



Public Debt Burden, Institutional Quality and Health Outcome in Nigeria

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Abstract. This study examines the impact of public debt burden and institutional quality on health outcomes in Nigeria, utilizing empirical analysis on data spanning from 1986 to 2022. The study utilized the Autoregressive Distributed Lag (ARDL) bounds test for cointegration analysis, demonstrating that life expectancy, as a proxy for health outcomes, is cointegrated with external debt to GDP, domestic debt to GDP, debt service to exports, number of bed spaces per 1000 people, number of physicians per 1000 people, total health expenditure, and the corruption index ranking, indicating a long-term equilibrium relationship. The empirical findings revealed that institutional quality, as measured by the corruption ranking index, has a significant inverse effect on health outcomes in both the long and short run. In contrast, the fiscal freedom index shows a direct, though insignificant, impact on health outcomes in the long run, becoming significant in the short run. Additionally, both the external and domestic debt burdens negatively and significantly affect health outcomes in both the short and long run. In contrast, the debt service to exports ratio has a positive influence on health outcomes in the long run but an adverse effect in the short run. Government health expenditure positively and significantly impacts on health outcomes in both the long and short run. The physicians per 1000 population have a negative long-run effect but a positive short-run effect on health outcomes, while the number of bed spaces per 1000 population consistently has a positive effect. The study concluded that external and domestic debt burdens reduce Nigeria's health outcomes, whereas debt service has a beneficial impact on health in the long run. Institutional quality also significantly contributes to the improvement of health outcomes. Therefore, the study recommended that thorough assessment of debt-financed health projects for sustainability, prioritization of low-interest public loans for health financing, reduction in reliance on external debt for health expenditures, enhancement of transparency and accountability in health spending, and institutional reforms to combat corruption and improve the efficiency of public health investments and its outcome.

Keywords: Public Debt Burden; Institutional Quality; Health Outcomes; Life Expectancy; External Debt; Domestic Debt; Debt Servicing; Fiscal Freedom; Corruption; Government Health Expenditure; Nigeria; ARDL.

1. Introduction

Health is widely recognized as a critical component of human capital development and a fundamental driver of economic growth and sustainable development. A healthy population enhances labour productivity, educational attainment, and overall socioeconomic welfare. According to Lawanson (2009) health constitutes a vital component of human capital formation, while Todaro (2007) argues that human resources represent the ultimate basis of a nation's wealth because they actively accumulate capital, exploit natural resources, and promote economic and social development. Consequently, investments in healthcare are essential for improving human capital and fostering sustainable economic growth.

Since independence in 1960, Nigeria's economy has been characterized by significant government participation in economic activities, particularly in the provision of social and community services (CBN, 2017). Despite efforts to increase private sector involvement in socioeconomic development, the government remains the largest provider of public services and employer of labour. However, growing expenditure commitments have frequently exceeded government revenue capacity, leading to increased reliance on public borrowing to finance development projects and social sector expenditures, including healthcare (Iyoha, 2007). While public debt can serve as a strategic instrument for financing economic development, excessive debt accumulation may constrain fiscal space and reduce the resources available for critical sectors such as health.

The Nigerian health sector continues to face numerous challenges, including inadequate healthcare

infrastructure, shortages of skilled health personnel, poor remuneration and motivation, unsustainable healthcare financing, corruption, inadequate supervision of healthcare providers, and high out-of-pocket healthcare expenditures (Obansa & Akinagbe, 2013). These challenges have contributed to poor health outcomes, particularly low life expectancy, high infant and maternal mortality rates, and a growing burden of communicable and non-communicable diseases. Akintunde, Fagbola, Aribatise, and Njoku (2023) further observed that inadequate funding, insufficient healthcare infrastructure, and limited access to quality healthcare services have significantly weakened healthcare delivery in Nigeria, resulting in one of the lowest life expectancy rates globally.

Recognizing the importance of healthcare financing, African leaders adopted the Abuja Declaration in 2001, committing member states to allocate at least 15 percent of their annual budgets to the health sector. However, evidence indicates that most Sub-Saharan African countries, including Nigeria, have consistently failed to meet this target (African Data Report, 2016). Historically, low public expenditure on health has been identified as a major contributor to poor health outcomes across the region (Kaseje, 2006). Studies by Akintunde et al. (2023) and Edeh (2022) revealed that health expenditure in Nigeria has remained below 7 percent of total government expenditure over the past two decades, falling significantly short of both the Abuja Declaration target and international recommendations. Similarly, Ezenwaka et al. (2022) reported that government expenditure accounts for only about 29 percent of total health spending in Nigeria, leaving households and private institutions to finance approximately 71 percent of healthcare costs.

At the same time, Nigeria's rising public debt burden has generated concerns regarding its implications for healthcare financing and health outcomes. Previous studies have shown that increasing debt obligations can drain foreign exchange reserves, stimulate capital flight, and reduce fiscal resources available for social sector investments (Fosu, 2008; Megersa, 2014; Richards & Nwankwo, 2010; Ndikumana & Boyce, 2011). Excessive debt servicing obligations may crowd out expenditure on healthcare, education, and infrastructure, thereby undermining efforts to improve human welfare and sustainable development (Soetan & Osadola, 2018). Although public borrowing may provide resources for development projects, poorly managed debt accumulation can impose substantial fiscal pressures that limit government capacity to invest in human capital development (Joy & Panda, 2020).

Beyond fiscal considerations, institutional quality plays a crucial role in determining the effectiveness of public spending and health sector performance. Strong

institutions facilitate transparency, accountability, efficiency, and equitable allocation of public resources, thereby improving healthcare delivery and health outcomes. Conversely, weak institutions often encourage corruption, resource misallocation, and inefficiency, which can undermine healthcare financing and service delivery. Sibanda, Qoko, and Gonese (2024) argue that high-quality institutions are essential for maximizing the effectiveness of health expenditure, reducing waste, and ensuring that healthcare resources are utilized efficiently. Effective governance mechanisms can therefore enhance the developmental benefits of public borrowing by ensuring that debt-financed resources are directed toward productive investments in healthcare and other critical sectors.

