ANALYSIS OF THE RELATIONSHIP BETWEEN HOUSEHOLD OUT-OF-POCKET HEALTH EXPENDITURE AND HEALTH OUTCOMES IN NIGERIA

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ABSTRACT
This study investigated the impact of household out-of-pocket expenditure (OOPE) on health outcomes in Nigeria using time series data from 1990 to 2023 sourced from the World Bank. Health outcomes were measured by maternal mortality rate (MMR), infant mortality rate (IMR), and life expectancy (LEX). Using the Autoregressive Distributed Lag (ARDL) Technique, the results showed that higher OOPE significantly increases MMR in both the short and long run, reduces IMR only in the short run, and lowers LEX in the long run. These findings indicated that reliance on OOPE undermines maternal and long-term population health while providing only temporary benefits for infant survival. Guided by Grossman's health demand theory, the study concluded that Nigeria's OOPE-dominated health financing is inequitable and unsustainable. It recommended expanding the National Health Insurance Authority (NHIA) to cover the informal sector, increasing public health spending to meet the Abuja Declaration target, prioritizing primary healthcare and skilled birth services, investing in education, water, and sanitation, adopting progressive health financing, expanding rural health infrastructure, and establishing emergency health funds to protect households from catastrophic costs.

Keywords: Autoregressive Distributed Lag Model, Infant Mortality, Life Expectancy, Maternal Mortality, Out-of-Pocket Expenditure
JEL Codes: I10, I15, I18, H51, C32

1. INTRODUCTION
Global health priorities, especially the United Nations Sustainable Development Goal 3 (SDG 3), highlight the urgent need to ensure that everyone has access to quality health and well-being. However, healthcare financing continues to be a significant challenge worldwide. The World Bank (2023) reports that about 1.4 billion people encounter catastrophic health costs, and nearly 70 million are driven into extreme poverty due to out-of-pocket (OOP) payments. An additional 435 million fall deeper into poverty for the same reason.

In many African countries, including Nigeria, health financing systems still rely heavily on OOP spending, which burdens vulnerable households the most (Ebeh et al., 2025). Most

African nations dedicate less than 5% of their Gross Domestic Product (GDP) to health (World Health Organization [WHO], 2021). Despite policy commitments such as the 2001 Abuja Declaration, where African leaders promised to allocate 15% of national budgets to health, and Nigeria's launch of the National Health Insurance Scheme (NHIS) in 2005, OOP payments remain the primary source of health funding (Abaneme & Ajibola, 2025). According to World Bank (2024), about 77% of Nigeria's total health expenditure comes from households' direct payments, greatly surpassing the African average of 36% and the global average of 16%. This situation reflects chronic government underfunding: in 2000, public spending constituted 18.3% of total health expenditure compared to households' 60.1%. By 2010, OOP spending rose to 76.9%, while government funding dropped to 13.6%. This imbalance continued in 2020 (74.6% vs. 14.9%) and worsened by 2023, with households covering 79.4% and the government only 9.9% (World Bank, 2024).

This heavy reliance on household OOP payments has serious consequences, leading to financial distress, increased poverty, and poorer national health outcomes (Akintunde & Olaniran, 2022). Nigeria's health indicators reflect this crisis: life expectancy averages just 55 years and the country represents 28.5% of global maternal deaths (United Nations, 2023). The latest demographic and health survey reports infant mortality at 63 deaths per 1,000 live births, under-five mortality at 110 deaths per 1,000, and maternal mortality at 1,047 per 100,000 live births (Nigeria Demography & Health Survey, 2024).

Despite the severity of these outcomes, the empirical evidence on the relationship between OOP health spending and health outcomes in Nigeria remains contradictory. For instance, while some studies (Ebeh et al, 2025, Nwachukwu et al., 2023; Iyakwari et al., 2023) found a strong positive effect of OOP spending on life expectancy, others (Akintunde et al., 2024) showed little to no effect. Similarly, while studies (Usman, 2024; Okekwu, 2023; Hamzat et al., 2019) suggest that higher OOP spending lowers child mortality in Nigeria, this seems far from reality as Nigeria continues to record high child mortality rates despite significant household spending casting doubt on these claims. However, evidence on maternal mortality is somewhat more consistent, with many cross-country studies showing that OOP spending increases maternal deaths (Udeorah et al., 2024; Boundioa & Thiombiano, 2024; Ai et al., 2023; Fofack & Sarpong, 2019). Yet there is still a contradiction as Atuhaire et al. (2023) suggest short-term decreases in maternal mortality associated with OOP payments. These inconsistences in extant studies motivated this study.

