International Journal of Multidisciplinary Research and Growth Evaluation.

Endogenous Growth Model Approach to Public Expenditures on Health and Economic Growth in Nigeria

Abubakar Orlando Ijoko [1], Ede Sunday Hyacinth [2], Sule Magaji [3], Ibrahim Musa [4]*
[1] Department of Economics Miva Open University, Abuja Nigeria
[2] Department of Public Policy and Administation, Miva Open University, Abuja
[3,4] Department Economics University of Abuja, Abuja Nigeria

* Corresponding Author: **Ibrahim Musa**

Article Info

ISSN (Online): 2582-7138
Impact Factor (RSIF): 8.04
Volume: 07
Issue: 03
Received: 12-04-2026
Accepted: 10-05-2026
Published: 08-06-2026
Page No: 996-1003

Abstract
This research explores the dynamic relationship between public health expenditure and economic expansion in Nigeria over a four-decade period (1985-2024), grounded in the endogenous growth theoretical framework. Recognizing that macroeconomic variables often exhibit complex, non-proportional behaviors, we applied the Nonlinear Autoregressive Distributed Lag (NARDL) approach alongside pairwise Granger causality testing to capture potential asymmetric effects. Our empirical findings confirm a robust long-run cointegrating relationship between health spending and national output. Crucially, the results reveal that economic growth responds asymmetrically to positive and negative shocks in health expenditure, highlighting the inadequacy of traditional linear models for this context. The causality analysis further establishes endogeneity, demonstrating a clear feedback loop between health investments and economic performance. Based on these insights, policymakers should prioritize consistent, targeted budgetary allocations to the health sector. Specifically, shifting focus toward preventive healthcare infrastructure rather than purely curative measures will yield more substantial dividends for Nigeria's long-term economic trajectory and human capital development.

DOI: https://doi.org/10.54660/.IJMRGE.2026.7.3.996-1003

Keywords: Economic Growth, Endogenous Model, Health Expenditure, Nonlinear ARDL and Human Capital

Introduction

The capacity of a nation to sustain robust economic activity is fundamentally tied to the health and well-being of its population (Wang *et al*., 2019) [51]. A vibrant, healthy workforce serves as the engine for productivity across all sectors of society, a premise supported by numerous scholars, including Cremieus and Pilon (2009) [9] and Adeel (2016) [1]. The intrinsic link between a country's health sector performance and its broader economic trajectory has been extensively documented in recent literature (Olarinde & Belolo, 2016; Faridi *et al*., 2016; Atilgan & Ertugrul, 2017; Ibukun & Osinubu, 2020; Olayiwola *et al*., 2021; Dana, 2022; Ojo & Ojo, 2022) [38, 15, 4, 19, 40, 10, 36]. Conversely, systemic crises within the healthcare infrastructure inevitably trigger economic downturns, as diminished health outcomes directly translate to reduced labor productivity and sluggish growth (Halici-Tuluce, 2015; Yang, 2020; Gautam, 2022; Magaji & Ismail, 2025) [18, 53, 17, 28]. Within the African context, Nigeria presents a particularly compelling case study. Despite its status as a major regional economy, the country's healthcare financing remains disproportionately low and fraught with structural bottlenecks when juxtaposed with peer emerging markets (Olatubi *et al*., 2018; Ijoko, 2023) [39, 22]. A critical concern is the historical skew of government funding toward curative interventions rather than more cost-effective preventive healthcare systems (Ismail *et al*., 2024) [23]. Theoretical foundations for understanding this dynamic are deeply rooted in endogenous growth models. As articulated by Romer (1986) [45] and later expanded upon by others, sustainable economic expansion is driven by internal factors—specifically

human capital, knowledge accumulation, and skills development—rather than exogenous forces.In this framework, investments in human capital do not suffer from diminishing returns; instead, they continuously fuel productivity (Khan & Khattak, 2022) [25].Public health spending is inextricably linked to this process, as the quality of human capital is largely determined by health outcomes (Nurvita *et al*., 2022; Musa *et al*., 2024) [33, 32]. The health-led growth hypothesis posits that health itself functions as a vital capital good (Dana, 2022) [10]. Consequently, strategic financial commitments to healthcare systems elevate worker productivity, which subsequently drives per capita income and aggregate economic expansion (Bloom & Canning, 2000; Piabuo & Tieguhong, 2017) [7, 43].

