EXAMINING THE LINK BETWEEN PUBLIC HEALTH EXPENDITURE AND ECONOMIC GROWTH IN NIGERIA

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Abstract

Purpose *- This study examined the relationship between public health expenditure and economic growth in Nigeria between 1988 and 2023.*

Design/methodology/approach *- The study employed a time-series econometric approach using the ARDL model to examine the short-run and long-run relationships between public health expenditure and economic growth. Data were sourced from the World Bank and the Central Bank of Nigeria.*

Findings *- The results showed that public health expenditure has a positive and statistically significant effect on economic growth in both the short run and the long run. Improved health outcomes, such as higher life expectancy and lower mortality rates, also positively influence economic performance. However, inefficiencies in health expenditure were identified, indicating the need for better resource allocation and governance.*

Originality/value *– The study contributes to the literature by analysing the relationship between public health expenditure and economic growth in Nigeria using the ARDL approach, providing policy insights for sustainable economic development.*

Keywords *- Public Health Expenditure, Economic Growth, Nigeria, Life Expectancy, Infant Mortality Rate, Maternal Mortality Rate, Healthcare Investment, Human Capital Development.*

Introduction

Public health expenditure has remained a major challenge in Nigeria, affecting healthcare delivery, economic productivity, and national development. Over the years, the country has experienced inadequate healthcare funding, poor infrastructure, a shortage of medical personnel, high maternal and infant mortality rates, and increasing cases of medical tourism. Nigeria committed to allocating 15% of its budget to the health sector under the Abuja Declaration in 2001, yet health expenditure remained about 8% of the national budget in 2023 (WHO, 2023). This inadequate funding has contributed to poor healthcare outcomes, brain drain, and dependence on foreign healthcare services. Health tourism has become increasingly common among Nigerians due to the poor state of healthcare facilities and the shortage of medical equipment and skilled professionals.

According to the World Tourism Organization, medical tourism involves travelling abroad to obtain healthcare services and treatment (Adigun, 2024). Consequently, billions of dollars are spent annually in countries such as the UK, India, UAE, Turkey, and Singapore, where healthcare systems are better funded and more efficient. Similarly, brain drain among healthcare professionals has intensified due to poor working conditions, insecurity, low wages, and inadequate healthcare infrastructure. According to the UK government, thousands of Nigerian doctors and nurses migrate annually to countries such as the UK, Canada, and the United States in search of better opportunities (Sunak, 2023). This migration weakens Nigeria's healthcare system and reduces access to quality healthcare services. Poor healthcare funding and corruption have also contributed to shortages of medical supplies, inadequate infrastructure, and unequal access to

healthcare services. According to the World Health Organization (2023), Nigeria records one of the highest maternal mortality rates globally, alongside high infant mortality and disease burden.

Furthermore, existing studies on health expenditure and economic growth have largely ignored issues such as inefficient healthcare funding, corruption, regional disparities in healthcare access, and the optimal level of health expenditure needed to stimulate economic growth. Therefore, this study examines the relationship between public health expenditure and economic growth in Nigeria from 1988 to 2023 using variables such as government health expenditure, life expectancy, infant mortality rate, maternal mortality rate, and GDP growth.

Literature review

Conceptual review

1. **Government Health Expenditure** - General government expenditure on health refers to the proportion of total government expenditure allocated to the health sector within a given period. It is usually expressed as a percentage of total government spending and includes expenditures through government budgets, parastatals, extrabudgetary entities, compulsory health insurance, external loans and grants, and social health insurance schemes (WHO, 2020). Nigeria's government health expenditure in 2024 stood at ₦1.5 trillion, representing 5.46% of the national budget, which remains far below the 15% target of the Abuja Declaration. With a population of about 218.5 million people, Nigeria's health expenditure per capita remains inadequate and below the World Health Organization's recommended minimum of $86 per capita for basic healthcare services (WHO, 2023). Government health expenditure is an important indicator because increased spending on healthcare helps reduce infant and maternal mortality rates, improve life expectancy, and lower disease burden. This leads to a healthier population and workforce, which enhances productivity and promotes long-run economic growth. Increased public health spending also reduces out-of-pocket healthcare expenses that often push households into financial hardship due to high medical costs.