Nigeria's experience presents a particularly important case for examining the nexus between public debt burden, institutional quality, and health outcomes. Despite substantial increases in public borrowing over the years, health indicators remain poor relative to many developing countries. According to the World Bank (2021), life expectancy at birth in Nigeria was approximately 54.49 years in 2019, considerably lower than figures reported for countries such as South Africa, Egypt, Libya, and India. Furthermore, evidence suggests that federal government budgetary allocations to health have consistently remained between 5 and 6 percent of total expenditure, largely due to growing debt servicing obligations and institutional weaknesses within the public sector (Adedokun, Adekanmbi, & Uthman, 2017).

Although several empirical studies have investigated the determinants of health outcomes in Nigeria and other developing economies (Muendiruth, 2014; Novignon & Lawanson, 2017; Adewumi, Acca, & Afolayan, 2018; Adeshina, Nwabuisi, & Adetutu, 2019; Jebbin, 2022; Abubakar & Inuwa, 2020; Yechi & Danladi, 2021; Hu & Zafar, 2022), limited attention has been devoted to examining the combined effects of public debt burden and institutional quality on health outcomes in Nigeria. This gap in the literature is particularly important given the country's increasing debt profile, persistent governance challenges, and continued struggle to improve healthcare outcomes.

Against this backdrop, this study investigates the impact of public debt burden and institutional quality on health outcomes in Nigeria. Specifically, the study examines the effects of external debt burden, domestic debt burden, debt servicing burden, fiscal freedom, and corruption on health outcomes. By doing so, the study contributes to the growing literature on public finance, institutional economics, and health economics while providing evidence-based recommendations for policymakers seeking to improve healthcare outcomes and promote sustainable development in Nigeria.

Succeeding this introduction, Section 2 deals with a survey of related literature, Section 3 anchors the study's methodology, the empirical results and discussion of findings are contained in Section 4, and Section 5 concludes the study with some policy implications.

2. Literature Review

2.1. Conceptual Review

2.1.1 Public Debt Burden

Public debt refers to the aggregate financial obligations incurred by a government through borrowing from domestic and external sources to finance budget deficits, development projects, and other public expenditures. According to Ajayi and Edewusi (2020) and Onyenwufe, Ekesiobi, and Okoli (2022), public debt encompasses funds borrowed from individuals, financial institutions, foreign governments, multilateral organizations, and private entities. Public debt is generally classified into domestic debt, which is sourced within the country, and external debt, which is obtained from foreign creditors, international financial institutions, and foreign governments.

The concept of debt burden extends beyond the stock of debt to include the cost of servicing debt obligations through interest and principal repayments. Black (2002) defines debt burden as the financial pressure imposed by debt servicing requirements, which may become unsustainable when debt levels rise excessively or when economic performance deteriorates. Excessive debt servicing obligations can crowd out public expenditure on productive sectors such as health, education, and infrastructure, thereby undermining economic development and social welfare.

Scholars have further distinguished between productive and unproductive debt. Udoka and Anyingang (2012) argue that productive debt finances investments that generate future economic returns, such as infrastructure and industrial projects, whereas unproductive or deadweight debt finances recurrent expenditures and activities that do not generate future income streams. Consequently, the developmental impact of public debt depends largely on the utilization and management of borrowed resources.

2.1.2 Institutional Quality

Institutional quality refers to the effectiveness, efficiency, transparency, and credibility of institutions responsible for governing economic, political, and social activities within a country. It encompasses the rule of law, government effectiveness, regulatory quality, accountability, control of corruption, and the protection of property rights. According to North (1981),

institutions consist of formal rules, compliance procedures, and behavioral norms that shape human interactions and economic outcomes. Similarly, Yildirim (2015) conceptualizes institutions as social structures and rules that guide individual and collective behavior.

The institutional economics literature emphasizes that strong institutions promote economic efficiency, innovation, investment, and sustainable development, while weak institutions encourage corruption, inefficiency, and rent-seeking behavior (North, 1990; Rodrik, 2000). In the context of healthcare, institutional quality determines the efficiency with which public resources are allocated and utilized. Strong institutions facilitate transparency and accountability in public financial management, thereby enhancing the effectiveness of health expenditure and improving health outcomes. This study adopts two indicators of institutional quality: fiscal freedom and corruption.

2.1.3 Fiscal Freedom

Fiscal freedom measures the extent to which government fiscal policies promote economic activity by minimizing excessive taxation and ensuring efficient public expenditure. It reflects the ability of individuals and businesses to retain earnings and invest resources without undue fiscal constraints. Higher fiscal freedom is generally associated with efficient public resource allocation, improved investment climate, and sustainable economic growth. In the healthcare sector, fiscal freedom influences government capacity to mobilize and allocate resources for healthcare delivery. Appropriate fiscal policies can enhance health financing, while excessive taxation or inefficient government spending may limit healthcare investment and service delivery.

2.1.4 Corruption

Corruption represents the misuse of public office or authority for private gain. It is widely recognized as a key indicator of weak institutional quality because it distorts resource allocation, reduces government effectiveness, weakens accountability, and undermines public trust. In the health sector, corruption can divert funds intended for healthcare infrastructure, personnel, and medical supplies, thereby reducing the effectiveness of health expenditure and worsening health outcomes. High levels of corruption are therefore associated with inefficient healthcare systems, poor service delivery, and increased health inequalities.

2.1.5 Health Outcomes

Health outcomes refer to measurable changes in the health status of individuals or populations resulting from healthcare interventions, public policies, environmental conditions, and socioeconomic factors. According to

Ikenna (2018), health outcomes capture improvements or deteriorations in health conditions attributable to healthcare investments and interventions. Common indicators of health outcomes include life expectancy, infant mortality, maternal mortality, disease prevalence, healthcare accessibility, and quality of life.

Among these indicators, life expectancy remains one of the most widely used measures of population health. Lawal (2016) defines life expectancy as the average number of years a newborn is expected to live under prevailing mortality conditions. It reflects the overall effectiveness of healthcare systems and broader socioeconomic conditions. Improved health outcomes are generally associated with increased healthcare expenditure, enhanced healthcare infrastructure, greater availability of healthcare professionals, and effective governance systems.