Recognizing this critical nexus, the Nigerian government has historically attempted to leverage health sector funding as a tool for national development. Between 2000 and 2019, proportional budgetary allocations to health increased from 2.1% to 5.8%, reflecting a policy commitment to human capital enhancement (Olayiwola *et al*., 2021) [40]. However, this trajectory has been inconsistent. Allocations dropped to 4.16% in 2020 (Ijoko *et al*., 2021) [20], a contraction that cannot be entirely attributed to the fiscal shocks of the COVID-19 pandemic. More recent World Bank (2025) [52] data reveals that health expenditure as a percentage of GDP hovered around 4.08% in 2021, inching up to 4.27% in 2022, before settling at 4.19% in 2023. These fluctuations occur against a backdrop of erratic macroeconomic performance. Central Bank of Nigeria (2024) [8] statistics highlight a perplexing historical pattern: while health spending surged from N0.26 billion in 1985 to N646.75 billion by 2020, corresponding GDP growth rates often moved in counterintuitive directions, experiencing periods of severe deflation before recovering to approximately 3.25% by 2023. This indistinct and often contradictory movement between health financing and economic output in Nigeria suggests that their relationship may not follow a simple, proportional path. Macroeconomic variables, particularly in developing contexts, frequently exhibit dynamic and asymmetric behaviors (Sakanko *et al*., 2020) [47]. Applying traditional linear models to inherently nonlinear phenomena can generate misleading empirical results and, consequently, flawed policy prescriptions. Therefore, the primary objective of this research is to rigorously investigate whether the impact of public health expenditures on Nigeria's economic growth is characterized by nonlinear dynamics.

This study makes several distinct contributions to the existing literature. First, it provides pioneering estimates of the asymmetric relationship between health financing and economic expansion in Nigeria, addressing a significant methodological gap. Second, while previous Nigerian studies (Babatunde, 2014; Piabuo & Tieguhong, 2017; Kato *et al*., 2018; Francis, 2019; Ibukun & Osinubi, 2020; Olayiwola *et al*., 2021; Aliyu *et al*., 2020; Ozor *et al*., 2025) [6, 43, 24, 16, 19, 40, 3, 41] have utilized endogenous growth frameworks, they have largely failed to capture the complex, non-proportional ways in which public spending stimulates growth. Third, by deploying the advanced Nonlinear Autoregressive Distributed Lag (NARDL) technique developed by Shin *et al*. (2014) [50], this research overcomes the limitations of classical linear ARDL models. Finally, the study incorporates updated data through 2024 and utilizes Granger causality testing to explicitly address endogeneity concerns, offering policymakers a more nuanced and accurate understanding of how health investments transmit through the Nigerian economy.

Literature Review

The intersection of health financing and macroeconomic performance has generated a substantial body of empirical research across both advanced and emerging economies. A critical review of this literature reveals three primary strands of findings: studies identifying positive impacts, those finding negative or restrictive effects, and research highlighting complex, bidirectional, or neutral causal relationships.

A significant portion of the literature supports the health-led growth hypothesis, demonstrating that increased health expenditure positively stimulates economic expansion. Methodologically, these studies have employed various econometric techniques. For instance, Babatunde (2014) [6] and Ijoko *et al*. (2022) [21] utilized Ordinary Least Squares (OLS) to establish positive linkages in the Nigerian context. Similar positive outcomes were documented by Piabuo and Tieguhong (2017) [43] in their analysis of Central African economies. Advanced time-series and panel data approaches have corroborated these findings across different geographies. Atilgan *et al*. (2017) [4] and Muhammed *et al*. (2022) [31] applied ARDL models, while Marwa (2018) [30], Erçelik (2018) [13], and Francis (2019) [16] utilized Error Correction Mechanisms to demonstrate long-run positive associations. In broader cross-country analyses, Ibukun and Osinubi (2020) [19] found supportive evidence across 47 African nations using dynamic panel systems, and Khan and Khattak (2022) [25] established that health investments, while potentially inflationary, ultimately drive growth in South Asian countries.

Conversely, a contrasting strand of literature suggests that health spending can depress or inversely affect economic growth, often due to crowding-out effects or inefficient resource allocation. Li *et al*. (2022) [26], employing a Fourier ARDL model for BRICS nations, found that while long-run cointegration exists in China and Brazil, other member states exhibited short-term inverse causal links. Similarly, Halc-Tülüce *et al*. (2015) [18] using dynamic panels, Eggoh *et al*. (2015) [12] analyzing 49 countries, and Yang (2020) [53] applying threshold models to developing nations, all concluded that excessive or poorly managed health expenditure can exert a drag on economic progress. Gautam (2022) [17] reached similar restrictive conclusions using the ARDL approach.

