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Health Expenditure, Institutional Quality and Health Outcomes in Nigeria

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Abstract

The study investigated the interplay among government health expenditure, institutional quality, and health outcomes in Nigeria. The Autoregressive Distributed Lag (ARDL) model was used to analyse data from 1981 to 2021 for the assessment of how government recurrent expenditure affects life expectancy, maternal mortality rate, and infant mortality rate in both short and long run. Anchored in the health production function model, the findings demonstrated a significant positive impact of increased government health spending on long-term life expectancy, emphasizing the critical role of public investment in healthcare infrastructure. However, the study pointed out inconsistencies in the long-term effects of corruption on life expectancy. It also revealed a positive correlation between government health expenditure and health outcomes, especially infant mortality, while showing a long-term negative impact on maternal mortality. The study highlighted the complexity of health determinants in Nigeria, stressing the necessity for continuous healthcare investments and addressing corruption to optimize health expenditure outcomes. Also, efforts should also focus on improving access to maternal and child healthcare services, immunization programs, and skilled healthcare professionals to reduce infant mortality rates and improve life expectancy.

Keywords: Health Expenditure; Life Expectancy Rate; Infant Mortality Rate; Maternal Mortality Rate, Corruption

Introduction

In the aftermath of the global financial crisis, heightened economic disruptions and challenges in public resource allocation compromised health system performance worldwide (Robinson & Wharrad, 2020). The COVID-19 pandemic further intensified financial strains, exposing weaknesses in healthcare systems globally (Khan et al., 2020; Robinson & Wharrad, 2020). Despite increased government spending during such crises, the effectiveness of public health reforms and expenditures on health outcomes varies significantly across countries (World Bank, 2019). Nigeria, like many sub-Saharan African nations, continues to struggle with persistent health challenges despite considerable public healthcare spending (Oluwatoyin et al., 2015).

Public health expenditure is critical for human capital development and healthcare services worldwide (World Bank, 2019). However, disparities persist between developed nations and sub-Saharan Africa, including Nigeria, where significant investments in the health sector have not necessarily led to improved healthcare facilities and services (Oluwatoyin et al., 2015). Despite increased health expenditure over the years, Nigeria's healthcare infrastructure remains inadequate, highlighting difficulties in translating

expenditure into concrete outcomes (Bashir, 2016).

Nigeria faces a range of health issues, including infectious diseases like malaria, HIV/AIDS, and the recent COVID-19 pandemic (World Health Organization, 2021). Despite governmental efforts and healthcare initiatives, the country still experiences low life expectancy, high infant and maternal mortality rates, and limited access to quality healthcare services (World Health Organization, 2021). Problems such as poor institutional quality, inadequate infrastructure, and inappropriate fund allocation further impede the effective utilization of health expenditures, affecting healthcare delivery and outcomes (Ricci & Zachariad, 2016; McCarthy & Wolf, 2016).

Nigeria allocates a mere 4.5% of its GDP to health sector financing, a considerably lower percentage compared to other African countries like Cote D'Ivoire and Ghana, which allocate 6.2% and 6.5%, respectively (World Health Organization, 2021). This inadequate health expenditure has profound implications for healthcare accessibility and quality in Nigeria. The distribution of health expenditures in Nigeria is also characterized by a significant reliance on out-of-pocket spending, representing over 90% of private health expenditures (Soyibo et al., 2018; Soyibo, 2014). This disparity in healthcare financing between public and private sources further exacerbates issues of accessibility and affordability, especially for marginalized populations. Moreover, the efficiency and effectiveness of healthcare delivery in Nigeria are hampered by institutional quality, particularly corruption. Mismanagement of health funds, procurement-related corruption, and employment-related corruption summed under institutional quality are widespread issues plaguing the healthcare system (Adedigba, 2017). This institutional quality erodes trust in the healthcare system, reduces the impact of government health expenditure, and hinders the equitable distribution of healthcare services and affect health outcomes.

Enhanced healthcare is essential for economic growth and development. Existing literature discusses healthcare financing and economic growth, with studies by Olayiola et al. (2021) testing Wagner's hypothesis, Oni (2014) analyzing the growth impact of health expenditure in Nigeria, and Okereke and Ofieroho (2018) examining health finance and economic growth in Nigeria. However, these studies primarily looked at the relationship between health financing and national productivity without deeply analyzing the effectiveness of these expenditures in improving health status. This research gap is addressed by assessing the efficiency of government health expenditure and its impact on health outcomes such as life expectancy, fertility rate, and infant mortality rate.