3. Theoretical Review

3.1 Debt Overhang Theory

The Debt Overhang Theory, developed by Krugman (1988) and Sachs during the debt crises of the 1980s, posits that excessive debt accumulation discourages investment and economic growth because future returns from investment are expected to be used primarily for debt repayment. Consequently, both domestic and foreign investors reduce investment activities due to uncertainty regarding future economic returns. Applied to the health sector, the theory suggests that excessive public debt and debt servicing obligations reduce fiscal resources available for healthcare financing. Governments burdened by large debt repayments may be forced to cut spending on social services, including health, thereby adversely affecting health outcomes. The theory therefore predicts a negative relationship between debt burden and health performance.

Neoclassical Debt Theory

The Neoclassical Model of Debt, as articulated by Rosen (1999), argues that government borrowing competes with private investment for available financial resources. This "crowding-out effect" reduces private investment and capital accumulation, ultimately slowing economic growth. Since lower economic growth translates into reduced government revenues, public spending on essential sectors such as healthcare may also decline. The theory implies that excessive government borrowing can indirectly impair health outcomes through reduced investment and economic performance.

3.2 Ricardian Equivalence Theory

The Ricardian Equivalence Theory, associated with Barro (1974), posits that debt-financed government spending is equivalent to tax-financed spending because

rational individuals anticipate future taxation required to repay government debt. Consequently, individuals increase savings to offset future tax burdens, leaving aggregate demand unchanged. Although the theory has attracted criticism due to its restrictive assumptions, it suggests that government borrowing may not necessarily affect economic outcomes if economic agents fully anticipate future fiscal adjustments. However, its applicability in developing countries such as Nigeria is often questioned due to imperfect information, liquidity constraints, and weak financial markets.

3.3 Grossman's Health Production Theory

Grossman's (1972) Health Production Theory provides the theoretical foundation for understanding health outcomes. The theory conceptualizes health as both a consumption good and an investment good. Individuals derive utility from good health while simultaneously investing in health to increase productivity and future earnings. Health is viewed as a form of capital that depreciates over time and requires continuous investment through healthcare services, nutrition, education, and healthy lifestyles. Government expenditure on healthcare therefore contributes to the accumulation of health capital and improved health outcomes. The theory further emphasizes that socioeconomic factors, public policies, and institutional arrangements influence the efficiency of health production and the overall health status of a population.

3.4 Empirical Review

Empirical studies on public debt, institutional quality, and health outcomes have produced mixed findings across countries and regions. ujkNovignon and Lawanson (2017) examined the relationship between health expenditure and child health outcomes in 45 Sub-Saharan African countries using panel data techniques. Their findings revealed that health expenditure significantly reduces infant, neonatal, and under-five mortality rates, with public health expenditure exerting stronger effects than private expenditure. Similarly, Olayiwola, Adedokun, and Olusanya (2020) found that government health expenditure significantly improves life expectancy while reducing infant and maternal mortality rates in Nigeria. Danladi (2021) also reported a positive relationship between government health expenditure and life expectancy, although the effects were statistically insignificant. Conversely, Adewumi, Acca, and Afolayan (2018) observed that government health expenditure exhibited a positive association with mortality indicators in Nigeria, suggesting inefficiencies in healthcare spending. Likewise, Ojo, Nwosa, Alake, and Adebajji (2020) found that health expenditure had an insignificant negative effect on life expectancy in Nigeria.

Regarding debt and health outcomes, Muendiruth (2014) found that debt servicing negatively affected healthcare service delivery in Nigeria between 1981 and 2013. Abubakar and Inuwa (2020) similarly reported that external debt servicing adversely affected health outcomes, recommending increased public investment in healthcare and improved debt management strategies. Yechi, Hu, and Zafar (2022), using panel data from emerging Asian economies, found that public debt increased infant mortality and reduced life expectancy in the long run. Adeshina, Nwabuisi, and Adetutu (2019) reported that domestic debt significantly influenced health outcomes in Nigeria, while Said and Sani (2020), using a sample of 43 Sub-Saharan African countries, found that public debt burden negatively affected health expenditure. Importantly, their study demonstrated that the negative effect of debt diminished and eventually became positive when institutional quality improved. This finding highlights the moderating role of institutions in determining the developmental consequences of public debt. Recent evidence by Nwokoye, Dimnwobi, Onuoha, and Madichie (2024) revealed that domestic debt, external debt, and debt servicing positively contributed to human capital development in Nigeria, suggesting that the effectiveness of debt depends largely on how borrowed resources are managed and invested.

3.5 Gap in the Literature

The reviewed studies reveal substantial evidence on the relationship between health expenditure and health outcomes, as well as the impact of public debt on economic performance and social development. However, existing studies have largely examined these relationships separately. Limited attention has been given to the joint influence of public debt burden and institutional quality on health outcomes, particularly within the Nigerian context. Furthermore, few studies have incorporated specific institutional quality indicators

such as fiscal freedom and corruption alongside various dimensions of public debt. This study seeks to fill this gap by examining how public debt burden and institutional quality jointly influence health outcomes in Nigeria.