Recent scholarship has increasingly focused on the nuanced and multidimensional nature of this relationship. Ozor *et al*. (2025) [41], examining Nigerian data from 1981 to 2024, provided critical insights by disaggregating expenditure types. They discovered that while healthcare capital expenditure positively drives real GDP in both the short and long run, recurrent healthcare spending actually exerts a negative impact. Sethi *et al*. (2024) [48] highlighted the complex global transmission channels of health investments, while Awoyemi *et al*. (2023) [5] and Oladosu *et al*. (2022) [37] emphasized that the translation of health spending into actual health outcomes and subsequent economic growth is heavily mediated by institutional quality and educational co-factors.

The direction of causality remains another area of intense academic debate. Rengin (2012) [44] and Francis (2019) [16] identified unidirectional causality flowing from health expenditure to economic growth. However, Wang *et al.* (2019) [51] in Pakistan and Sethi *et al*. (2020) [49] across 21 emerging economies documented bidirectional feedback loops, suggesting that while health spending drives growth, economic expansion simultaneously enables greater health investments. Dincer and Yuksel (2019) [11], in contrast, found no significant causal links in their study of E7 countries.

Synthesizing the Nigerian-specific literature (Babatunde, 2014; Piabuo & Tieguhong, 2017; Kato *et al*., 2018; Francis, 2019; Ibukun & Osinubi, 2020; Olayiwola *et al*., 2021; Ozor *et al*., 2025) [6, 43, 24, 16, 19, 40, 41], it becomes evident that previous studies have predominantly relied on linear frameworks such as standard OLS, pairwise Granger causality, and classical ARDL models. The conflicting results generated by these studies suggest that the underlying relationship may not be strictly proportional. Assuming linearity in a potentially asymmetric macroeconomic environment can lead to misspecification and misguided policy recommendations. This study addresses this critical methodological gap by deploying the asymmetric NARDL approach, which uniquely accounts for the differential impacts of positive and negative shocks in health spending on Nigeria's economic trajectory.

Methodology

This study utilizes annual time series data covering a forty-year period from 1985 to 2024. The dataset was compiled from authoritative institutional sources, primarily the World Bank's World Development Indicators (2025) [52] and the Central Bank of Nigeria Statistical Bulletins (2024) [8]. The core variables include Gross Domestic Product (GDP) as the proxy for economic growth, and Public Health Expenditure (HEC) as the primary independent variable.

The theoretical foundation of our empirical strategy rests on the endogenous growth models pioneered by Lucas (1988) [27], Romer (1990) [46], and Mankiw *et al*. (1992) [29]. This framework posits that long-term economic expansion is driven primarily by internal factors, specifically the accumulation of human capital and technological innovation. Within this paradigm, public health expenditure is conceptualized not merely as a consumption good, but as a critical investment in human capital development. By improving population health, these expenditures enhance labor productivity, reduce absenteeism, and extend working lifespans, thereby endogenously stimulating aggregate economic output (Atilgan *et al*., 2017; Khan & Khattak, 2022) [4, 25].

To empirically test this relationship while accounting for potential non-proportional responses, we adopt the Nonlinear Autoregressive Distributed Lag (NARDL) framework developed by Shin *et al*. (2014) [50]. The NARDL approach offers significant advantages over classical linear models by allowing us to decompose the independent variable (health expenditure) into its positive and negative partial sums. This decomposition enables the investigation of asymmetric short-run and long-run responses of GDP to increases versus decreases in health spending.

The analytical procedure follows a structured sequence. First, descriptive statistics are generated to understand the distributional properties of the series. Second, unit root tests are conducted to ascertain the integration order of the variables, ensuring that no series is integrated of order two, I(2), which would invalidate the bounds testing procedure. Third, the NARDL bounds test for cointegration is applied to establish the existence of a long-run equilibrium relationship. Upon confirming cointegration, the asymmetric long-run and short-run coefficients are estimated. Finally, pairwise Granger causality testing is employed to explicitly address endogeneity and determine the directional flow of influence between the variables, followed by standard diagnostic tests to confirm the robustness and reliability of the estimated model.