2. **Gross Domestic Product (GDP)** - Gross Domestic Product (GDP) is the monetary value of all final goods and services produced within a country during a given period, usually a year. It measures the total output generated within a country's borders and includes both market production and certain nonmarket services such as defense and education provided by the government (IMF, 2019). GDP can be measured using three main approaches: the expenditure method, which sums consumer spending, investment, government expenditure, and net exports; the income method, which aggregates wages, rents, interest, and profits; and the production method, which calculates the value added at each stage of production. In theory, all three methods produce the same result. Nigeria's GDP was valued at $363.82 billion in 2023, lower than the $472.6 billion recorded in 2022 (NBS, 2022; NBS, 2023). A decline in GDP negatively affects healthcare expenditure because government revenue and national budget allocations are influenced by economic output.

Consequently, lower GDP may result in reduced health sector funding, while economic growth increases the resources available for healthcare expenditure.

3. **Life Expectancy** - Life expectancy refers to the average number of years a person is expected to live within a particular population. It reflects the health conditions, level of development, and quality of healthcare in a country. Developing countries generally record lower life expectancy due to factors such as poor healthcare systems, infectious diseases, high infant mortality, and inadequate access to clean water (Ortiz-Ospina & Roser, 2024). Life expectancy is calculated using a life table, which combines data on age-specific mortality rates and population statistics obtained from national census and vital registration records.

According to the World Health Organization (WHO), Nigeria's average life expectancy is 63.4 years, ranking the country among the lowest globally. Studies have shown a positive relationship between health expenditure and life expectancy. Nixon and Ullman (2006) found that increased healthcare spending improves healthcare outcomes and reduces mortality rates, although the effectiveness depends on institutional quality and policy implementation. Similarly, Bhargava et al. (2001) concluded that economic growth positively influences life expectancy, particularly in developing countries with weak healthcare infrastructure.

4. **Infant Mortality Rate -** Infant mortality rate (IMR) refers to the probability that a child born within a given year or period will die before reaching one year of age, based on the age-specific mortality rates for that period. It is expressed as the number of deaths per 1,000 live births and is derived from mortality tables rather than being a traditional rate (WHO, 2020).

As of 2023, Nigeria's infant mortality rate stood at 55.17 deaths per 1,000 live births, which is considerably high compared to many developed countries where infant mortality rates are below 5 deaths per 1,000 live births. Studies have established a negative relationship between health expenditure and infant mortality rate. Increased healthcare spending, particularly on preventive and primary healthcare services such as immunization, neonatal care, and skilled birth attendance, significantly reduces infant mortality. Farag et al. (2012), in a study of 133 countries, found that higher health expenditure per capita contributes to lower infant mortality rates, especially in developing countries where public health spending improves access to maternal and child healthcare services.

5. **Maternal Mortality Rate** - Maternal mortality refers to deaths that occur during pregnancy or within 42 days after delivery or termination of pregnancy due to causes related to or aggravated by pregnancy (WHO, 2022). It is measured using the maternal mortality ratio (MMR), which represents the number of maternal deaths per 100,000 live births. Maternal mortality rates are significantly higher in low-income countries due to poor access to quality healthcare services, especially in rural areas where medical equipment and trained obstetricians are inadequate. According to the World Health Organization, the lifetime risk of maternal death is about 1 in 49 in low-income countries compared to 1 in 5300 in high-income countries. High maternal mortality reflects inequality in healthcare access between developed and developing countries. Increased government and non-governmental funding for healthcare infrastructure, modern medical equipment, and skilled healthcare personnel can help reduce maternal mortality and improve healthcare outcomes.

Theoretical Review

Neoclassical Growth Model - The neoclassical growth model is an economic theory created to account for long-term economic expansion by focusing on three key elements: labour, capital, and technology. It was first proposed by Robert Solow in the 1950s (hence, it is frequently called the Solow Growth Model) (Investopedia, 2023). The model emphasizes how economies develop over time, concentrating on the connection between inputs and outputs, along with the importance of technological advancement. The theory posits that short-term equilibrium arises from different quantities of labour and capital within the production function. Additionally, it suggests that technological advancements play a crucial role in an economy, making it impossible for economic growth to persist without them.

Neoclassical growth theory highlights three essential components of a thriving economy: labour, capital, and technology. Nonetheless, it emphasizes that temporary equilibrium differs from long-term equilibrium, which does not depend on any of these three elements. The typical production function in the neoclassical growth framework is expressed as follows: A real-world example of the neoclassical growth model in South Korea's economic shift from the 1960s through the 2000s aligns closely with the Solow model. In the beginning, the nation poured considerable resources into both capital and human development, resulting in swift economic expansion. As capital per worker rose, diminishing returns began to appear over time. Nevertheless, ongoing advancements in technology and education facilitated sustainable growth over the long term, propelling the economy into high-income territory.