Three important gaps were identified in the literature. First, the relationship between OOP spending and life expectancy or child mortality in Nigeria remains unclear. Second, although evidence on maternal mortality is stronger, it largely comes from cross-country analyses that may not adequately reflect Nigeria's specific context. Third, most prior studies examine only individual health indicators, overlooking the broader picture of how OOP health spending simultaneously affects multiple dimensions of population health. This study seeks to fill these gaps by examining the impact of OOP spending on three critical health outcomes - maternal mortality, infant mortality, and life expectancy - using Nigeria-specific time-series data. In doing so, it provides a more comprehensive and contextually grounded assessment of the consequences of OOP health financing in Nigeria.

The rest of this study is organized as follows: Section 2 reviews relevant literature. Section 3 explains the methodology and theoretical framework; Section 4 presents the data analysis; and Section 5 concludes with key policy recommendations.

2. LITERATURE REVIEW

2.1 Conceptual Review

Health is broadly defined beyond the absence of disease, encompassing complete physical, mental, social, and even spiritual well-being (WHO, 1948; Tiljak, 2017). Scholars also emphasise its intrinsic value, equating health to wealth, as poor health limits individual potential (Gandhi, 1948). Health outcomes are measurable consequences of healthcare interventions and reflect care quality, commonly assessed via indicators such as maternal mortality, infant mortality, and life expectancy (Oleske & Islam, 2019). Out-of-pocket expenditure (OOPE) on the other hand refers to direct payments by individuals or households for healthcare services at the point of consumption, excluding insurance reimbursements, covering consultations, medications, diagnostics, hospital stays, and related services (World Bank, 2024; Fofack & Sarpong, 2019). High OOPE is linked to catastrophic and impoverishing spending, highlighting its role as a critical component of private health expenditure and a determinant of health outcomes.

2.2 Theoretical Review

The relationship between out-of-pocket expenditure (OOPE) and health outcomes in Nigeria can be understood through several complementary theories. The Health Capital Model by Michael Grossman (1972) treats health as a form of capital that can be accumulated through investment, yet high OOPE in Nigeria limits such investment, negatively affecting maternal and child health. Similarly, the Human Capital Theory by Schultz (1961) and Becker (1964) emphasises that health and education enhance productivity and income, but excessive household spending on healthcare diverts resources from these investments, constraining long-term human development. Resource Allocation Theory by Musgrave (1959) highlights the state's responsibility in providing public goods, explaining how inadequate government health funding in Nigeria forces households to bear the burden, increasing inequities. The Social Determinants of Health Framework by Marmot (1991) further underscores that income, education, and living conditions shape health outcomes, with Nigeria's high OOPE disproportionately affecting poorer populations. Lastly, the Health Financing Transition Theory proposed by Kutzin (1995) argues that countries should move from reliance on OOPE to pooled health financing, a transition that Nigeria has struggled with, resulting in persistent household dependence and suboptimal life expectancy. Collectively, these theories illustrate how OOPE undermines health outcomes by limiting health investment, exacerbating inequality, and reflecting weak public health financing.

2.3 Empirical Review

Extant studies on the link between out-of-pocket (OOP) healthcare spending and health outcomes are complex and often inconsistent. On life expectancy, findings diverge considerably. For instance, Akintunde et al. (2024), using ARDL on Nigerian data from 1990 to 2020, found no significant long-term relationship between OOP spending and life expectancy. In contrast, Nwachukwu et al. (2023), applying FMOLS on data from 1990 to 2022, reported that OOP spending, government health spending, and education positively influenced life expectancy. Iyakwari et al. (2023) also found a positive link between OOP spending and life expectancy, although they noted that recurrent and capital health expenditures had a negative association. These differences may reflect variations in estimation techniques, data coverage, and the treatment of control variables, which can produce contrasting results even when using the same country as a case study. Outside Nigeria, the divergence persists: Dang et al. (2024) found that OOP expenditure reduced life expectancy among female-headed households in China, pointing to the burden of healthcare costs on vulnerable groups.

Research on OOP spending and child mortality also yields mixed findings. Usman (2024), using cointegration and OLS for Nigeria between 2000 and 2020, found that higher OOP spending significantly reduced neonatal mortality. Hamzat et al. (2019) reported a similar negative effect of OOP spending on infant mortality in Nigeria. However, Okekwu (2023) found an insignificant negative effect of OOP spending on under-five mortality, highlighting instead the greater role of female literacy, immunization, and sanitation. Cross-country evidence adds to the inconsistency: Logarajan et al. (2022) found that OOP spending increased under-five mortality in Malaysia, while Kiross et al. (2020) observed no significant impact of private health spending on infant and neonatal mortality across sub-Saharan Africa. These conflicting findings suggest that contextual factors such as differences in health system structures, levels of social protection, and complementary interventions may partly explain why the effect of OOP spending on child health varies across studies.