4. Research Methodology

4.1 Theoretical Framework / Model Specification

Conventionally, the idea to model the determinants of health outcome took its roots from the Grossman (1972) where the health outcome model was specified as a function of input. Subsequent studies expanded the model to be the function of other additional factors. To examine the impact of public debt burden on health outcome, this study adapts the empirical model by Abubakar and Inuwa (2020) who examined the relationship between public debt services and health outcome in Nigeria. They specified their model as:

$$HOC = f(GEH, EX, DS, RGDP) \quad 3.1$$

Econometrically the model is specified as

$$HOCT = \beta_0 + \beta_1GEHt + \beta_2EXDSt + \beta_3RGDPt + U_t \quad 3.2$$

Where:

HOC = Health Outcome proxy by life expectancy

GEH = Government expenditure on health

EXDS = External Debt service

U_t = Error Term

For this study, the debt burden is further disaggregated into external debt to GDP ratio (EXG), domestic debt to GDP ratio (DDG) and debt services to export ratio (DSR). Meanwhile, institutional quality is captured by the fiscal freedom index (FFI) and corruption index ranking (COR). Control variables such as number of bed spaces per 1000 people (NBS) and number of physicians per 1000 people were also included. Therefore, Equation (3.3) below modeled the above factors:

$$LIF = \beta_0 + \beta_1DDG + \beta_2DSR + \beta_3EXG + \beta_4FFI + \beta_5COR + \beta_6NBS + \beta_7NPH + \beta_8TGH + U_t \quad 3.3$$

$\beta_1, \beta_2, \beta_3, \beta_5 < 0; \beta_4, \beta_6, \beta_7, \beta_8 > 0$,

The ARDL model for equation 3.3 is expressed as follows:

$$\begin{aligned} \Delta TGH_t = & \alpha_0 + \sum_{i=1}^p \alpha_1 \Delta(DDG)_{t-i} + \sum_{i=0}^p \alpha_2 \Delta(DSR)_{t-i} + \sum_{i=0}^p \alpha_3 \Delta(EXG)_{t-i} \\ & + \sum_{i=0}^p \alpha_4 \Delta(FFI)_{t-i} + \sum_{i=0}^p \alpha_5 \Delta(COR)_{t-i} + \sum_{i=0}^p \alpha_6 \Delta(NBS)_{t-i} + \sum_{i=0}^p \alpha_7 \Delta(NPH)_{t-i} + \\ & \sum_{i=0}^p \alpha_8 \Delta(TGH)_{t-i} + \delta_1(DDG)_{t-1} + \delta_2(DSR)_{t-1} + \delta_3(EXG)_{t-1} + \delta_4(FFI)_{t-1} + \delta_5(COR)_{t-1} + \\ & \delta_6(NBS)_{t-1} + \delta_7(NPY)_{t-1} + \delta_8(TGH)_{t-1} + v_t \end{aligned} \quad (3.4)$$

The coefficients from α_1 to α_7 represent the short-run coefficients whereas the coefficients from δ_1 to δ_8 represent the long-run coefficients of the ARDL model. Also, α_0 is the drift component, “n” is the maximum lag length while v_t is the stochastic error term. The bounded F-statistic test was used to check the existence of a stable, long-run relationship among the variables in the model. For instance, if the calculated F-statistic in equation 3.4 is greater than the appropriate upper bound critical values, the null hypothesis is rejected implying the existence of co-integration relationship. But if the value of the F-statistic is below the lower bound, the null cannot be rejected, indicating the absence of co-integration. Besides, if the F- statistic value lies within the lower and upper bounds, the results are considered inconclusive (Pesaran et al., 2001). If the bound test shows evidence of co-integration among variables specified for example as in equation 3.4, the long and the short-run (an error correction model (ECM)) models are specified as follows;

The long-run model:

$$TGH_t = \alpha_0 + \sum_{i=1}^p \alpha_1(DDG)_{t-i} + \sum_{i=0}^p \alpha_2(DSR)_{t-i} + \sum_{i=0}^p \alpha_3(EXG)_{t-i} + \sum_{i=0}^p \alpha_4(FFI)_{t-i} + \sum_{i=0}^p \alpha_5 \ln(COR)_{t-i} + \sum_{i=0}^p \alpha_6(NBS)_{t-i} + \sum_{i=0}^p \alpha_7(NPH)_{t-i} + \sum_{i=0}^p \alpha_8(TGH)_{t-i} + v_t \text{ -----(3.5)}$$

short-run model (ECM model):

$$\Delta(TGH)_t = \delta_0 + \sum_{i=1}^p \delta_1 \Delta(DDG)_{t-i} + \sum_{i=0}^p \delta_2 \Delta(DSR)_{t-i} + \sum_{i=0}^p \delta_3 \Delta(EXG)_{t-i} + \sum_{i=0}^p \delta_4 \Delta \ln(FFI)_{t-i} + \sum_{i=0}^p \delta_5 \Delta(COR)_{t-i} + \sum_{i=0}^p \delta_6 \Delta(NBS)_{t-i} + \sum_{i=0}^p \delta_7 \Delta(NPH)_{t-i} + \sum_{i=0}^p \delta_8 \Delta(TGH)_{t-i} + \beta ECM_{t-1} + v_t \text{ -----(3.6)}$$

Where β is the error correction term and it measures the speed of adjustment towards the long run equilibrium, and the remaining coefficients provide the short-run dynamics.

4.2 Sources of Data

The data used in the study are time series data covering the period 1986 – 20222 and were obtained mainly from secondary sources. Among these are Central Bank of Nigeria (CBN) Statistical Bulletin (various issues), National Bureau of Statistic (NBS), and World Bank Development Indicators statistical bulletin, Economic Journals, text books and published journals on the subject matter.

4.3 Method of Data Analysis.

The Autoregressive Distributed Lag (ARDL) methodology developed by Pesaran & Shin (1999) and Pesaran et al. (2001) was used to investigate the long and short-run relationship among public debt burden, institutional quality and government expenditure on health in Nigeria. The ARDL bound model has three advantages when compared with the Engle and Granger (1987) two-step method and Johansen and Juselius (1990) cointegration method. The ARDL method is applied to deal with the series having mixed stationary issues (i.e. the mixture of I(0) and I(1)). Hence, it relaxes the assumption that all series must be integrated in the same order. The next advantage is that the ARDL test is relatively more efficient in the case of small and finite sample data sizes. The method produced unbiased estimates of the long-run model (Harris & Sollis, 2003). The bounds test is a simple technique because it allows the co-integration relationship to be estimated by OLS once the lag order of the model is identified, unlike other multivariate co-integration methods. Furthermore, to determine the performance of the estimated model, RESET test, Serial correlation, normality and Heteroscedasticity tests were conducted, whereas the Cumulative Sum (CUSUM) and Cumulative Sum of Square (CUSUM Q) of residual of the ARDL model test was conducted to verify the stability nature of the model.