Endogenous Growth Model - The endogenous growth model, mainly developed by Paul Romer and Robert Lucas in the 1980s, addresses the shortcomings of the neoclassical growth model by asserting that economic growth is fundamentally influenced by internal factors, particularly human capital, innovation, and the accumulation of knowledge. In contrast to the neoclassical model, which considers technological advancement as an external factor, endogenous growth theory highlights that policies, education, research and development, and investments can significantly promote long-term growth.

Empirical Review

The literature shows that public health expenditure has significant implications for economic growth and health outcomes across developed and developing countries. Several studies have examined the relationship between healthcare spending, life expectancy, mortality rates, human capital development, and economic growth, with findings showing that increased investment in healthcare contributes positively to economic performance and human welfare. Afolabi (2019) found that higher public health expenditure and life expectancy positively impact Nigeria's GDP, recommending increased government investment in healthcare for sustainable development. Similarly, Ogundipe et al. (2011) established a strong relationship between health expenditure and economic growth in Nigeria, emphasizing that improved healthcare facilities and access to quality healthcare contribute to economic development and poverty reduction. Bakare and Olubokun (2011) also found a significant positive relationship between healthcare expenditure and economic growth in Nigeria.

In South Africa, Ndaguba and Hanyane (2019) and Ndaguba and Hlotywa (2021) found a positive relationship between public health expenditure and the Human Development Index (HDI), suggesting that healthcare investments improve human capital and economic development. Likewise, Somé et al. (2019) examined 48 African countries and found that increased health expenditure positively influences economic growth through improved health outcomes and education. Novignon et al. (2012, 2022) also reported that both public and private healthcare spending improve life expectancy and reduce mortality rates in Sub-Saharan Africa, although public spending has a greater effect. Several studies employed econometric approaches such as ARDL, VECM, ECM, and GMM to investigate the long-run relationship between health expenditure and economic growth. Inuwa and Haruna (2012), Kabuga and Ahmad (2017), Kareem et al. (2017), and Lawal et al. (2023) found evidence of a significant long-run relationship between healthcare expenditure and economic growth in Nigeria. Similarly, Yusufu et al. (2021) and Ali and Ogeto (2020) found that public healthcare expenditure has a stronger long-run impact on economic growth than private healthcare spending in Sub-Saharan Africa.

However, some studies reported weak or insignificant relationships. Awogbemi (2022) found only a weak positive relationship between healthcare spending and economic growth in Nigeria, while Bennee et al. (2021) reported a non-significant relationship between the two variables. Keghter et al. (2020) found a negative long-run relationship between health expenditure and economic growth in Nigeria, arguing that institutional quality plays an important role in determining the effectiveness of healthcare spending. Akintunde and Olaniran (2022) also found that government health expenditure worsens health outcomes in the short run but improves them in the long run. Other studies focused on health outcomes such as infant mortality and life expectancy. Eboh et al. (2022) found that government recurrent health expenditure significantly reduces under-five mortality in Nigeria. Nixon and Ullman (2006) concluded that increased healthcare spending improves life expectancy and reduces mortality rates, while Bhargava et al. (2001) found that economic growth positively influences life expectancy, especially in developing countries with poor healthcare infrastructure.

Methodology

3.1 The Model

Following the empirical framework of Aboubacar and Xu (2017). The econometric model that explains the relationship between the independent and dependent variables is specified below.

The functional model is specified as

$y = f(x)$.....(i),

$y = (_1, _2, _3$

$x_4)$……..……

……(3.1)

where;

y is the dependent variable

x= X_1, X_2, X_3, $X_4$are independent variables, Y = Gross domestic product, X_1 = public health expenditure, X_2 = infant mortality, X_3 = maternal mortality, X_4 = life expectancy

The functional model is expressed as:

GDP = *f*(LE, IM, MM, PHE) ----------(ii)

The econometric model is expressed as follows:

$RGDP_t = \beta_0 + \beta_1 LEt + \beta_2 IM_t + \beta_3 MM_t + \beta_3 PHE_t$

+ ……..(iii)

Where = The error term at time t, β0 is the intercept of the model, β_1, β_2, β_3 and β_4 are the coefficients of the independent variables.