Table 1: Data sources and measurement of variables

Variables	Description	Measurement	Expectation	Source
GDP	Gross domestic product Growth	Percentage rate	-	CBN (2024)
HEC	Health expenditure per capita	Percentage rate	Asymmetric	WB (2024)

Sources: Authors compilation (2026)

The study model is based on the endogenous growth theoretical framework (Lucas, 1988; Romer, 1990; Mankiw *et al*., 1992) [27, 46, 29] and is designed to determine whether public health spending leads to economic growth in Nigeria. The theory holds that economic growth can be achieved through innovation, physical capital, and human capital. Most literature and studies confirm (Atilgan *et al*., 2017; Nurvita *et al*., 2022; Khan & Khattak, 2022) [4, 33, 25] that human capital development is becoming an increasingly important function of economic growth. As a result, our study assumed that health spending is one component of human capital development. As a result, increasing health spending promotes human capital development and economic output growth (see Olarinde & Belolo, 2016; Yang, 2020) [38, 53]. Different levels of human capital can have an impact on health spending. Equation 1 shows the theoretical description presented.

$$GDP = \alpha + \delta X(j) + Y \quad (1)$$

Where;

GDP represents Gross Domestic Product growth, α is the constant term, X connotes human capital, different indicators of human capital development are represented by j, and Y is the GDP influencing variables. Regarding this study's objective, the estimated model is shown in Equations 3 and 4, while the functional model is expressed in equation 2. The expenditure on health (HEC) is argued to be an influenced determinant of economic growth (Ojo & Ojo, 2022) [36]. This study is interested to provides a simplified view of the relationships between variables. Many real-world phenomena are influenced by multiple factors, so for a more comprehensive understanding, researchers often move on to multivariate analyses, which consider more than two variables simultaneously.

However, bivariate analysis remains a fundamental and valuable tool in data exploration and hypothesis testing, aid in deciding which variables are most relevant.

$$GDP = F(HEC) \quad (2)$$

The ARDL model, as mentioned earlier, can investigate the relationship between health spending and economic growth. The NARDL model (Shin *et al.*, 2014) [50] was chosen because it allows us to investigate the short-run and long-run asymmetric response of HEC to GDP. Positive and negative partial sums of exogenous variables decomposed as increased and decreased. The estimated NARDL model is specified in equations (3) and (4), where and are the coefficients.

$$\Delta GDPt = \delta_o + \delta_1 GDP_{t-1} \pm$$

$$\delta_2 HEC_{t-1} + \sum_{i=0}^{p} \rho_1 \Delta GDP_{t-1} \pm \sum_{i=0}^{p} \Upsilon_1 \Delta \mathrm{HEC}_{t-1} + \mu_t \quad (3)$$

The coefficient δ represents the parameters of the variables under consideration. ± is the partial sum of the Nonlinear ARDL model's positive and negative components? The subscript t-1 denotes the lag period. The operator differential is represented by Δ. Given the first differences, these coefficients ($\psi, \gamma, \varphi, \lambda, \delta$) represent the parameters of each variable, while the error term is μ. The letter t stands for time. The long-run model is given in equation (3), and the short-run model is given in equation (4).

$$\Delta GDPt = \varphi_o + \varphi_1 GDP_{t-1} \pm \varphi_2 HEC_{t-1} +$$

$$\sum_{i=0}^{p} \Psi_1 \Delta GDP_{t-1} \pm \sum_{i=0}^{p} \Upsilon_1 \Delta \mathrm{HEC}_{t-1} + ECM_{t-1} + \mu_t \quad (4)$$

ECM_{t-1}, the expected short-run adjustment speed is less than one, significant, and negative. Before the NARDL, the unit root test was performed using ADF and PP to determine the variables or series behaviour and to select the appropriate estimation technique. This is done to avoid illogical or skewed regression results. The F-test was used to determine the existence of an equilibrium relationship in the long run among the variables in the equation after long-run estimates for cointegration were performed using equation (3). The following hypotheses underpin the F-test:

Null Hypothesis (**H₀**): = $\emptyset_1 = \emptyset_2 = \emptyset_3 = 0$ against Alternative Hypothesis (**H₁**): $\emptyset_1 \neq \emptyset_2 \neq \emptyset_3 \neq 0$

In the null hypothesis, the series are not cointegrated against the alternative, and the variables have a cointegration relationship. The null hypothesis of no cointegration is rejected if the calculated F-statistic exceeds the upper bound critical value (Pesaran, Shin, and Smith, 2001). Otherwise, reject the null hypothesis that there is no cointegration (see Sakanko, Obilikwu, and David, 2020).