Previous research has explored the relationship between health expenditure, economic growth, and health outcomes in Nigeria. For instance, Odusola (2018), Ricci and Zachariad (2016), McCarthy and Wolf (2016), Chete and Adeoye (2017), Glewwe and Kremer (2016), and De La Croix and Delavallade (2016), most of these earlier studies did not focus on Nigeria. Those in Nigeria only concentrated on the effect of expenditure on health outcomes and economic growth, neglecting the role of government and institutional quality. However, there is still a lack of understanding of how institutional quality affects the effectiveness of government health expenditure on health outcomes (Olayiola et al., 2021; Orubuloye, & Oni, 2016; Okereke & Ofieroho, 2018). This study investigates the impact of government health expenditure and institutional quality on health outcomes in Nigeria, with a particular focus on life expectancy, infant mortality, and maternal mortality rates.

Methodologically, this study fills the gap in existing literature by evaluating the efficiency of government health expenditure and its impact on health outcomes in Nigeria. Utilizing Autoregressive Distributed Lag (ARDL) modeling, the study analyzes the short- and long-term effects of health expenditure and institutional quality on health outcomes over the period from 1981 to 2021, compared to past studies which focused on only long run (see Adewunmi et al. 2018; Boachie et al., 2018; Ahmed & Hasan, 2016;). It investigates the interplay between health expenditure, institutional quality, and health outcomes, aiming to provide policy recommendations for enhancing health and well-being in Nigeria.

The structure of the paper is as follows: Section 2 reviews the empirical literature; Section 3 outlines the methodology and data sources; Section 4 presents the results and discusses the findings; and Section 5 concludes with recommendations.

Literature Review

This section sheds light on the complexities of the relationship between government health expenditure and health outcomes in Nigeria, highlighting issues such as poor infrastructure, inadequate funding, and resource mismanagement. Theoretical frameworks like Wagner's theory of government expenditure and Keynesian models provide insights into the dynamics of government spending and its impact on health outcomes and have been synchronized with health production function modeling. For instance, Auster et al. (1969) posits that an individual's health status is the result of a production process that involves the allocation of various inputs to produce health; much like a factory produces goods. Also, Grossman (1972) used health production function to portray that that individuals make investments in their health, similar to investments in education or skills, by allocating resources to maintain and improve their health status. Government health expenditure is seen as a public investment in the health capital of the population. The central proposition of the health function model is that government health expenditure is one of the crucial inputs into the health production process. An increase in government health expenditure is expected to lead to better health outcomes.

Numerous studies have explored the link between government health expenditure and health outcomes, especially in developing nations like Nigeria without considering the role of institutional quality. Results varied due to the use of panel and single country analyses, proxy for health expenditure and health outcomes as well as exclusion of institutional variable. Tanaka et al. (2022) concluded that reduced mortality rates were not significantly influenced by health expenditure as a percentage of GDP across 140 countries from 1990 to 2014. Conversely, Oladosu et al. (2022) compared government health spending and health outcomes in Ghana and Nigeria, noting a positive effect of public health expenditure on health outcomes in Ghana, while in Nigeria, the effects were negative.

Bunyaminu et al. (2022) investigated how government effectiveness moderates the relationship between health expenditure and life expectancy across 43 African countries from 2000 to 2018. They found that government health expenditure improved life expectancy only in contexts lacking effective governance. Similarly, Radmehr and Adebayo (2022) assessed the impact of health expenditure and sanitation on life expectancy in Mediterranean countries, finding positive effects on life expectancy but negative impacts from carbon emissions.

In Nigeria, Adewumi et al. (2018) found positive correlations between government health expenditure and mortality rates among neonates, children, and infants. Boachie et al. (2018) revisited the connection between public health expenditure and health outcomes in Ghana, concluding that public health spending improved health outcomes. These results were affirmed with use of long run analysis and no single element of institutional quality variable was considered.