Data for the study

The data for the study covered the period from 1988 to 2023 based on data availability. Data for public health expenditure, life expectancy, infant mortality and maternal mortality rate were obtained from World Development Indicators, while Gross domestic product was obtained from the CBN statistical bulletin.

Results and discussion

Table 4.1: Descriptive Statistics Result

	RGDP	IMR	LE	MMR	PHE
Mean	44277.37	96.6881	49.4927	1131.222	127.3652
Median	39951.85	93.4000	49.8815	1125.000	58.9768
Maximum	77936.10	124.5000	55.7500	1261.000	468.6388
Minimum	19030.69	55.1700	45.4870	1028.000	0.1501
Std.Dev	21088.44	20.5686	3.0181	61.2975	148.4323
Skewness	0.2461	0.0127	0.0535	0.2055	1.0018
Kurtosis	1.4205	1.7020	1.7305	2.1540	2.6950
Jarque-Bera	4.1054	2.5281	2.4345	1.3270	6.1618
Probability	0.1284	0.2825	0.2960	0.5151	0.0459
Sum	1593985	3480.770	1781.739	40724.00	4585.146
Sum Sq Dev	1.5600	14807.45	318.8077	131508.2	771125.4
Observations	36	36	36	36	36

Source: Author's compilation using E-views 9 (2025)

Table 4.1 presents the descriptive statistics of the variables used in the study. Real gross domestic product recorded the highest average value of 42487.54, indicating substantial economic output during the study period, while life expectancy had the lowest mean value of 50.49, reflecting relatively low average life expectancy in Nigeria. The large difference between the minimum and maximum values of RGDP suggests fluctuations in economic performance over time.The standard deviation shows that RGDP had the highest variability at 17251.67, indicating significant fluctuations in economic output across the study period.

In contrast, LE recorded the lowest standard deviation of 2.62, suggesting relatively stable life expectancy values compared to other variables. Infant mortality rate (IMR), maternal mortality rate (MMR), and public health expenditure (PHE) also exhibited varying degrees of dispersion, reflecting differences in health outcomes and government spending over time. The skewness statistics reveal that most variables are positively skewed, including RGDP, IMR, LE, MMR, and PHE, indicating the presence of higher extreme values within the distributions. IMR and LE displayed near-symmetrical distributions due to their low skewness values, while MMR and PHE showed relatively higher positive skewness, suggesting the presence of unusually high maternal mortality and health expenditure values during some periods. The kurtosis results indicate that all variables are leptokurtic, implying heavier tails and a higher likelihood of extreme values or outliers. MMR and PHE recorded the highest kurtosis values, suggesting greater concentration of extreme observations in maternal mortality and public health expenditure data.

Furthermore, the Jarque-Bera statistics show that RGDP, IMR, and LE are approximately normally distributed since their probability values exceed 0.05. However, MMR and PHE do not follow a normal distribution, which is consistent with their higher skewness and kurtosis values.

Overall, the descriptive statistics reveal variations in economic growth, health outcomes,

and public health expenditure across the study period.

Table 4.2: Correlation Co-efficient Matrix

	RGDP	IMR	LE	MMR	PHE
RGDP	1				
IMR	-0.968995	1			
LE	0.972028	-0.998759	1		
MMR	-0.730375	0.843886	-0.822689	1	
PHE	0.926514	-0.889042	0.896108	-0.512975	1

Source: Author's compilation using E-views 9(2025)

The correlation matrix reveals strong interrelationships between key economic and health indicators. GDP demonstrates a strong positive correlation with both life expectancy (LE, 0.972028) and public health expenditure (PHE, 0.926514), suggesting that wealthier nations tend to have higher life expectancies and invest more in public health. Conversely, GDP exhibits a strong negative correlation with the infant mortality rate (IMR, -0.968995), indicating that higher GDP is associated with lower infant mortality. The maternal mortality ratio (MMR) also shows a negative correlation with GDP (-0.532172), though not as strong, implying that economic development is linked to reduced maternal mortality.

