625	28.29058	42.91525	0.6046
At most 3	0.244569	13.72715	25.87211	0.6800
At most 4	0.069014	2.788925	12.51798	0.9006

Trace test indicates 1 cointegratingeqn at the 0.05 level

Unrestricted Cointegration Rank Test (Maximum Eigenvalue)

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.**

None*	0.740809	52.65738	38.33101	0.0006
At most 1*	0.590805	34.84895	32.11832	0.0226
At most 2	0.311625	14.56342	25.82321	0.6734
At most 3	0.244569	10.93823	19.38704	0.5197
At most 4	0.069014	2.075440	10.87098	0.8099

Max-eigenvalue test indicates 2 cointegratingeqns at the 0.05 level

Table 4.3 shows the Johansen cointegration test and likelihood statistics indicates the presence of one co-integrating equation at 5% significance level. Conclusively, because the test for both the trace statistics and max-eigen probability is lesser than 5% of significance level at none, there is a long run relationship between the variables employed i.e. since the p-values of both tests are below the 5% threshold, we reject the null hypothesis of no co-integration. This suggests that there is evidence of at least one co-integrating relationship among the variables.

Table 4.4: Auto-Regressive Distributed Lag (ARDL)

Panel A: Long Run Estimates

Dependent Variable: GDP				
Variable	**Coefficient**	**S.E**	**t-stat**	**Prob**
CEXP	10.174495	5.121651	1.986565	0.0822
DGHE	-5.300918	1.954007	-2.712844	0.0265
CHE	-11.058815	15.097928	-0.732472	0.4848
C	-9.782943	14.899457	-0.656597	0.5299

Panel B: Short Run Estimates

Dependent Variable: GDP				
Variable	**Coefficient**	**S.E**	**t-stat**	**Prob**
D(CEXP)	-0.295455	2.863919	-0.103165	0.9204
D(DGHE)	-2.401448	0.831924	-2.886620	0.0203
D(CHE)	-11.446631	5.917902	-1.934238	0.0891
ECM(-1))	-0.453025	0.180642	-2.507858	0.0365

Panel C: Diagnostic Tests

	Statistic	**Prob.**
Bound Test	3.2901	
Serial Correlation	0.7660	0.2175
Heteroscedasticity	0.2990	0.8398

Normality Test	9.6270	0.0556
Linearity Test	0.0524	0.0002
Adjusted R-Square	0.0927	
F-Statistic	0.765914	0.2175
	CUSUM	
Stability Test	Stable	

Source: Author’s computation, 2024.
Notes: ***, **, and * respectively represent statistical significance at 1%, 5% and 10% levels.

In the long run, there is evidence suggesting a positive relationship between current health spending (CEXP) and GDP. However, this relationship is not statistically significant (CEXP = 10.174495, t-test = 1.986565, Prob = 0.08). This implies that a one percent increase in current health spending boost economic growth by about 10% and vice versa. In contrast, the relationship between domestic government health expenditure (DGHE) and GDP growth rate in Nigeria was shown to be statistically significant and negative (DGHE = -5.300918, t-test = -2.712844, Prob = 0.03). This suggests that a marginal rise of one percent in domestic government health expenditure is associated with a corresponding drop of 5.3 percent in the gross domestic product of Nigeria over an extended period of time. The DGHE result has had a detrimental impact on Nigeria's economy, as it has led to the underutilization of government monies allocated to the health sector. This may be attributed to either misuse of funds or corruption within the fund handlers. In the interim, there exists a positive correlation between capital health expenditure (CHE) and GDP, albeit without statistical significance (CHE = 11.058815, t-test = -0.732472, Prob = 0.48). The term "positive" in this context refers to the inclination of capital health expenditure to contribute to the growth of GDP. In this context, the term "insignificant" refers to the lack of substantial impact on Nigeria's GDP growth rate resulting from the observed change in capital health expenditure. The finding of this study also align with the work of Akintunde and Satope (2013) that found a positive relationship between health expenditure and economic growth in the long run.