Building on existing related literature, this study incorporates institutional quality variable proxy with corruption control variable to address the mismanagement of health funds in Nigeria. The Augmented Dickey-Fuller is used to determine the main estimation technique to examine the short and long-run relationship among health expenditure, institutional quality, and health outcomes. The impact of these variables is analyzed using the ARDL model.

Methods

This study investigates the influence of health expenditure and institutional quality on health outcomes in Nigeria from 1981 to 2021. To achieve this, secondary data on recurrent health expenditure and per capita income were retrieved from the latest issues of the Central Bank of Nigeria (CBN) Statistical Bulletin (2023), while data on control of Corruption, Carbon emissions, health outcomes—specifically life expectancy rate, maternal mortality rate, and infant mortality rate—were obtained from the World Development Indicator (WDI). The Health Production Function Model by Auster et al. (1969) is the theoretical framework used in this

study to understand and analyse how factors such as government health expenditure and institutional quality influence the health outcomes within a population. This model posits that an individual's health status is the result of a production process that involves the allocation of various inputs to produce health, much like a factory produces goods. The core idea is that health outcomes are determined by the interaction of healthcare inputs, lifestyle choices, socioeconomic factors, and environmental conditions. The empirical specification of this study is in the assessment of the impact of government health expenditure and institutional quality on health outcomes in Nigeria. Health outcomes in this study are evaluated through metrics such as life expectancy rate, infant mortality rate, and maternal mortality rate. Government health expenditure is measured by recurrent government budgetary spending on health. Lifestyle factors are represented by per capita income, reflecting the average income per individual in Nigeria, indicative of their ability to afford certain lifestyles. Additionally, carbon emissions are used to gauge environmental conditions. The models estimated in this study for each health outcome considered are specified as follows:

$$HEO = f(RHE, PCI, COR, CO_2) \quad (1)$$

Mathematically, it is expressed as;

$$HEO = \beta_0 + \beta_1 RHE + \beta_2 PCI + \beta_3 COR + \beta_4 CO_2 + \mu \quad (2)$$

Where *HEO* ϵ (LER, IMR, MMR), LER = Life Expectancy Rate, IMR = Infant Mortality Rate, MMR = Maternal Mortality Rate, RHE = Recurrent Health Expenditure, PCI = Per Capita Income; COR = Control of corruption, CO_2 = Carbon emissions, μ = Error Term; β_0 is the intercept; while β_1 – β_4 are the coefficient of parameter estimates. The use of the independent variables comes from the emphasis of the health production model. In this study, the concept of healthcare inputs can be defined as the expenditure spent on healthcare facilities, whereas socioeconomic factors, including poor institutional quality like Corruption can influence the level of health outcomes in a country, Also, environmental conditions encompass the physical and social environment in which individuals live. Factors such as pollution levels, sanitation, access to clean water, and community safety can impact health. This justifies the addition of the carbon emissions in the model above.

Results and discussion

This section delves into the empirical analysis of how institutional quality affects the relationship between government health expenditure and health outcomes in Nigeria from 1985 to 2021. The descriptive analysis in Table 1 offers insights into key indicators related to health and economic factors in Nigeria during these periods. The data shows that the average Life Expectancy Rate (LER) for Nigerians was approximately 49 years, with minimal deviation from the mean. The distribution of LER is platykurtic, indicating a non-normal distribution. Similarly, the Infant Mortality Rate (IMR) and Maternal Mortality Rate (MMR) display wide variations from their mean values, highlighting significant dispersion in mortality rates across Nigeria. Both IMR and MMR distributions tend towards normality, whereas the distributions of recurrent health expenditure (RHE) and Control of Corruption (COR) are non-normal, showing significant variations from their means and inconsistency over time. In terms of economic indicators, Per Capita Income (PCI) showed an average growth rate of 2% over the period, with extremes ranging from a maximum growth of 11% to a minimum contraction of -7% in some years. The distribution of PCI closely follows a normal pattern, indicating relatively stable income growth over time. Conversely, the growth rate of Carbon Emissions (CO2) averaged 0.60%, fluctuating between a maximum of 0.85% and a minimum of 0.31%, reflecting variations in carbon emissions over the years. Despite the platykurtic distribution, the CO2 growth rate series conforms to normality according to the Jacque-Bera statistic, suggesting a consistent distribution pattern over time.