Table 4.3A: Augmented Dickey-Fuller Test Results at Levels

Variables		**Augmented Dickey-Fuller (at Levels)**				
	ADF	**5% Critical Value**	**Prob**	**Included in the equation**	**Order of integration**	**Conclusion**
LINGDP	-0.7016	-2.9511	0.8331	Trend and Intercept	1(0)	Non-Stationary
IMR	1.9323	-2.9540	0.9997	Trend and Intercept	1(0)	Non-Stationary
LE	0.5731	-2.9571	0.9867	Trend and Intercept	1(0)	Non-Stationary
MMR	-2.4502	-3.5442	0.3492	Trend and Intercept	1(0)	Non-Stationary
LINPHE	-2.4762	-2.9	0.1317	Trend and Intercept	1(0)	Non-Stationary

Source: Author's compilation using E-views 9(2025)

Table 4.3A presents the results of the Augmented Dickey-Fuller (ADF) unit root test at levels. The variables LINRGDP, IMR, LE, MMR and LINPHE are non-stationary at levels because the probability value is greater than the critical value of 0.05 and the ADF t-statistics value is less than the 5% critical value.

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MMR	-2.4502	-3.5442	0.3492	Trend and Intercept	1(0)	Non-Stationary
LINPHE	-2.4762	-2.9	0.1317	Trend and Intercept	1(0)	Non-Stationary

Source: Author's compilation using E-views 9(2025)

Table 4.3A presents the results of the Augmented Dickey-Fuller (ADF) unit root test at levels. The variables LINRGDP, IMR, LE, MMR and LINPHE are non-stationary at levels because the probability value is greater than the critical value of 0.05 and the ADF t-statistic value is less than the 5% critical value.

Table 4.4A: Results of PP Unit Root Test (at levels)

Variables	**Phillip-Perron Unit Root Test at levels**					
	ADF	**5% Critical Value**	**Prob**	**Included in the equation**	**Order of integration**	**Conclusions**
LINGDP	-1.4768	-3.5443	0.8186	Trend and Intercept	1(0)	Non-Stationary
IMR	-3.7389	-1.9507	0.0005	None	1(0)	Stationary
LE	-2.2477	-3.5443	0.4500	Trend and Intercept	1(0)	Non-Stationary
MMR	-2.4501	-3.5443	0.3942	Trend and Intercept	1(0)	Non-Stationary
LINPHE	-0.8919	-3.8753	0.9214	Trend and Intercept	1(0)	Non-Stationary

Source: Author's compilation using E-views 9 (2025)

Table 4.4A presents the results of the Phillip-Perron (PP) unit root test at levels. The variables LINRGDP, MMR, LE and LINPHE are not stationary at levels because the probability value is greater than the critical value of 0.05, and the PP t-statistic value is less than the 5% critical value. IMR is stationary because the probability value is less than the critical value of 0.05, and the PP t-statistic value is greater than the 5% critical value.

Table 4.4B: Results of PP Unit Root Test (at First Difference)

Variables	**Phillip-Perron Unit Root Test at levels**					
	ADF	**5% Critical Value**	**Prob**	**Included in the equation**	**Order of integration**	**Conclusions**
LINGDP	-3.5858	-3.5485	0.0462	Trend and Intercept	1(1)	Stationary
IMR	-0.2670	-3.5485	0.9885	Trend and Intercept	1(1)	Non-Stationary
LE	-4.7583	-3.5485	0.0028	Trend and Intercept	1(1)	Stationary

MMR	-6.4221	-3.5485	0.0000	Trend and Intercept	1(1)	Stationary
LINPHE	-30.4280	-3.5485	0.0000	Trend and Intercept	1(1)	Stationary

Source: Author's compilation using E-views 9 (2025)

Table 4.4B presents the results of the Phillip-Perron (PP) unit root test at First difference. The variables LINRGDP, MMR, LE and LINPHE are stationary at first difference because the probability value is lower than the critical value of 0.05, and the PP t-statistic values are greater than the 5% critical value. IMR is non-stationary because the probability value is greater than the critical value of 0.05, and the PP t-statistic value is less than the 5% critical value. Based on the Phillip Perron stationarity test, it is concluded that there is a mixed order of integration. Therefore, the ARDL bounds cointegration test was conducted to test for a long-run relationship among the variables employed in this study.

Table 4.5: Optimal Lag Length Result

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-296.9098	NA	35.5201	17.7594	17.9839	17.8359
1	-145.0135	250.1821*	0.0207*	10.2949*	11.6417*	10.7542*
2	-122.1962	30.8705	0.0261	10.4233	12.8924	11.2653

Source: Researcher's computation using E-views 9 (2025)
*Indicates lag order selected by the criterion.