A clearer pattern emerges in the literature on maternal mortality, where most studies link higher OOP spending to adverse outcomes. Boundioa and Thiombiano (2024) in WAEMU countries and Fofack and Sarpong (2019) in Central and Latin America both found a positive relationship between OOP spending and maternal mortality. Ai et al. (2023) in China reported a similar association. In Uganda, Atuhaire et al. (2023) showed that government health spending reduced maternal deaths, but reliance on OOP payments remained inequitable. Evidence from Nigeria generally aligns with these findings: Akintunde et al. (2024) observed that overall healthcare spending reduced maternal mortality, while Udeorah et al. (2024) emphasised that government health spending was more effective than private spending. Compared to life expectancy and child mortality, the evidence here is more consistent, underscoring the particular vulnerability of maternal health to financial barriers.

Studies have also examined the relationship between OOP spending and disease prevalence. Muhammad et al. (2023) found that OOP spending significantly increased malaria incidence in Nigeria, while Olaposi (2018) reported that it influenced HIV/AIDS prevalence. These findings reinforce concerns about the broader health risks associated with high reliance on OOP payments.

Overall, the literature shows both areas of consensus and divergence. While there is stronger agreement that OOP spending worsens maternal mortality, the evidence on life expectancy and child mortality in Nigeria remains inconsistent, partly due to methodological choices, differences in datasets, and contextual factors across studies. Moreover, much of the evidence on maternal mortality is derived from cross-country research, which may not fully capture Nigeria's specific realities. Finally, the tendency of existing studies to focus on individual indicators limits understanding of the multidimensional effects of OOP spending. This study addresses these shortcomings by providing a Nigeria-specific analysis that simultaneously considers maternal mortality, infant mortality, and life expectancy using recent time-series data, thereby offering a more comprehensive and contextually grounded perspective on the health implications of OOP expenditure.

3. METHODOLOGY

3.1. Theoretical Framework

This study draws on Grossman's Health Capital Model (1972), which treats health as both a consumption good, directly enhancing well-being, and an investment good, improving productivity (Nwankwo et al., 2025; Joseph & Agada, 2024). The model posits that individuals are born with a health stock that naturally declines over time, requiring investments like medical care and good nutrition to maintain it. In Nigeria, where out-of-pocket expenditure (OOPE) dominates healthcare financing, high costs limit such investments, accelerating health

deterioration. Health contributes to utility directly (well-being) and indirectly (productivity), but high OOPE forces trade-offs between medical care and other goods, particularly affecting low-income households. Elevated OOP costs reduce incentives to seek timely care, worsening health outcomes. Grossman's model emphasises that demand for healthcare balances expected benefits against costs, showing how financial barriers hinder effective health investment. Consequently, reducing OOP expenditure through universal health coverage (UHC) or expanded insurance schemes is vital. Such policies lower health investment costs, promote consistent care, improve long-term outcomes, and reduce disparities in the Nigerian context.

3.2. Data

In a bid to examine the impact of out-of-pocket health expenditure on health outcomes in Nigeria, this study utilized time series secondary data spanning a period from 1991 to 2023. The data on Infant Mortality Rate (*Imr*), Maternal Mortality Rate (*Mmr*), Life Expectancy at birth (*Lex*), Out of Pocket Expenditure (*Oope*), Government Health Expenditure (*Ghe*) and Government Education Expenditure (*Gex*) and Per Capital Income (*Pci*) were sourced from World Bank's World Development Indicators.

3.3. Model Specification

This study employs a unique approach by examining the effect of out-of-pocket expenditure (*Oope*) on health outcomes using three distinct models, each utilizing a different proxy for health outcomes: Maternal Mortality Rate (*Mmr*), Infant Mortality Rate (*Imr*), and Life Expectancy (*Lex*).

The models are adapted from previous research by Ai et al. (2023), Kiross et al. (2020), and Dang et al. (2024). Specifically, the model from Ai et al. (2023), which originally used industrial production, was modified to include Government Education Expenditure (*Gex*) and Per Capita Income (*Pci*). These additions are justified by Grossman's Health Capital Model (1972), which emphasises that investments in health, including those influenced by education and income, lead to better health outcomes. Higher education can improve health knowledge and behaviors, while higher income provides greater access to healthcare services.