5. Data Analysis and Discussion of Results

5.1 Introduction

This section deals with the presentation and the empirical estimation of the model. Using the data on the variables from 1986 – 2024. We regressed and analyzed the prediction equation results of the model which was specified in section three using the Eview Econometric software package to run the OLS bearing in mind the objectives and hypotheses of the study. The results of the estimation are presented below in the sub-sections.

5.2 Unit Root Test:

The Augmented Dickey-Fuller Unit root test was used to assess whether the variables are stationary or not and their order of integration. The test involved testing the null hypothesis of non-stationarity of variables against the alternative hypothesis of stationarity. The result of the ADF Unit root test is shown in Table 4.1

Table 4.1: Results of Augmented Dickey Fuller (ADF) Unit Root Test

Variable	ADF Calculated Value in Level	ADF Calculated Value at 1st Difference	Mckinnon 5% Critical Value	Order Of Integration
EXG	-1.2282	-4.9695*	-2.9484	I(1)
DDG	-1.6262	-4.8387*	-2.9484	I(1)
DSR	-2.8686	-8.1040*	-2.9484	I(1)
THE	-3.7303	-	-2.9458	I(0)
NBS	-2.0553	-9.3740*	-2.9484	I(1)
FFI	-5.4434*	-	-2.9484	I(0)
COR	-2.1278	-5.3852*	-2.9484	I(1)
NPY	-0.8362	-3.8837*	-2.9484	I(1)
LIF	-1.3291	-9.8395*	-2.9484	I(1)

Source: Regression Output using Eview 12

*Significant at 5 per cent

The unit root test in Table 4.1 shows that external debt to GDP ratio (EXG), domestic debt to GDP ratio (DDG), debt services to export ratio (DSR), life expectancy (LIF), number of bed spaces per 1000 people (NBS), number of physicians per 1000 people and corruption index ranking (COR) are stationary at first difference since the calculated ADF Statistics is greater than the McKinnon 5% critical values while fiscal freedom index and health expenditure as a percentage of total government expenditure (THG) are stationary at level because the ADF value of the variable at level is greater than the McKinnon 5% critical values.

5.3 Lag Length Criteria

The step that follows is, therefore, determining the appropriate lag. The lag-length selection criteria such as sequential modified LR test statistic (LR), Final Prediction Error (FPE), Akaike Information Criterion (AIC), Schwarz Information Criterion (SC), and Hanna-Quinn information criterion (HQ) were employed to determine the appropriate lag length of the models. The test results of the different lag selection methods are reported in table 4.2. After a meticulous examination of the different lag lengths by estimating the VAR at each lag length and diagnosing the whiteness of resulting residuals, two (2) lag lengths was recommended by Aikaike Information Criteria AIC statistic, was selected for the model.

Table 4.2: VAR Lag Order Selection Criteria

VAR Lag Order Selection Criteria
 Endogenous variables: LIF COR DDG DSR EXG FFI NBS NPY THG
 Exogenous variables: C
 Date: 11/02/24 Time: 08:36
 Sample: 1986 2022
 Included observations: 35

Lag	LogL	LR	FPE	AIC	SC	HQ
0	635.2439	NA	2.32e-27	-35.78537	-35.38542	-35.64731
1	819.8230	263.6844	7.24e-30	-41.70417	-37.70471	-40.32356
2	968.8907	136.2904*	4.14e-31*	-45.59376*	-37.99477*	-42.97059*

* indicates lag order selected by the criterion
 LR: sequential modified LR test statistic (each test at 5% level)
 FPE: Final prediction error
 AIC: Akaike information criterion
 SC: Schwarz information criterion
 HQ: Hannan-Quinn information criterion

Source: Regression Output using Eview 12

5.4 Bounds Test for Co-Integration

The next step after determining the order of integration and lag length of the variables was to apply the bound F-test in order to establish the existences or otherwise of long-run relationship among the variables. The summary results of the bounds test for co-integration for the model is shown in Tables 4.3 below alongside with critical values. The computed F-statistic from bound test for the models is 31.3056. These values exceed the upper bounds critical value of 3.15 at 5% significance level. This implies that the alternate hypothesis of the existence of a unique co-integration (long run) relationship between the health outcome proxy by life expectancy and the explanatory variables is accepted while null hypothesis of no co-integration is rejected.

Table 4.3: Summary of ARDL Bound Test Results

Models	Test statistic	Computed statistic	F-	Lag	Significance level	Bound Critical values	
						Lower Bounds I(0)	Upper Bounds I(1)
Model 1	F-statistic	31.3056		2	5%	2.11	3.15

Source: Regression Output using Eview 12

5.5 Long Run Regression Results of the ARDL Model

The results of the estimated long-run coefficients using the ARDL approach are presented in Table 4.4 below. The models selected by AIC are (2,1,2,2,2,1,1,2,1).

Table: 4.4: Summary of the Long Run ARDL Regression Results

Depended Variable: LIF

Variable	Coefficient	Standard Error	t-Statistic	Prob.
COR	-0.0191*	0.0086	-2.1687	0.0509
DDG	-0.0191*	0.0077	-2.4746	0.0292
DSR	0.0451*	0.0055	8.1436	0.0000
EXG	-0.0099*	0.0019	-5.1352	0.0002
FFI	0.0129	0.0066	1.9648	0.0730
NBS	0.0264*	0.0087	3.0178	0.0107
NPY	-0.0102	0.0145	-0.7049	0.4943
THG	0.0112*	0.0049	2.3412	0.0373
Constant	1.5719	0.0142	111.0864	0.0000

Note: * is significant at 5% level of significance.

Source: Regression Output using Eview 12

From Table 4.4, it could be observed that corruption index ranking (COR) as an institutional quality variable is negatively signed which indicates that an inverse relationship exists between corruption index and health outcome. This is not consistent with the apriori expectation. The value of the coefficient is -0.0179, which implies that one unit increase in COR leads to 0.0179 unit decrease in the health outcome in Nigeria’s when other regressors are held constant. The coefficient of the variable is significant at 5 percent level of significance with a probability value of 0.0509 and a T-Value 2.1687 which is greater than the critical value 2.052. Thus, the alternate hypothesis is accepted, that is, that corruption index as an institutional quality variable has a significant impact on the Nigerian health outcome. This result supports the fact that in the long run increase in Nigeria corruption index stemmed Nigeria health outcome.