Table 4.5 presents the optimal lag length criteria as determined by Akaike information criterion, Schwarz information criterion and Hannan-Quinn information criterion. This study adopted the Akaike information criterion as the optimal lag length criterion. Therefore, the optimal is 1, meaning that the outcome of the previous year affects the current year, thus allowing us to see the effects of health expenditure of the previous year on the economic growth of the current year.

Table 4.6: ARDL Bounds Cointegration Test Result

Test Statistic	Value	K
F-Statistic	21.9910	4
Critical Value Bounds		
Significance	**I (0) Bound**	**I (1) Bound**
10%	2.45	3.52
5%	2.86	4.01
2.5%	3.25	4.49
1%	3.74	5.06

Source: Author computation using E-views 9 (2025)

From the result above in Table 4.6, the F-statistic value of 21.9910 is greater than the upper bound of the critical value of 5% level of significance. This indicates a long-run relationship between the dependent variable and the independent variables. This qualified the adoption of the Autoregressive Distributed Lag (ARDL) estimation technique for long-run and short-run estimation.

Estimation of Autoregressive Distributed Lag (ARDL) Model
Short-Run ARDL Model Estimation

Table 4:7 Short-Run Autoregressive Distributed Lag

Variable	Coefficient	Std.Error	T-Statistic	Prob
LOGPHE	0.0216	0.0072	-2.9960	0.0090
IMR	-0.0421	0.0154	2.7404	0. 0152
MMR	-0.0003	0.0002	1.5984	0.1308

LE	0.0399	0.0229	-1.7440	0.1016
CointEq(-1)	-0.7279	0.1555	-4.6817	0.0003
R-Squared	0.9994		Adjusted R-Squared	0.9987
F-Statistics	1547.264		Prob (F-statistics)	0.0000
DURBIN -WATSON			2.0024	

Source: Researcher's computation using E-views 9 (2025)

The short-run ARDL results show that public health expenditure has a positive and statistically significant effect on real gross domestic product (RGDP), indicating that increases in public health expenditure stimulate economic growth in the short run. Specifically, a percentage increase in public health expenditure leads to a 2.16% increase in RGDP.

Similarly, infant mortality rate (IMR) has a negative and statistically significant relationship with RGDP, implying that increases in infant mortality reduce economic growth. Maternal mortality rate (MMR) also exhibits a negative relationship with RGDP, suggesting that reductions in maternal mortality contribute positively to economic growth; however, the relationship is statistically insignificant. Life expectancy (LE) has a positive relationship with RGDP, indicating that improvements in life expectancy promote economic growth, although the effect is statistically insignificant. The coefficient of determination (R^2) indicates that about 99.94% of the variations in RGDP are explained by the explanatory variables included in the model, while the remaining 0.06% is explained by factors outside the model. The error correction term is negative and statistically significant, confirming that the model adjusts to long-run equilibrium at a speed of approximately 72% following short-run disequilibrium.

Furthermore, the high F-statistic and its corresponding probability value confirm the overall significance of the model, while the Durbin-Watson statistic indicates the absence of serial correlation in the residuals.

Estimation of Autoregressive Distributed Lag (ARDL) Model

Long-Run ARDL Model Estimation

Table 4:8 Long-Run Autoregressive Distributed Lag

Variable	Coefficient	Std.Error	T-statistic	Prob
LOGPHE	0.0467	0.0184	2.5452	0.0224
IMR	-0.0003	0.0112	-0.0245	0.9808
MMR	-0.0002	0.0004	-0.5579	0.5852
LE	0.1297	0.0616	2.1042	0.0526
C	4.4660	3.8748	1.1676	0.2612

Source: Researcher's computation using E-views 9 (2025)

The long-run ARDL results show that public health expenditure has a positive and statistically significant effect on real gross domestic product (RGDP), indicating that increased public health expenditure promotes economic growth in the long run. Specifically, a percentage increase in public health expenditure leads to a 4.67% increase in RGDP, which conforms with the a priori expectation.

Similarly, infant mortality rate (IMR) has a negative relationship with RGDP, implying that increases in infant mortality reduce economic growth in the long run. However, the relationship is statistically insignificant. Maternal mortality rate (MMR) also exhibits a negative and statistically insignificant relationship with RGDP, suggesting that higher maternal mortality adversely affects economic growth. Life expectancy (LE) has a positive relationship with RGDP, indicating that improvements in life expectancy contribute positively to economic growth in the long run, although the relationship is statistically insignificant. The intercept coefficient implies that, holding public health expenditure, infant mortality rate, maternal mortality rate, and life expectancy constant, RGDP is estimated at 4.4.