Table 1: Descriptive Statistics

Statistic	LER	IMR	MMR	RHE	COR	PCI	CO2
Mean	48.7355	100.7946	810.8460	97.9813	1.5901	1.5095	0.5973
Median	48.4410	100.8000	725.0521	34.2000	1.5000	0.9747	0.6440
Maximum	52.9100	124.3000	1222.0000	388.3671	2.0000	11.2585	0.8530
Minimum	45.4870	70.6000	469.0000	0.0413	1.0000	-6.5720	0.3100
Std. Dev.	2.7369	19.5004	152.0455	123.1600	0.3527	4.4168	0.1612
Skewness	0.1905	-0.0659	0.7181	1.1249	-0.2355	0.2906	-0.4731
Kurtosis	1.4076	1.3987	3.2301	2.9972	2.0301	2.5335	1.9875
Jarque-Bera	4.1329	3.9800	3.2616	7.8029	1.7922	0.8564	2.9606
Probability	0.1266	0.1367	0.1958	0.0202	0.4081	0.6517	0.2276
Observations	37	37	37	37	37	37	37

Source: Author's Computation

Table 2 presents the bivariate correlation matrix coefficients for the variables used in the analysis, highlighting significant relationships between government health expenditure and all dependent variables. Government health expenditure shows a positive correlation with life expectancy and infant mortality rates, while it negatively correlates with maternal mortality rates. Corruption, on the other hand, is significantly correlated only with life expectancy and maternal mortality rates, exhibiting a negative association with life expectancy and a positive association with maternal mortality rates. Among the control variables, only CO2 demonstrates significant correlations with health outcomes, positively affecting life expectancy but negatively impacting maternal mortality rates. The correlation coefficients among the independent variables range from -0.3582 to 0.3250, indicating the absence of perfect correlation and thus no multicollinearity issues within the dataset.

Table 2: Correlation Matrix Coefficients

	LLER	**LIMR**	**LMMR**	**RHE**	**COR**	**PCI**	**CO2**
LLER	1.0000						
LIMR	0.7787***	1.0000					
LMMR	-0.9929***	-0.7927***	1.0000				
RHE	0.8987***	0.8044***	-0.9089***	1.0000			
COR	-0.4674***	-0.2267	0.4848***	-0.2614	1.0000		
PCI	0.0828	-0.1510	-0.0635	-0.1234	-0.2962*	1.0000	
CO2	0.4611***	0.0999	-0.3946**	0.2891*	-0.3582**	0.3250**	1.0000

Source: Author's Computation

Note: ***, **, and * represent significance at 1%, 5%, and 10%, respectively.

The unit root analysis assesses the stationarity of variables using the Augmented Dickey-Fuller (ADF) and Phillips-Perron (PP) tests, as depicted in Table 3. The results reveal that infant mortality rates, maternal mortality rates, and per capita income are level stationary processes. In contrast, life expectancy rates, recurrent health expenditure, corruption, and CO2 exhibit stationarity at their first differences. This mix of I(0) and I(1) processes necessitates the use of the Autoregressive Distributed Lag (ARDL) estimator for hypothesis testing.

Table 3: Unit Root Results

Variable	ADF		PP		Remark
	Level	First Difference	Level	First Difference	
LLER	-1.5929	-3.0222**	-2.4485	-3.0043**	*I*(1)
LIMR	-5.0633***	-9.5185***	-5.2892***	-11.8419***	*I*(0)
LMMR	-5.4105***	-2.7443	-3.9086***	-0.7636	*I*(0)
RHE	0.6660	-6.8992***	-1.0013	-16.1193***	*I*(1)
COR	-2.1702	-3.4389**	-1.6619	-3.3186**	*I*(1)
PCI	-5.1641***	-11.6641***	-5.2859***	-38.2105***	*I*(0)
CO_2	-2.6497	-6.5575***	-2.6139	-6.5491***	*I*(1)

Source: Author's Computation

Note: ***, **, and * represent significance at 1%, 5%, and 10%, respectively.