The general functional form of the three models is given in Equation 1

$Ho = f\ (Oope, Ghe, Gex, Pci)$ ----------[1]

Equation 2 is the econometric form:

$Ho = \alpha_0 + \alpha_1\ Oope + \alpha_2 Ghe + \alpha_3 Gex + \alpha_4 Pci + \mu_1$ ---------- [2]

Where: *Ho* can be split into three – *Mmr*, *Imr* and *Lex*.

Mmr = Maternal Mortality Rate, *Imr* = Infant Mortality Rate, *Lex* = Life Expectancy, *Oope* = Out of Pocket Expenditure, *Ghe* = Government Health Expenditure, *Gex* = Government Education Expenditure, *Pci* = Per Capita Income.

The A priori are stated as follows:

$\frac{dMmr}{dOope} > 0, \frac{dGmr}{dGhe} < 0, \frac{dMmr}{dGex} < 0, \frac{dMmr}{dPci} < 0,$

$\frac{dImr}{dOope} > 0, \frac{dImr}{dGhe} < 0, \frac{dImr}{dGex} < 0, \frac{dImr}{dPci} < 0,$

$\frac{dLex}{dOope} < 0, \frac{dLex}{dGhe} > 0, \frac{dLex}{dGex} > 0, \frac{dLex}{dPci} > 0,$

Table 1: Description of Variables and Unit of Measurement

Variables	Description and Measurement	Measurement
Maternal Mortality Rate	Number of maternal deaths during a given period	Per 100,000 live births.
Infant Mortality Rate	Number of deaths of infants during a given period.	Per 1000 people at risk each year
Life Expectancy	Average number of years that a person of a given age can expect to live.	Years
Out of Pocket Expenditure	Direct payments made by individuals to healthcare providers at the time-of-service use.	% of total health expenditure.
Government Health Expenditure	Total amount of money spent by the government on the health sector.	% of total health expenditure
Government Education Expenditure	Total amount of money spent by the government on education.	% of total government spending
Per Capita Income	Average income earned by an individual in a given period. It was measured using the real per capita income.	Annual %

Source: Authors' Compilation, 2025

3.4 Estimation Technique

To estimate the relationship between out-of-pocket expenditure and health outcomes, this study employed the Autoregressive Distributed Lag (ARDL) model, introduced by Pesaran, Shin, and Smith (2001). The ARDL model is a widely used econometric technique for estimating long-term relationships between variables in time series data. It is particularly effective when variables are integrated at different orders, such as a combination of I (0) and I (1) variables. It simultaneously estimates both short-run dynamics and long-run equilibrium relationships by including lagged values of the dependent variable as well as current and lagged values of the independent variables in the regression equation. The ARDL Bound Testing approach, developed by Pesaran et al. (2001), enables testing for the existence of a long-run relationship among variables, even when they are non-stationary or integrated at different orders, provided none are of order 2. The General form of the ARDL model is stated in Equation 3 while Equation 4 and 5 are the error correction form and long-run form respectively.

$$\Delta Ho_t = \omega_0 + \theta T + \sum_{i=1}^{m} \beta_1 \Delta Ho_{t-1} + \sum_{i=0}^{n} \beta_2 \Delta Oope_{t-1} + \sum_{i=0}^{p} \beta_3 \Delta Ghe_{t-1} + \sum_{i=0}^{q} \beta_4 \Delta Gex_{t-1} + \sum_{i=0}^{r} \beta_5 \Delta Pci + \alpha_1 Ho_{t-1} + \alpha_2 Oope_{t-1} + \alpha_3 Ghe_{t-1} + \alpha_4 Gex_{t-1} + \alpha_5 Pci_{t-1} + \varepsilon_t \quad [3]$$

$$\Delta Ho_t = \omega_0 + \theta T + \sum_{i=1}^{m} \beta_1 \Delta Ho_{t-1} + \sum_{i=0}^{n} \beta_2 \Delta Oope_{t-1} + \sum_{i=0}^{p} \beta_3 \Delta Ghe_{t-1} + \sum_{i=0}^{q} \beta_4 \Delta Gex_{t-1} + \sum_{i=0}^{r} \beta_5 \Delta Pci + \varphi Ect + \varepsilon_t \quad [4]$$

$$\Delta Ho_t = \alpha_1 Ho_{t-1} + \alpha_2 Oope_{t-1} + \alpha_3 Ghe_{t-1} + \alpha_4 Gex_{t-1} + \alpha_5 Pci_{t-1} + \varepsilon_t \quad [5]$$

Where:

Ho: Any of the health outcomes variables – Maternal Mortality Rate, Infant Mortality Rate and Life Expectancy. $\alpha_1 - \alpha_5$ are the long-run coefficients while β_1 to β_4 are the short-run coefficients, φ represent the coefficient of the error correction term showing the speed of adjustment from short-run disequilibrium to long-run equilibrium. Δ is the difference operator.