However, the intercept is statistically insignificant since its probability value exceeds 0.05

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Post-Estimation Tests

Table 4.9: Breusch-Godfrey LM Serial Correlation Test Result

F-statistic	2.297044	Prob. F (1,9)	0.1639
Obs*R-Squared	6.506605	Prob. Chi-Square (2)	0.0107

Source: Researcher's computation using E-views 9 (2025)

The Breusch-Godfrey test showed that there was no serial correlation issue among the variables.

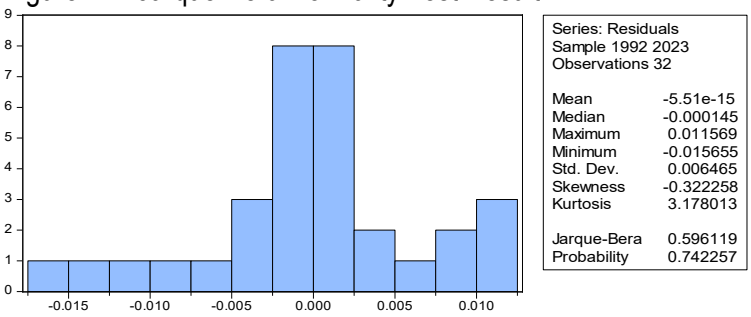
4.10: Breusch-Pagan Heteroskedasticity Test Result

F-statistic	1.0147	Prob. F (21,10)	0.5153
Obs*R-Squared	21.7792	Prob. Chi-Square (21)	0.4123

Source: Author's computation using E-views 9 (2025)

The Breusch-Pagan test showed the presence of homoskedasticity, in other words, constant variance.

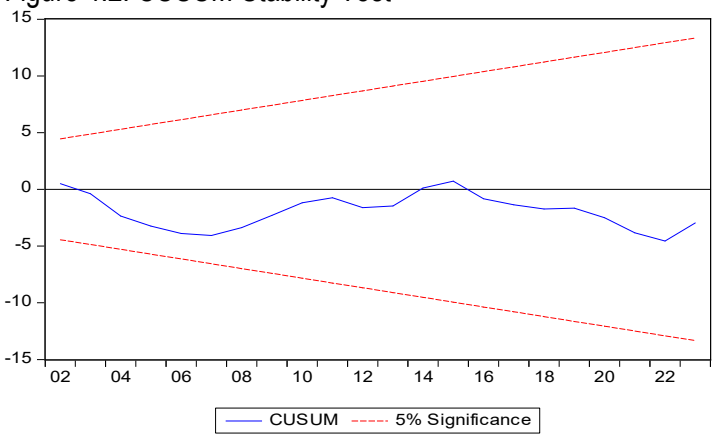
Figure 4.1: Jarque-Bera Normality Test Result



Source: Author's computation using E-views 9 (2025)

The result showed that there is normality. Therefore, the residuals of the model follow a normal distribution.

Figure 4.2: CUSUM Stability Test

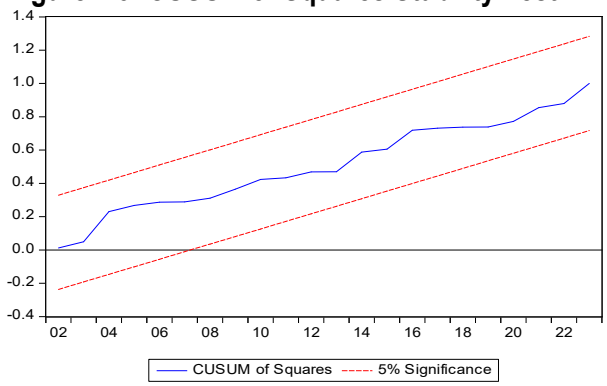


Source: Author's computation using E-views 9 (2025)

The CUSUM test results show that the blue line remained within the 5% significance boundaries (red dashed lines), indicating that the null hypothesis of parameter stability is not rejected. This confirms that the regression coefficients are stable over time and not affected by structural changes.

Consequently, the model's relationships can be reliably used for prediction and inference.