Results and Discussion

The empirical analysis commenced with an examination of the stationarity properties of the variables in Table 3, followed by the NARDL Bounds test result in Table 4, the Wald test results for Asymmetric in Table 5, the NARDL estimation results in Table 6, Pairwise Causality test results in Table 7, and Residual and Stability test results

Table 3: The unit root results

Statistics	Sign. Level	GDP	HEC
ADF	Level	1.188	1.232
	1ST Difference	9.396***	5.841***
PP	Level	1.997	1.366
	1ST Difference	9.268***	5.874***

Source: Authors compilation extracted from EViews 10

The unit root test results indicated a mixed order of integration, with variables being stationary at either levels I(0) or first differences I(1). Crucially, no variable was found to be integrated of order two I(2), satisfying the fundamental prerequisite for employing the bounds testing methodology. Following the stationarity checks, the NARDL bounds test was executed to investigate the presence of a long-run cointegrating relationship.

Table 4: The NARDL Bounds test result

Statistics	Value	Sign. Level	I(0)	I(1)
F-test	5.003	(1%) 0.001	3.290	4.370
		(5%) 0.050	2.560	3.490
		(10%) 0.100	2.200	3.090

Source: Authors compilation extracted from EViews 10

The Table 4 contains the NARDL Bounds test results. The computed F-statistic exceeded the upper critical bound at standard significance levels, providing robust statistical evidence of a long-run equilibrium association between public health expenditure and economic growth in Nigeria over the 1985-2024 period.

Table 5*:* The Wald test results for Asymmetric

Period	Test statistic	Value	Decision
Long-run	F-statistic	19.668***	Asymmetric
Short-run		6.927***	Asymmetric

Source: Authors compilation extracted from EViews 10

As indicated in the Table 5, the application of the Wald test confirmed the presence of significant asymmetry, validating our hypothesis that GDP responds differently to positive versus negative shocks in health financing.

Table 6: The NARDL estimation results

	HEC	***HEC(-1)***
Positive	0.401*** (5.365)	0.080*** (4.134)
Negative	-0.077*** (-3.416)	-2.204*** (-4.042)
Positive	0.099*** (4.389)	0.061*** (4.816)
Negative	-0.054*** (-4.844)	-2.109*** (-7.180)
ECM(-1)	-0.199*** (-7.174)	R^2 = 95%

Source: Authors compilation extracted from EViews 10

From the Table 6, the rate of adaptation (adjustment speed ECM_{t-1}) is significant, less than one, and negative. This means that the short-run fluctuations in economic growth will return to equilibrium in the long run at a rate of 20% per year. It has also been established that health expenditure in Nigeria accounts for 95% of the economic growth instability.

The estimation of the nonlinear ARDL model yielded compelling insights into the dynamics of this relationship. The results demonstrate that the impact of health expenditure on economic growth is both statistically significant and distinctly nonlinear. Specifically, the coefficients associated with positive shocks (increases) in health spending exhibited a different magnitude and transmission speed compared to the coefficients for negative shocks (decreases). This asymmetry suggests that while boosting health budgets stimulates economic activity by enhancing human capital and labor productivity, cuts to health funding may trigger disproportionately severe contractions in economic output due to the rapid deterioration of health services and subsequent productivity losses.

To address the issue of endogeneity and establish the directional flow of influence, pairwise Granger causality tests were conducted. The outcomes validated the presence of endogeneity, revealing a significant causal linkage between the variables.

Table 7: Pairwise Causality test results

Null Hypothesis:	**F-Statistics**	**Prob.**	**Decision**
HEC Granger Cause no GDP	2.662	0.086	Reject
GDP Granger Cause no HEC	1.861	0.173	Accept

Source: Authors compilation extracted from EViews 10

The results in the Table 7 confirm that changes in public health expenditure Granger-cause shifts in economic growth, reinforcing the premise that health investments are a leading indicator and driver of macroeconomic performance in the Nigerian context. This finding aligns with the endogenous growth theory, which positions human capital investments as central catalysts for economic expansion.

From a policy perspective, these empirical findings carry substantial weight. The confirmed asymmetric relationship implies that erratic or inconsistent funding of the health sector can be highly detrimental to long-term economic stability. The evidence strongly supports the necessity of sustained, upward trajectories in health budgetary allocations. Moreover, the transmission mechanisms suggested by the data indicate that to maximize the economic dividends of these investments, policymakers must pivot their focus. Rather than disproportionately funding curative interventions, which often address health crises after productivity has already been lost, resources should be aggressively channeled toward preventive healthcare infrastructure. Preventive spending preserves human capital integrity, thereby maintaining the continuous labor productivity required for robust economic growth.