The coefficient of domestic debt to GDP ratio (DDG) is negatively signed which indicates that an inverse relationship exists between DDG and health outcome in Nigeria. This is consistent with the apriori expectation. The value of the coefficient is -0.0191, which implies that one unit increase in DDG leads to 0.0191 unit decrease in health outcome in Nigeria. The coefficient of the variable is significance at 5 percent level of significance with a probability value of 0.0292 and a T-Value 2.4746 which is greater than the critical value 2.052. Thus, the alternate hypothesis is accepted, that is, domestic debt burden has a significant impact on the Nigeria health outcome. This result supports the fact that in the long run increase in domestic debt burden reduces health outcome. This finding is consistent with Muendiruth (2014) who reported that debt servicing has negative and significant impact on health outcome in Nigeria. Furthermore, this result conforms to Yechi, Hu and and Zafar (2022) who stated that debt has increased infant mortality and decreased life expectancy in emerging Asian economies in the long run.

The coefficient of debt services to export ratio (DSR) is positively signed. This shows that the variable has a direct relationship with the Nigeria health outcome. The value of the coefficient is 0.0451 which implies that one unit increase in DSR leads to 0.0451 unit increase in the Nigerian health outcome on the long run. The variable is statistically significant

with a probability value of 0.0000 and a T-Value 8.1436 which is greater than the critical value of 2.052. Thus, we reject the alternate hypotheses that debt services to export ratio have a significant impact on Nigeria health outcome. This is in line with Adeshina, Nwabuisi and Adetutu (2019) who confirmed that public debt has long run significant impact on health status in Nigeria.

The coefficient of external debt to GDP ratio (EXG) shows an inverse and significant relationship with health outcome in Nigeria. This is in line with the apriori expectation. One percent increase in EXG leads to a 0.0099 unit decrease in health outcome in Nigeria. This result suggests that debt burden stunted the growth of health outcome in Nigeria. The result revealed that external debt has inverse and significant effect on health outcome in Nigeria, which is in line with the findings of Ogwuma, Orikara and Uruakpa (2018) and Ajah and Jacob (2022). This means that external debt as an index of public debt in Nigeria has on significant influence on the proportionate increase in the government health expenditure in Nigeria.

The coefficient of fiscal freedom index (FFI) as an institutional quality variable has a direct and insignificant impact on the Nigeria health outcome. One unit increase in FFI leads to 0.0129 unit increase in health outcome in Nigeria. This is consistent with the apriori expectation. This implies that fiscal freedom index contributed to the increase in government budget allocation on health which improves the sector output. The coefficient of number of physicians per 1000 (NBS) has a direct and significant impact on health outcome in Nigeria. One unit increase in NBS leads to 0.0264 unit increase in Nigeria health outcome. This is consistent with the apriori expectation. This implies that an increase in NBS increased Nigerian health outcome. The coefficient of number of physicians per 1000 (NPY) has an inverse and insignificant impact on the Nigeria health outcome. One unit increase in NPY leads to 0.0102 unit decrease in Nigeria health outcome. This is not consistent with the apriori expectation. This implies that number of physicians per 1000 does not contribute to the increase in Nigerian health outcome. This finding is a pointer to the fact that the Nigerian health sector is characterised by inadequate number of professional doctors and which will lead to low-capacity buildings and reduce human capacity utilisation which will lead to reduction in health output. This finding is consistent with Adewumi, Acca and Afolayan (2018) who shown that numbers of physicians have negative relationship with neonatal mortality, child and infant mortality rate in Nigeria.

The coefficient of government health expenditure (TGH) is positively signed. This shows that the variable has a direct relationship with the Nigeria health outcome. The value of the coefficient is 0.0112 which implies that one unit increase in TGH leads to 0.0112 unit increase in the Nigerian health outcome on the long run. The variable is statistically significant with a probability value of 0.0373 and a T-Value 2.3412 which is greater than the critical value of 2.052. Thus, we reject the null hypotheses that government health expenditure has an insignificant impact on Nigeria health outcome. This is in line with Danladi (2021) who indicated that capital health expenditure and recurrent health expenditures are positively related to the performance of the health sector proxy by life expectancy rate.

5.6 Short Run Parsimonious Estimation of the ARDL Model

In order to capture the short run deviations that might have occurred in estimating the long run co-integration equation, a dynamic parsimonious error correction estimate is reported in Table 4.5:

Table 4.5: Summary of Short Run Parsimonious Estimations of the ARDL model
Depended Variable: LIF

Variable	Coefficient	Standard Error	t-Statistic	Prob.
LIF	0.2225*	0.0543	4.0590	0.0016
D(DDG)	0.0387*	0.0092	4.1911	0.0013
D(COR)	-0.0463*	0.0115	-4.0387	0.0016
D(COR(-1))	-0.0690*	0.0114	-6.0702	0.0001
D(DSR))	0.0244*	0.0034	7.1942	0.0000
D(DSR(-1))	-0.0239*	0.0032	-7.1942	0.0000
D(EXG)	-0.0082	0.0039	-2.1037	0.0572
D(EXG(-1))	0.0230*	0.0040	5.7663	0.0001
D(FFI)	0.0129*	0.0042	3.0358	0.0104
D(NBS)	-1.4905*	0.3547	-4.2017	0.0015
D(NPY)	0.0505*	0.0215	2.3493	0.0368
D(TGH)	0.0128	0.0023	5.3682	0.0002
D(TGH(-1))	-0.0043	0.0024	-1.8072	0.0958
D(NBS(-1))	-4.4777*	0.6061	-7.3879	0.0000
D(NBS(-2))	-3.2728*	0.6698	-4.8862	0.0005
D(NBS)	0.0216*	0.0064	3.3604	0.0057
ECM(-1)	-0.9674*	0.0841	-23.4062	0.0000
R-squared		0.9725		

Adjusted R-squared	0.9555
Durbin – Watson stat	2.31520

Note: * is significant at 5% level of significance.