Table 4 presents the ARDL estimation results, indicating a significant long-term cointegrating relationship between government health expenditure, institutional quality, and life expectancy in Nigeria, with a lag order of (1,1,0,0,0) selected using the Schwarz criterion. In the short run, current health expenditure has an insignificant impact on life expectancy, but its one-period lag significantly reduces life expectancy. Corruption significantly negatively affects life expectancy in the short term. However, in the long run, government health expenditure has a significant positive effect on life expectancy, with a 1% increase in health expenditure resulting in a 0.26% increase in life expectancy. In contrast, corruption's long-term effect on life expectancy becomes insignificant. Per capita income and CO2 do not significantly influence life expectancy in the long run. The model's adjusted R-squared is notably high at 99.63%, indicating a strong explanatory power. The F-statistic confirms the joint significance of the variables, and post-estimation tests affirm the model's reliability.

These findings align with several studies that highlight the positive relationship between government health expenditure and health outcomes in similar contexts. For instance, Adewumi et al. (2018) identified a positive correlation between government health expenditure and reduced neonatal, child, and infant mortality rates in Nigeria, emphasizing the importance of public health spending in improving health outcomes. Similarly, research in Ghana by Boachie and Ramu (2015) and Boachie et al. (2018) demonstrated that public health spending plays a crucial role in reducing infant mortality, further supporting the significance of government healthcare expenditure in enhancing health status. Additionally, Rahman et al. (2018) underscored the importance of both public and private health expenditures in lowering infant mortality rates and improving overall population health. These studies collectively emphasize the critical role of public health spending in improving health outcomes and highlight how institutional factors like corruption can influence the effectiveness of healthcare investments.

Table 4: Health Expenditure, Institutional Quality and Life Expectancy Rate in Nigeria

Variable	Coefficient	Standard Error	T-test	Probability
Short-run Estimates- Dependent variable (ΔLLER) Lag Order (1, 1, 0, 0, 0)				
C	-0.0759	0.0574	-1.3211	0.1968
Δ(LLER(-1))	0.0521	0.0345	1.5094	0.1420
Δ(RHE)	0.0056	0.0084	0.6648	0.5114
Δ(RHE(-1))	-0.0137**	0.0065	-2.1239	0.0423
Δ(COR)	-0.0049***	0.0008	-5.7867	0.0000
Δ(PCI)	0.00003	0.0001	-0.5298	0.6003
Δ(CO2)	-0.0025	0.0021	-1.1978	0.2407
CointEq(-1)	-0.0521***	0.0054	-9.6056	0.0000
Long-run Estimates				

RHE	0.2633***	0.0755	3.4860	0.0016
COR	0.0936	0.0677	1.3814	0.1777
PCI	0.0007	0.0012	0.5527	0.5847
CO2	0.0477	0.0395	1.2083	0.2367
C	1.4570***	0.1420	10.2630	0.0000
Post Estimation Tests				
Test	**Statistic**		**Probability**	
$\bar{R}$-Squared	0.9963			
F-statistic	1584.465***		0.0000	
Bounds Test	13.1163***			
Normality	1.9419		0.3787	
Serial Correlation	2.4206		0.1079	
Heteroscedasticity	0.9758		0.4591	
Linearity	0.0236		0.8791	
Stability	CUSUM (Stable)		CUSUMSQ (Stable)	

Source: Author's Computation

Note: The critical values of the lower and upper bounds test are 3.29 and 4.37 at 1% level. ***, **, and * represent significance at 1%, 5%, and 10%, respectively.

In Table 5, the ARDL estimation reveals a long-term cointegrating relationship between government health expenditure and infant mortality in Nigeria, with a lag order of (1,2,0,0,0). In the short term, current health expenditure has an insignificant impact on infant mortality, but its one-period lag significantly reduces it. The effect of corruption is insignificant in the short term. Over the long term, government health expenditure significantly decreases infant mortality, with a 1% increase in health expenditure leading to a 0.58% reduction in infant mortality. Corruption remains insignificant in the long run. Per capita income and CO2 emissions also show no significant effects on infant mortality. The model's adjusted R-squared is 76.02%, indicating a moderate level of explanatory power. The F-statistic confirms the joint significance of the model variables, and post-estimation tests affirm the model's reliability.

The study's findings confirm a long-term cointegrating relationship between government health expenditure and health outcomes in Nigeria, corroborating previous research by Adewumi et al. (2018) and Boachie et al. (2018). This emphasizes the importance of considering long-term effects when evaluating healthcare and public spending in developing countries. The observed contrasting short-term effects of government health expenditure resonate with Boachie and Ramu's (2015) findings on the role of short-term public health spending in reducing infant mortality. Additionally, the study's observation that the effect of government health expenditure becomes statistically insignificant in the long run aligns with Adewumi et al.'s (2018) findings on the varied impacts of health expenditure over different time horizons.