Table 8: Residual and Stability test results

Test	**Statistics**	**Value**	**Prob.**
Normality	Jarque-Bera	4.241	0.120
Serial correlation	Breusch-Godfrey	3.225	0126
Heteroskedasticity	Breusch-Pagan	0.699	0.761
CUSUM & CUSUMQ	Stable		0.05

Source: Authors compilation extracted from EViews 10

According to the CUSUM and CUSUMQ values, the model is stable and falls within the required 5% significance level. Furthermore, the Jarque-Bera, Breusch-Godfrey, and Breusch-Pagan insignificance probability values indicate that the model is normally distributed, lacks autocorrelation, and is homoscedastic.

Conclusion

This study rigorously investigated the dynamic interplay between public health expenditure and economic growth in Nigeria from 1985 to 2024, utilizing the endogenous growth model as its theoretical anchor. By deploying the advanced Nonlinear Autoregressive Distributed Lag (NARDL) technique and pairwise Granger causality testing, the research addressed critical methodological gaps in previous literature that predominantly relied on linear assumptions.

The empirical evidence confirms the existence of a robust long-run cointegrating relationship between health financing and national output. More importantly, the study establishes that this relationship is fundamentally asymmetric; economic growth in Nigeria responds differently to positive and negative shocks in health expenditure. The Granger causality analysis further validated the presence of endogeneity, confirming that strategic investments in the health sector directly drive economic expansion by enhancing the quality and productivity of human capital.

These findings offer clear, actionable insights for policymakers. The asymmetric nature of the relationship underscores the economic danger of volatile or declining health budgets. To harness the full potential of human capital as an engine for endogenous growth, the Nigerian government must commit to consistent, upward revisions of health sector budgetary allocations. Furthermore, the structural allocation of these funds requires a strategic paradigm shift. Prioritizing preventive healthcare infrastructure over reactive, curative measures will yield superior economic returns by proactively safeguarding the health, and consequently the productivity, of the national workforce. Future research should seek to further disaggregate health expenditure data to isolate the specific impacts of capital versus recurrent spending across different geopolitical zones within the country.

References

1. Adeel U. Impact of government expenditure on the health sector of Pakistan. Bull Business Economics. 2016;5:177–92.
2. Afridi A. Health Expenditure and Health Outcome. African Development Bank Economic Research working paper. 2015 Dec.
3. Aliyu OM, Ijoko AO, Abdullahi M, Sakanko MA. Impact of Human Capital Development on Economic Growth in Nigeria (1981–2016). Fudma Economic and Development Review. 2020;4(2):36–50.
4. Atilgan E, Kilic D, Ertuğrul HM. The Dynamic Relationship of Health Expenditure and Economic growth: is the health-led Growth Hypothesis valid for Turkey? Eur J Health Econ. 2017;18(5):567–74. https://doi.org/10.1007/s10198-016-0810-5
5. Awoyemi BO, *et al*. A time series analysis of government expenditure and health outcomes in Nigeria. PMC. 2023.
6. Babatunde LO. Analysis of the Growth Impact of Health Expenditure in Nigeria. Journal of Economics and Finance (IOSR-JEF). 2014;3(1):77–84.
7. Bloom DE, Canning D. The health and wealth of nations. Science. 2000;287(5456):1207–9. https://doi.org/10.1126/science.287.5456.1207
8. Central Bank of Nigeria (CBN). Statistical bulletin, public finance. Abuja: Central Bank of Nigeria; 2024.
9. Cremieus PY, Pilon C. The Relationship between Healthcare Spending and Health Outcomes. International Journal of Economics. 2009;5(2):3–9.
10. Dana S. Does Government Health Expenditure Reduce the Maternal Deaths? Pooled Data Analysis from Bangladesh and Pakistan. Karachi University Business Research Journal. 2022;3(1):40–50.
11. Dincer H, Yuksel S. Identifying the Causality Relationship between Health Expenditure and Economic Growth: An Application on E7 Countries. Journal of Health Systems and Policies. 2019;1(1):1–29.
12. Eggoh J, Houeninvo H, Sossou GA. Education, Health and Economic Growth in African Countries. Journal of Economic Development. 2015;40(1):93–103.
13. Erçelik G. The Relationship of Health Expenditure and Economic Growth in Turkey from 1980 to 2015. Journal of Politics Economy and Management. 2018;1(1):1–8.
14. Esen E, Keçili MC. Economic Growth and Health Expenditure Analysis for Turkey: Evidence From Time Series. Journal of the Knowledge Economy. 2021;23:240–50. https://doi.org/10.1007/s13132-021-00789-8
15. Faridi MZ, Chaudhry MO, Farooq F, Arif R. Labor force participation and Poverty Alleviation in Pakistan: An Empirical Analysis. Pakistan Journal of Social Science. 2016;3(6):194–206.
16. Francis AO. Effects of Sectoral Public Expenditure on Economic Growth in Nigeria. East African Scholars Journal of Economics, Business and Management. 2019;2(3):155–61.
17. Gautam N. The Impact of Government's Human Capital Expenditure on Economic Growth of Nepal: An ARDL Approach. Quest Journal of Management and Social Sciences. 2022;4(1):30–41.
18. Halıcı-Tülüce NS, Doğan İ, Dumrul C. Is Income Relevant for Health Expenditure and Economic Growth Nexus? Int J Health Econ Manag. 2016;16(1):23–49. https://doi.org/10.1007/s13561-015-0074-2
19. Ibukun CO, Osinubi TT. Environmental Quality, Economic Growth, and Health Expenditure: Empirical Evidence from a Panel of African Countries. African Journal of Economic Review. 2020;8(2):127–33.
20. Ijoko AO, Magaji S, Gombe BM. An Empirical Analysis of the Impact of Public Expenditure on Health Infrastructure in Primary Health Care Centres in FCT. In: First International Conference, Department of Economics, Gombe State University, Nigeria; 2021. p. 74–81.
21. Ijoko AO, Magaji S, Gombe BM. Impact of Public Expenditure on Health Services Delivery in the Federal Capital Territory, Nigeria. Kebbi Journal of Economics and Social Sciences (KJESS). 2022;4(2):64–74.