Source: Regression Output using Eviews 12

Table 4.5 indicates that the difference in corruption index D(COR) in the current year has an inverse and significant impact on health outcome in Nigeria. This is in line with a priori expectation. Also, the difference in one year lag periods of corruption index D(COR(-1)) has an inverse and significant impact on the health outcome in Nigeria. This confirms the fact that corruption has the tendency of diverting fund met for the health sector to private pocket which have adverse effect on public expenditure on health and health outcome in Nigeria on the short run.

The difference in domestic debt to GDP ratio (DDG) has a direct and significant impact on health outcome in Nigeria on the short run which does not conform to the a priori expectation. This indicated that domestic debt burden does not have adverse impact on health outcome in Nigeria. Furthermore, the difference debt services to export ratio D(DSR) has a direct and significant impact health outcome in Nigeria on the short run. But the deference in the variable at lag one D(DSR(-1)) has an inverse and significant impact on Nigeria health outcome. This is not consistent to the apriori expectation. This implies that government debt if used on productive sector will enhance government revenue generation and impact positively on government budget allocation to the health sector and its outcome. The difference in external debt to GDP ratio, D(EXG) has an inverse and insignificant impact on the on-health outcome in Nigeria on the short run which is in line with the apriori expectation. While at lag one D(EXG(-1)) has a direct and significant impact on the Nigerian health outcome on the short run.

Furthermore, the difference number of bed spaces per 1000 people D(NBS) has direct inverse and significant impact on Nigeria health outcome on the short run and this is in line with the apriori expectation while the difference in number of physicians per 1000 people (NPY) has direct but significant impact on health outcome in Nigeria. The difference in public expenditure on health, D(THG) has a direct and significant impact on the health outcome in Nigeria on the short run which is in line with the apriori expectation. While at lag one D(THG(-1)) has an inverse but insignificant impact on the Nigerian health outcome on the short run.

The result from Table 4.5 shows that the coefficient of ECM is negative -0.9674 and significant at 5% per cent critical level. This shows that about 98 percent disequilibria in the health outcome in the previous one year are corrected for in the current year. The high level of significance of the ECM further confirms the existence of a long run equilibrium relationship the Nigeria health outcome, debt burden and institutional quality variables used in the study. The coefficient of determination (R^2) value of 0.9725 implies that 97 percent of the total variation in Nigeria health outcome is explained by changes in debt burden and institutional quality variables during the study period. Subsequently, 3 percent is unexplained due to error term. The adjusted coefficient of determination (R^2) Value of 0.9555 implies that 96 percent of the total variation in the Nigeria health outcome is explained by changes in the independent variables when the coefficient of determination is adjusted for degree of freedom. This implies that 4 per cent is unexplained due to error term while the Durbin Watson Statistic of 2.1520 indicates absence of autocorrelation of the error term in the ordinary least square method of regression.

5.7 Diagnostic statistical testing

The results of the ARDL estimation for the model are subjected to statistical diagnostic tests. The diagnostic test results is reported in Table 4. 6.

Table 4.6: Diagnostic tests on the real estimated mining and quarrying model

Purpose of test	Test	Test statistic	Probability	Conclusion
Normality	Jarque-Bera	1.1148	0.5727	Normal
Heteroscedasticity	Breusch–Pagan–Godfrey Heteroskedasticity Test	0.3378	0.9868	No heteroscedasticity
Serial correlation	Breusch–Godfrey serial correlation LM test	2.9625	0.0871	No serial correction
Ramsey RESET	Model Specification fitness	1.6197	0.1336	Correctly Specified

Source: Regression Output using Eviews 12

From table 4.6 above, All the tests as captured by Jarque-Bera, Breusch-Godfrey LM test, Breusch–Pagan-Godfrey Heteroskedasticity and Ramsey RESET test among others, reveal the fines of the estimated equation results and the desired properties of an econometric model. The diagnostic tests confirm the suitability of the estimated model. Thus, the model

residual series are normally distributed as suggested by the Jarque–Bera statistics, while the Breusch–Godfrey LM test statistics indicate that the model does not have significant serial correlation problem. Moreover, the Breusch–Pagan–Godfrey test show that the residuals are homoscedastic and the model has correct functional form while Ramsey RESET test) shows that the ARDL models are correctly specified.

5.8 Stability Test

Stability test was also performed using Cumulative Sum (CUSUM) and Cumulative Sum of Square (CUSUM Q) of residual of the ARDL model. The results are shown in figure I and II