Figure 4.3: CUSUM of Squares Stability Test



Source: Author's computation using E-views 9 (2025)

The graph indicates that the CUSUM of Squares line stays within the 5% significance boundaries, noting that the model does not show meaningful deviations. However, the line approaches the upper boundary, suggesting that there may be some gradual, but not strong enough, changes in variance over time. We do not reject the null hypothesis since the CUSUM of Squares line does not cross the red dashed lines. This suggests that the model is largely stable across different time periods.

Table 4.11: Ramsey RESET Linearity Test

T-statistic	0.6775	Probability	0.5151
F-statistic	0.4590	Probability	0.5151

Source: Author's computation using E-views 9 (2025)

The Ramsey Reset result showed that there is linearity in the model and it is correctly specified.

Discussion of Findings

Edeme (2021) examined the interplay between public health expenditure, economic growth, and health outcomes in Nigeria. Utilizing time-series data and causality tests, the study found that increased public health expenditure leads to a reduction in infant mortality rates, which in turn positively influences economic growth. The research findings are in line with the outcome of this analysis. This unidirectional causality from health expenditure to growth underscores the importance of government investment in healthcare as a catalyst for economic development.

Similarly, Bakare and Olubokun (2011) investigated the impact of healthcare expenditure on Nigeria's economic growth. Their empirical analysis revealed that both public and private health expenditures are significant determinants of economic growth, with a positive correlation between health spending and GDP. The study emphasized that improved health outcomes, facilitated by increased expenditure, enhance labour productivity, thereby fostering economic expansion.

Furthermore, the result of this research analysis expanded the findings asserting that an increase in health expenditure will also have a positive impact on life expectancy and a negative impact on infant mortality rate and mortality rate, contributing to the economic growth rate in the long run as a result of better and healthier living of citizens.

In another study, Onisanwa (2014) explored the effect of health on economic growth in Nigeria, incorporating variables such as life expectancy, infant mortality, and health expenditure. The findings indicated that health indicators, particularly life expectancy, have a substantial positive impact on economic growth conforming with the findings of this study. The research suggested that investments in health not only improve population well-being but also contribute to economic performance by expanding the productive workforce.

Furthermore, Riman and Akpan (2010) conducted a state-level analysis of healthcare financing and health outcomes in Nigeria. Their study employed multivariate analysis to assess the effects of health expenditure on health outcomes

and economic growth. The results demonstrated that increased healthcare funding is associated with improved health indicators, such as reduced infant and maternal mortality rates, which in turn positively affect economic growth.

Conclusion and policy implications

This study examined the relationship between public health expenditure and economic growth in Nigeria from 1988 to 2023 using the ARDL model. The findings reveal that public health expenditure has a positive and significant effect on real GDP in both the short run and long run. Specifically, a 1% increase in health expenditure increases real GDP by 2.91% in the short run and 4.67% in the long run, confirming that sustained investment in healthcare contributes significantly to economic growth in Nigeria. The study also found that increased health expenditure improves health outcomes through higher life expectancy and lower infant and maternal mortality rates. Trend analysis further showed that improvements in health outcomes are associated with increases in real GDP growth. The ARDL model was validated through stationarity, cointegration, and post-estimation diagnostic tests, confirming the reliability and stability of the model. Overall, the findings support the endogenous growth theory, which emphasizes the importance of human capital development in promoting long-term economic growth.

These findings carry important policy implications. First, the government should increase budgetary allocation to the health sector in line with the Abuja Declaration target to improve healthcare delivery, reduce mortality rates, and promote economic productivity. Second, greater investment should be directed toward healthcare infrastructure, preventive healthcare services, and healthcare research to improve access to quality healthcare and strengthen long-term economic performance. Third, policies aimed at expanding healthcare access in rural and underserved areas should be implemented through improved healthcare facilities, mobile clinics, and the expansion of the National Health Insurance Scheme (NHIS).

Furthermore, the government should address the problem of brain drain by improving the welfare, salaries, and working conditions of healthcare professionals to retain skilled medical personnel within the country. The adoption of digital healthcare technologies and evidence-based policy decisions should also be encouraged to improve efficiency in healthcare service delivery. Finally, targeted interventions such as free antenatal care, skilled birth attendance, vaccination programs, and improved disease surveillance systems should be strengthened to reduce infant and maternal mortality and improve overall public health outcomes.

Overall, achieving sustainable economic growth in Nigeria requires increased and efficient public health expenditure, strong governance, improved healthcare infrastructure, and effective healthcare policies that enhance both population well-being and long-term economic development.

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