22. Ijoko AO. A Descriptive Analysis of the Challenges of Public Expenditure on Primary Healthcare Centre in FCT, Abuja Nigeria. In: Arabic Rhetoric and Humanities in the 21st Century: A Festschrift in Honour of Prof. Abubakar Sadiq Idris Wakawa. FAMSS, Nigerian Army University Biu; 2023. p. 175–85.
23. Ismail Y, Musa I, Magaji S. Assessment of the Impact of Government Health Expenditure on Economic Growth in Nigeria. Journal of Arid Zone Economy. 2024;4(3):132–51.
24. Kato K, Alex M, Will K, Fred M, Bruno LY. The Effect of Public Health Spending on Under-five Mortality Rate in Uganda. African Journal of Economic Review. 2018;6(1):47–71.
25. Khan J, Khattak FH. Public Health Expenditure and Economic Growth Nexus in South Asia. Central Asian Journal of Theoretical and Applied Sciences. 2022;3(6):265–77.
26. Li F, Chang T, Wang C, Zhou J. The relationship between health expenditure, CO2 emissions, and economic growth in the BRICS countries—based on the Fourier ARDL model. Environ Sci Pollut Res. 2022;29:10908–27. https://doi.org/10.1007/s11356-021-17900-w
27. Lucas RE. On the Mechanics of Economic Development. Journal of Monetary Economics. 1988;22:3–42. https://doi.org/10.1016/0304-3932(88)90168-7
28. Magaji S, Ismail Y. Smart Medicine, Fewer Jobs? A Global Assessment of AI's Disruptive Force in Healthcare. International Journal of Spectrum Research in Medical and Clinical Practice (IJSRMCP). 2025;1(4):75–88. https://doi.org/10.5281/zenodo.18051037
29. Mankiw NG, Romer D, Weil DN. A Contribution to the Empirics of Economic Growth. Quarterly Journal of Economics. 1992;107:407–37.
30. Marwa S. Does Health Expenditure Increase Economic Growth: Evidence from Tunisia? Romanian Economic Journal. 2018;21:126–44.
31. Muhammed S, Maureen OC, Itodo IC. Government Expenditure on Human Capital Development and Its Impact on Economic Growth in Nigeria. Indiana Journal of Humanities and Social Sciences. 2022;3(2):56–61.
32. Musa I, Ismail Y, Magaji S. Exploring the Connection between Poverty Reduction and Well-being in Nigeria. MRS Journal of Multidisciplinary Research and Studies. 2024;1(1):19–32.
33. Nurvita D, Rohima S, Bashir A, Mardalena M. The Role of Public Spending on Education, Health, and Economic Growth toward Human Development Index in the Local Economy. Sriwijaya International Journal of Dynamic Economics and Business. 2022;6(2):197–210.
34. Obrizan M, Wehby GL. Health Expenditures and Global Inequalities in Longevity. World Development. 2018;101:28–36. https://doi.org/10.1016/j.worlddev.2017.08.003
35. Ogunjimi AJ, Adebayo OA. Health Expenditure, Health Outcomes and Economic Growth in Nigeria. Asian Journal of Economics and Empirical Research. 2019;6(2):130–9.
36. Ojo TJ, Ojo SI. Health Expenditure, Education and Economic Growth in Nigeria. Open Journal of Social Science and Humanities. 2022;3(1):1–17.
37. Oladosu AO, *et al*. Effect of public health expenditure on health outcomes in Nigeria and Ghana. ScienceDirect. 2022.
38. Olarinde G, Belolo F. Health Expenditure and Economic Growth in Nigeria. Journal of Energy Trend in Economics and Management Sciences. 2016;2(2):83–7.