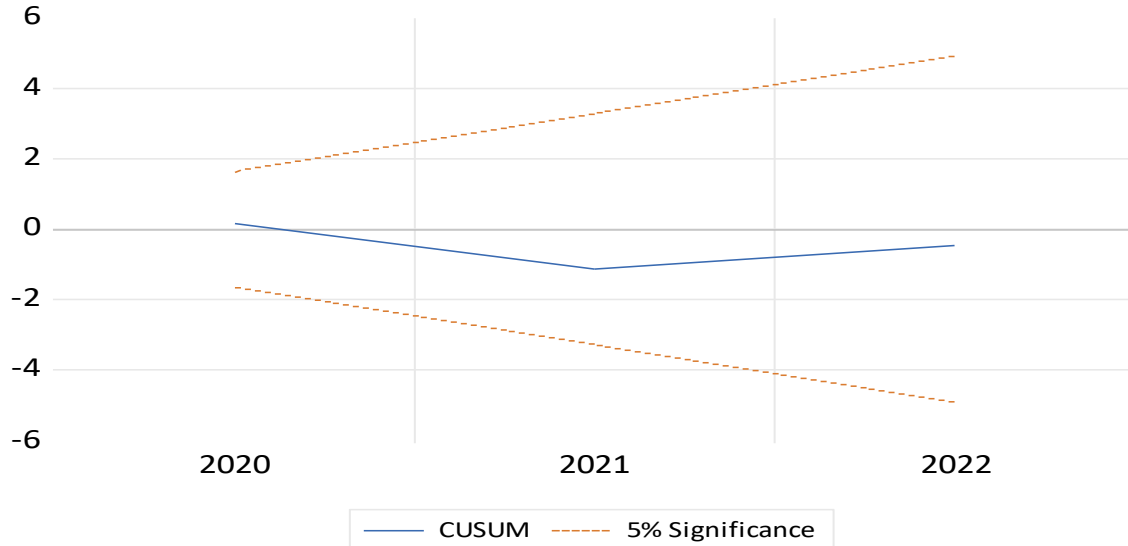


Figure I: Plot of Cumulative Sum of Recursive Residual for the ARDL Model

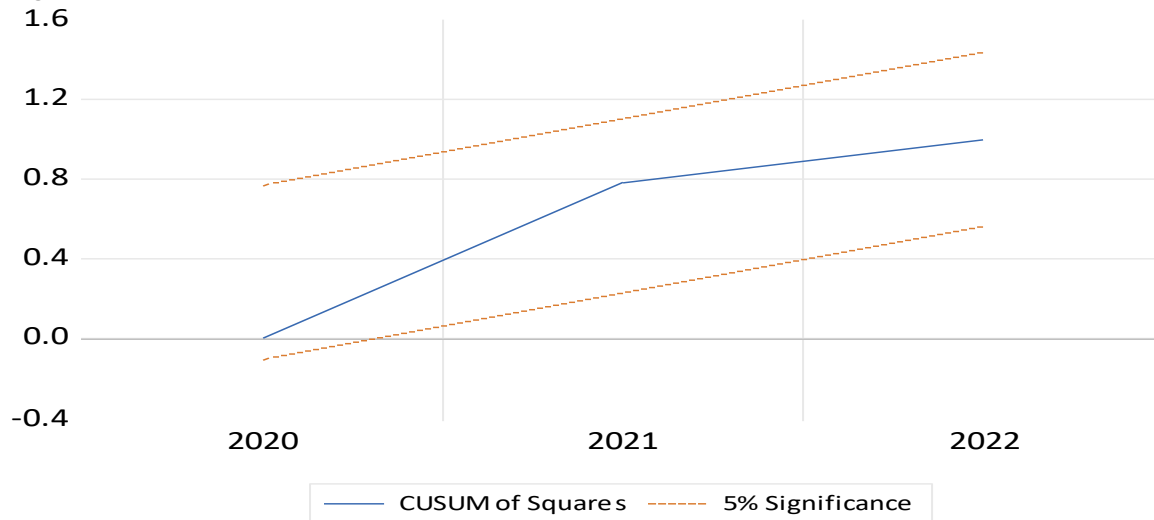


Figure II: Plot of Cumulative Sum of Square of Recursive Residual for the ARDL Model

The existence of parameter instability is established if the Cumulative Sum of the residual goes outside the area between the critical (dotted bounded) lines. It is estimated at 5 per cent critical level. From Figure I and II, it can be inferred that the ARDL model at 5 per cent level of significance has been stable over time.

6. Conclusion and Recommendations

This study examined the impact of public debt burden and institutional quality on health outcomes in Nigeria

using annual time-series data covering the period 1986–2022. The study employed the Augmented Dickey–Fuller (ADF) unit root test and the Autoregressive Distributed Lag (ARDL) bounds testing approach to investigate both the short-run and long-run relationships among the variables. The unit root results revealed a mixed order of integration among the variables, justifying the application of the ARDL methodology. The ARDL bounds test confirmed the existence of a long-run equilibrium relationship between health outcomes and the explanatory variables, including

external debt burden, domestic debt burden, debt servicing burden, fiscal freedom index, corruption index, government health expenditure, physician density, and hospital bed availability.

The empirical findings indicate that institutional quality plays a significant role in shaping health outcomes in Nigeria. Specifically, corruption was found to have a negative and statistically significant impact on health outcomes in both the short term and the long term, suggesting that weak governance and poor accountability hinder improvements in the healthcare sector. Conversely, fiscal freedom exhibited a positive effect on health outcomes, although its impact was only significant in the short run. The results further revealed that both external debt burden and domestic debt burden have a negative and significant impact on health outcomes in Nigeria, both in the short and long run. This finding supports the debt overhang hypothesis, which suggests that excessive debt obligations constrain government spending on critical sectors such as healthcare. Although debt servicing burden exerted a positive and significant effect on health outcomes in the long run, its short-run effect was negative and significant, implying that debt repayment obligations may initially crowd out healthcare spending before generating potential long-term benefits through improved fiscal credibility and access to financing.

Furthermore, government health expenditure was found to have a positive and significant impact on health outcomes in both the short run and long run, highlighting the importance of sustained public investment in healthcare. The availability of hospital bed spaces also contributed positively and significantly to health outcomes, emphasizing the role of healthcare infrastructure in improving population health. While physician density exhibited mixed results, its positive short-run effect underscores the importance of adequate healthcare personnel in enhancing health service delivery. Overall, the study concludes that rising domestic and external debt burdens constitute major constraints to the improvement of health outcomes in Nigeria, whereas sound institutional quality and increased public health expenditure contribute significantly to better health performance. Therefore, improving governance structures, strengthening institutional quality, and ensuring prudent debt management are critical for achieving sustainable improvements in health outcomes in Nigeria.

The study therefore recommended that the Nigerian government should adopt prudent debt management practices by ensuring that borrowed funds are invested in productive health projects capable of improving health outcomes and generating long-term benefits. Efforts should be made to reduce reliance on external debt and prioritize low-interest financing options to minimize the

burden of debt servicing. Government should also increase and efficiently manage public health expenditure through greater transparency, accountability, and fiscal discipline. Furthermore, institutional reforms aimed at reducing corruption and strengthening governance should be intensified to enhance the effectiveness of health spending. Finally, increased investment in healthcare infrastructure and medical personnel is necessary to improve the quality, accessibility, and sustainability of healthcare services in Nigeria.

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