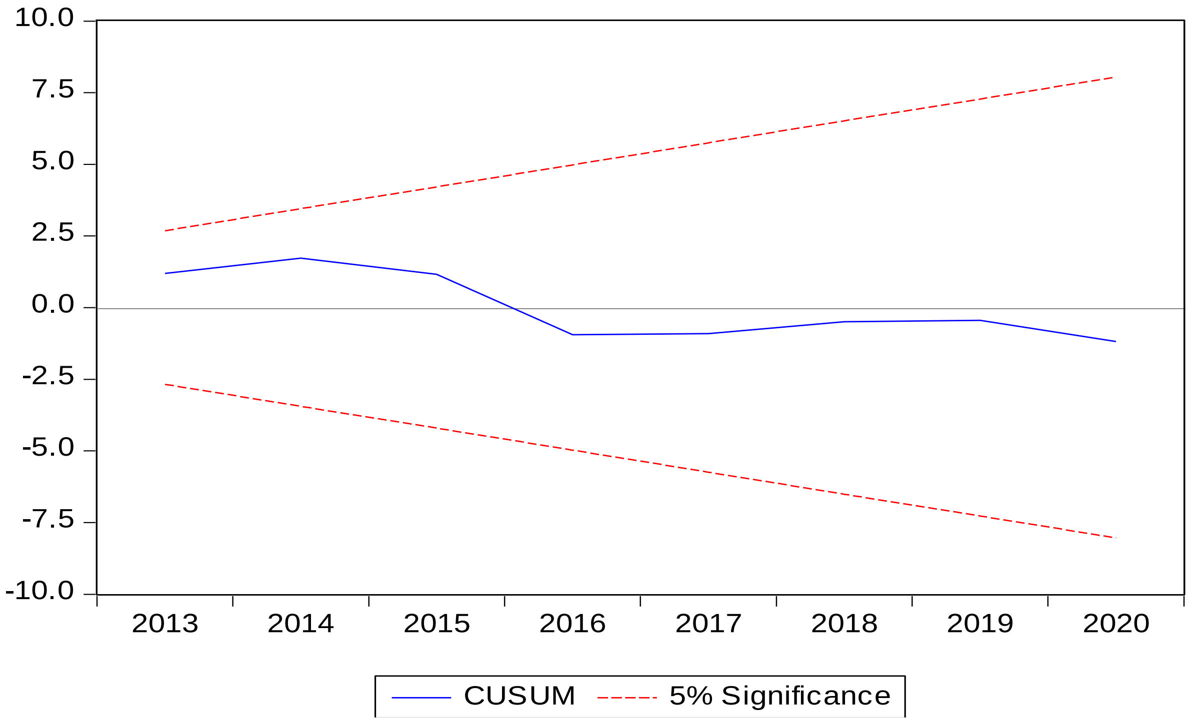
In the short-run, it can be concluded that current health spending (CEXP) has a small negative effect on Nigeria's GDP in the short term. The same holds true for Nigeria, where DGHE (domestic government health expenditure) significantly and negatively affects GDP. However, the effect of capital health expenditure (CHE) on Nigeria's GDP was positive but negligible. Furthermore, as shown in Table 4.4 above, there is a statistically significant negative coefficient for the ECMt-1 (ECM= -0.453025, t-test = -2.507858, $p<0.05$). This means that the following year, there is a correction of roughly 45.3% in the departures from the path of equilibrium for gross domestic output. To rephrase, Nigeria is experiencing a somewhat slow adjustment process. Gross domestic product, current health expenditure, domestic government health expenditure, and capital health expenditure all show a long-run equilibrium relationship in Nigeria, according to the statistical significance of the ECMt-1.

A post-estimation test was conducted to verify that the model matched econometric criteria. The study did this by conducting autocorrelation, heteroscedasticity tests, normality and

CUSUM test. To determine whether the error term exhibits autocorrelation, the LM serial correlation test was performed. The result indicates that there is no serial correlation in the error terms. The probability value of 0.2175 in the above table was higher than the 5% level of significance, which explains this. Therefore, autocorrelation is not an issue for this model. Breusch-Pagan Godfrey test of heteroskedasticity indicated that since the F-statistic and probability values are far greater than 5%, we can accept homoscedasticity as the null hypothesis and reject heteroscedasticity as the alternative. When we say the error term is homoscedastic, we indicate that the variance and covariance remain the same regardless of how much the explanatory variables are raised or lowered. Heteroscedasticity is thus not a problem in our model. Determining whether a series is normally distributed is the job of the normality test, which use the residual of the series. Both the null and alternative hypotheses of the test state that the residuals of the model and the series respectively, follow a normal distribution. Since the Jarque-Bera estimate has a probability higher than 0.05 at the 5% level of significance, we can conclude that the model does, in fact, follow a normal distribution for the residuals.