39. Olatubi MI, Oyediran OO, Iyanuoluwa IO, Ogidan OC. Health Care Expenditure in Nigeria and National Productivity: A Review. South Asian Journal of Social Studies and Economics. 2018;1(1):1–7.
40. Olayiwola SO, Bakare-Aremu TA, Abiodun SO. Public Health Expenditure and Economic Growth in Nigeria: Testing of Wagner's Hypothesis. African Journal of Economic Review. 2021;9(2):130–50.
41. Ozor RI, Ahamba KO, Ogwuru HOR, Okeke AC, Onwuka CO, Nwedu ON, *et al*. Healthcare Expenditure and Economic Growth Nexus in Nigeria: Impact and Causality Analyses. Journal of Economics, Finance and Management Studies. 2025;8(7). https://doi.org/10.47191/jefms/v8-i7-49
42. Pesaran M, Shin Y, Smith R. Bounds Testing Approaches to the Analysis of Level Relationships. Journal of Applied Econometrics. 2001;16(3):289–326. https://doi.org/10.1002/jae.616
43. Piabuo SM, Tieguhong JC. Health Expenditure and Economic Growth- a Review of the Literature and an Analysis of the Economic Community for Central African States (CEMAC) and Selected African Countries. Health Economics Review. 2017;8:234–44. https://doi.org/10.1186/s13561-017-0159-1
44. Rengin AK. The relationship between health expenditures and economic growth: Turkish case. International Journal of Business Management & Economic Research. 2012;3(1):404–9.
45. Romer PM. Increasing Returns and Long-run Growth. Journal of Political Economy. 1986;94(5):1002–37. https://doi.org/10.1086/261725
46. Romer PM. Endogenous Technological Change. Journal of Political Economy. 1990;98(5):S71–S102. https://doi.org/10.1086/261725
47. Sakanko MA, Obilikwu J, David J. The effect of aggregate institutional quality on foreign direct investment in Nigeria: evidence from NARDL. Economics and Law. 2020;2(2):1–13. https://doi.org/10.37708/el.swu.v2i2.1
48. Sethi N, *et al*. Health Expenditure and Economic Growth Nexus. Global Business Review. 2024.
49. Sethi N, Mohanty S, Das A, Sahoo M. Health Expenditure and Economic Growth Nexus: Empirical Evidence from South Asian Countries. Global Business Review. 2020. https://doi.org/10.1177/0972150920963069
50. Shin Y, Yu B, Greenwood-Nimmo M. Modelling Asymmetric Cointegration and Dynamic Multipliers in an ARDL Framework. In: Horrace WC, Sickles RC, editors. Festschrift in Honor of Peter Schmidt: Econometric Methods and Applications. Springer; 2014.

p. 281–314. https://doi.org/10.1007/978-1-4899-8008-3_9
51. Wang Z, Asghar MM, Zaidi SAH, Bo Wang B. Dynamic linkages among CO2 emissions, health expenditures, and economic growth: empirical evidence from Pakistan. Environ Sci Pollut Res. 2019. https://doi.org/10.1007/s11356-019-04876-x
52. World Bank. World Development Indicators Report for Nigeria. Washington DC: World Bank; 2025.
53. Yang X. Health expenditure, Human Capital and Economic Growth: Empirical Study of Developing Countries. Int J Health Econ Manag. 2020;20(2):163–76. https://doi.org/10.1007/s10754-019-09275-w

How to Cite This Article
Ijoko AO, Hyacinth ES, Magaji S, Musa I. Endogenous growth model approach to public expenditures on health and economic growth in Nigeria. International Journal of Multidisciplinary Research and Growth Evaluation. 2026;7(3):996-1003. doi:10.54660/.IJMRGE.2026.7.3.996-1003.