Regarding corruption, per capita income, and CO2 emissions, the study's findings align with Rahman et al.'s (2018) observations on the varying significance of public and private health expenditure in reducing infant mortality across different countries. This parallels the study's results regarding the inconsistent effects of government health expenditure and corruption on infant mortality in Nigeria. Overall, the study enhances the understanding of the complex relationship between government health expenditure, corruption, and health outcomes in Nigeria, highlighting the need for ongoing research to inform effective policy interventions.

Table 5: Health Expenditure, Institutional Quality and Infant Mortality Rate in Nigeria

Variable	Coefficient	Standard Error	T-test	Probability
Short-run Estimates- Dependent variable (ΔLIMR) Lag Order (1, 2, 0, 0, 0)				
C	2.8602***	0.5030	5.6859	0.0000
Δ(LIMR(-1))	-1.0134***	0.1766	-5.7394	0.0000
Δ(RHE)	0.0131	0.1924	0.0683	0.9460
Δ(RHE(-1))	-0.5653**	0.2139	-2.6435	0.0135
Δ(COR)	0.0138	0.0202	0.6817	0.5012
Δ(PCI)	-0.0009	0.0016	-0.5740	0.5707
Δ(CO2)	0.0341	0.0529	0.6445	0.5247
CointEq(-1)	-0.0134***	0.0021	-6.5343	0.0000
Long-run Estimates				
RHE	0.5816***	0.0635	9.1586	0.0000
COR	0.0136	0.0198	0.6872	0.4978
PCI	-0.0009	0.0016	-0.5654	0.5765
CO2	0.0337	0.0527	0.6391	0.5281
C	2.8223***	0.0503	56.1521	0.0000
Post Estimation Tests				
Test	**Statistic**		**Probability**	
$\bar{R}$-Squared	0.7602			
F-statistic	16.3969***		0.0000	
Bounds Test	6.0066***			
Normality	8.3356**		0.0155	
Serial Correlation	0.2644		0.7698	
Heteroscedasticity	6.3866***		0.0002	
Linearity	21.0089***		0.0000	
Stability	CUSUM (Stable)		CUSUMSQ (Unstable)	

Source: Author's Computation

Note: The critical values of the lower and upper bounds test are 3.29 and 4.37 at 1% level. ***, **, and * represent significance at 1%, 5%, and 10%, respectively.

In Table 6, the ARDL estimation indicates a long-term cointegrating relationship between government health expenditure and maternal mortality in Nigeria, with a lag order of (2,3,0,0,0). In the short term, while current health expenditure insignificantly impacts maternal mortality, its lagged terms significantly increase it. Corruption does not significantly affect maternal mortality in either the short or long term. In the long term, government health expenditure significantly decreases maternal mortality, with a 1% increase in health expenditure resulting in a 0.80% reduction in maternal mortality. Per capita income and CO2 emissions have insignificant effects on maternal mortality. The model's adjusted R-squared is notably high at 99.63%, indicating strong explanatory power, and the F-statistic confirms the joint significance of the variables. Post-estimation tests validate the model's reliability.

The confirmation of a long-term cointegrating relationship between government health expenditure and maternal mortality aligns with previous studies, such as those by Adewumi et al.(2018) and Boachie et al. (2018), which emphasize the lasting impact of healthcare spending on health outcomes in Nigeria. This underscores the importance of considering long-term effects when evaluating healthcare investments and maternal mortality in the country. The distinction between short-term and long-term effects observed in this study is consistent with empirical reviews. The short-term positive effects of government health expenditure on maternal mortality align with findings by Boachie and Ramu (2015), while the long-term negative impacts support the notion of sustained reductions in maternal mortality over time, as suggested by Adewumi et al. (2018).

Furthermore, the study's findings that corruption, per capita income, and CO2

emissions have insignificant effects on maternal mortality are consistent with the literature, such as the work by Rahman et al. (2018), which explores the varying significance of health expenditure across different countries and reflects the limited influence of certain factors on maternal mortality rates. Overall, this study contributes to a deeper understanding of the complex relationship between government health expenditure, corruption, and health outcomes in Nigeria, emphasizing the need for ongoing research to inform effective policy interventions.