According to the data presented in Figure 4.1, the CUSUM report indicates that the estimated model exhibits stability, as evidenced by the displayed CUSUM statistics falling inside the 5% significance threshold, as depicted by the presence of two-line segments. Based on the findings of the post estimation test, it is evident that the study outcomes are favourable and may be effectively utilised for predicting future values of the dependent variable.

Figure 4.1: Stability Test - Plots of Cumulative Sum of Residual



Source: Authors' Computation, 2024.

The direction of causality in the model was tested using the Granger causality test, and the findings are shown in Table 4.4:

Table 4.4: Granger Causality test

Null Hypothesis:	Obs	F-Statistic	Prob.
CEXP does not Granger Cause GDP	38	12.3083	8.E-05
GDP does not Granger Cause CEXP		1.93106	0.1597
DGHE does not Granger Cause CHE	38	0.46663	0.6309
CHE does not Granger Cause DGHE		0.14872	0.8623
GDP does not Granger Cause CHE	38	0.21888	0.8045
CHE does not Granger Cause GDP		0.42164	0.6592
CEXP does not Granger Cause CHE	38	0.30867	0.7363
CHE does not Granger Cause CEXP		1.30888	0.2827
DGHE does not Granger Cause DGHE	38	0.32243	0.7265
GDP does not Granger Cause GDP		0.03292	0.9676
CEXP does not Granger Cause DGHE	38	1.30112	0.2847
DGHE does not Granger Cause CEXP		0.93439	0.4021

Source: Author's Computation, 2024.

A low p-value (usually less than 0.05) means that we can reject the null hypothesis and conclude that there is significant granger causality between the two variables. A high p-value (usually greater than 0.05) means that there is no need to reject the null hypothesis and conclude that there is no significant granger causality between the two variables. From the causality test above, there is no significant causal relationship that exists among the variables which are current health expenditure, domestic government health expenditure and capital health expenditure on economic growth in Nigeria. The p-value is the probability of observing the test statistic or a more extreme value under the null hypothesis.

5.0 Summary, Conclusion and Policy Recommendations

The purpose of this study was to examine the relationship between health infrastructure and GDP growth in Nigeria from 1985 to 2022. It used a set of specified goals, such as finding out how much of an influence capital health expenditure has on economic growth, how much of influence does domestic government health expenditure have on economic growth, and how much of an impact current health expenditure has on economic growth. The following outcomes were seen as the result of ARDL Model application:

i. Current health expenditure had an insignificant negative impact on economic growth in Nigeria in the short run. Meanwhile, in the long run, current health expenditure had a positive but insignificant impact on economic growth in Nigeria.
ii. Domestic government health expenditure had a significant negative impact on economic growth in Nigeria in both the short and long run.
iii. Capital health expenditure had an insignificant positive impact on economic growth in Nigeria in both the short and long run.
iv. The ARDL error correction model result showed that there is a long-run relationship between the dependent variable and independent variables of the model.
v. The granger causality result showed that there is no causal relationship among the variables employed

Conclusively, this study provided an evaluation of the impact of health infrastructure on the promotion of economic growth. The findings of the analysis indicate that current level of health expenditure had a statistically negligible adverse effect on the Gross Domestic Product (GDP). Similarly, it was seen that internal government health expenditure had a statistically significant negative influence on economic growth. On the contrary, the allocation of resources towards capital health spending yielded a negligible yet favourable effect on economic growth. Based on the analysis conducted from 1985 to 2022, this paper concluded that the influence of health infrastructure on the economic growth of Nigeria is not substantial.

Hence, the study provided the following recommendations based on the research outcomes.

i. In order to boost economic growth, it is recommended that capital health expenditure be increased on qualified healthcare professionals, healthcare facilities, apparatus, and equipment, as well as on training healthcare workers.
ii. The Nigerian government should ensure that the country's health infrastructure is efficiently implemented, maintained, and used to its full potential.
iii. Government should increase budgetary allocation to health sector and monitor the implementation of heath sector budget to achieve positive health results, which will translate to an increase in economic growth.
iv. Government should focus on improving the efficiency and effectiveness of existing health systems by addressing barriers such as healthcare access, cost, and the shortage of skilled healthcare workers. By aligning health infrastructure development with the country's overall economic growth agenda, Nigeria can foster a sustainable cycle where investments in health drive economic prosperity, and economic growth further supports the healthcare sector.
v. Government should establish long-term monitoring and evaluation frameworks to assess how investments in healthcare infrastructure contribute to economic growth over time. These assessments should focus on indirect benefits such as human capital development, improved workforce participation, and reduced healthcare costs.

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