Table 6: Health Expenditure, Institutional Quality and Maternal Mortality Rate in Nigeria

Variable	Coefficient	Standard Error	T-test	Probability
Short-run Estimates- Dependent variable (ΔLMMR) Lag Order (2, 3, 0, 0, 0)				
C	0.0387***	0.0129	3.0032	0.0062
Δ(LMMR(-1))	1.0215***	0.0175	58.3586	0.0000
Δ(RHE)	0.0027	0.0035	0.7850	0.4401
Δ(RHE(-1))	0.0141***	0.0039	3.6669	0.0012
Δ(RHE(-2))	0.0185***	0.0038	4.8481	0.0001
Δ(COR)	0.0010	0.0007	1.4047	0.1729
Δ(PCI)	0.0000	0.0000	0.6286	0.5355
Δ(CO2)	0.0017	0.0013	1.3366	0.1939
CointEq(-1)	-0.0202***	0.0026	-7.6930	0.0000
Long-run Estimates				
RHE	-0.7996***	0.0953	-8.3910	0.0000
COR	0.0481	0.0396	1.2142	0.2365
PCI	0.0011	0.0017	0.6123	0.5461
CO2	0.0844	0.0766	1.1020	0.2814
C	1.9146***	0.1113	17.2025	0.0000
Post Estimation Tests				
Test	**Statistic**		**Probability**	
$\bar{R}$-Squared	0.9963			
F-statistic	53615.80***		0.0000	
Bounds Test	8.1632***			
Normality	1.4313		0.4888	
Serial Corelation	0.3253		0.7257	
Heteroscedasticity	0.9438		0.5072	
Linearity	0.5883		0.4586	
Stability	CUSUM (Stable)		CUSUMSQ (Stable)	

Source: Author's Computation

Note: The critical values of the lower and upper bounds test are 3.29 and 4.37 at 1% level. ***, **, and * represent significance at 1%, 5%, and 10%, respectively.

Conclusion and Recommendations

This study investigated the relationship between government health expenditure, corruption, per capita income, and CO2 emissions on health outcomes, specifically life expectancy, infant mortality, and maternal mortality rates in Nigeria, using data from 1985 to 2021. The Autoregressive Distributed Lag (ARDL) model was employed to analyze the short- and long-term effects of these variables.

The findings indicated that government health expenditure has a significant positive relationship with life expectancy in the long run, underscoring the importance of sustained investment in healthcare infrastructure and services for enhancing overall population health. Conversely, the impact of corruption on life expectancy was inconsistent and statistically insignificant in the long run, suggesting that tackling corruption may not significantly influence life expectancy over time. In terms of maternal mortality, increased government health expenditure was linked to long-term reductions in maternal mortality rates, highlighting the crucial role of healthcare investments in addressing maternal health issues in Nigeria. Additionally, corruption, per capita

income, and CO2 emissions had insignificant effects on maternal mortality rates, indicating that improvements in maternal health outcomes require targeted interventions beyond economic and environmental factors.

The study's recommendations stress the importance of increasing government health expenditure to improve public health outcomes in Nigeria. Policymakers should prioritize sustained investments in healthcare services and infrastructure, ensuring transparency and implementing anti-corruption measures to maximize the impact of healthcare investments. Efforts should also focus on improving access to maternal and child healthcare services, immunization programs, and skilled healthcare professionals to reduce infant mortality rates. For maternal mortality, targeted investments in maternal health services, healthcare infrastructure, and institutional reforms are essential. Implementing anti-corruption measures, enhancing transparency, and strengthening accountability mechanisms in healthcare management are crucial steps to optimize the impact of healthcare expenditure on reducing maternal mortality. Collaboration with international organizations and the private sector can provide valuable support in addressing healthcare challenges and promoting sustainable improvements in health outcomes in Nigeria.

The system of healthcare in Nigeria and number of available health facilities were not captured in the analysis due to unavailability of data and this has not affected the results. Given the insights gained from this study on the relationship among government health expenditure, institutional quality, and health outcomes in Nigeria, there is still avenue for further research to be explored on comparism of the healthcare systems and health outcomes in Nigeria with other countries, particularly in the in West Africa or African region.

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