3.5 Diagnostic Tests

To ensure the reliability and validity of the estimated ARDL model, a series of diagnostic tests were considered. The Breusch–Godfrey LM test was employed to examine the presence of serial correlation, while the Breusch–Pagan–Godfrey test was used to check for heteroskedasticity in the error terms. The Jarque–Bera test was applied to assess whether the residuals follow a normal distribution, and the Ramsey RESET test was utilized to verify the correctness of the functional specification of the model. Concerns about multicollinearity were addressed by carefully selecting variables based on theoretical and empirical justification, supported by correlation analysis to avoid highly correlated regressors.

4. PRESENTATION AND ANALYSIS OF RESULT

4.1 Preliminary Analysis

Table 2: Descriptive Statistics

	Mmr	*Imr*	*Lex*	*Oope*	*Ghe*	*Gex*	*Pci*
Mean	1127.71	95.39	49.33	64.48	14.96	7.65	1.58
Median	1122.5	90.85	49.88	70.93	14.7	8.03	1.5
Maximum	1328	124.4	52.91	79.38	26.89	12.56	12.28
Minimum	822	66.5	45.49	35.73	3.22	0.55	-4.51
Std. Dev.	105.35	19.38	2.75	13	5.5	2.33	3.74
Jarque-Bera	3.62	3.1	3.63	4.68	0.14	5.5	1.97
Probability	0.16	0.21	0.16	0.1	0.93	0.06	0.37

Sources: Authors' Computation, 2025

Between 1990 and 2023, Nigeria experienced persistently poor health outcomes amid a healthcare financing structure heavily reliant on out-of-pocket payments. The maternal mortality rate (*Mmr*) averaged 1,127 deaths per 100,000 live births. Similarly, the infant mortality rate (*Imr*) remained troubling, with a mean of 95 deaths per 1,000 live births. Life expectancy at birth (*Lex*) averaged just 49.33 years which is remarkably low. The financial structure of health funding highlights the burden placed on individuals: *Oope* averaged 64.48% of total health spending, suggesting that households bore the bulk of healthcare costs. Government health expenditure (*Ghe*) averaging only 14.96% of the total health expenditure indicate a lack of sustained commitment to health system strengthening.

Table 3: Correlation Matrix

	Mmr	*Imr*	*Lex*	*Oope*	*Ghe*	*Gex*	*Pci*
Mmr	1.00						
Imr	0.82	1.00					
Lex	-0.74	-0.99	1.00				
Oope	-0.84	-0.94	0.91	1.00			
Ghe	-0.39	-0.26	0.22	0.47	1.00		
Gex	-0.03	-0.07	0.08	0.22	0.41	1.00	
Pci	-0.12	-0.01	0.00	0.11	0.37	0.10	1.00

Source: Authors' Compilation, 2025

The correlation matrix shows strong positive correlations between maternal mortality rate (*Mmr*) and infant mortality *(Imr)* (0.82), and a strong negative correlation between *Mmr* and life expectancy (*Lex*) (-0.74), confirming that higher maternal deaths are associated with higher infant deaths and lower life expectancy. *Mmr* is also strongly and negatively correlated with out-of-pocket expenditure (*Oope*) (-0.84), suggesting that higher *Oope* is linked with lower maternal mortality. *Oope* correlates positively with *Lex* (0.91) and negatively with *Inf* (-0.94), again hinting that private spending plays a major role in health outcomes in Nigeria. Government health expenditure (*Ghe*) and education spending (*Gex*) show weak correlations with MMR and INF, suggesting limited direct impact. Per capita income (*Pci*) has weak or negligible correlations with all health indicators, highlighting that income growth alone did not strongly influence health outcomes during the period. Since none of the explanatory variables are highly or perfectly correlated, the model shows no evidence of multicollinearity.

4.2 Pre-Estimation Tests

Table 4: Unit Root Tests

Variables	Augmented Dickey Fuller			Phillips Perron		
	Levels @ 5%	First Difference @ 5%	I(n)	Levels @ 5%	First Difference @ 5	I(n)
Mmr	0.1756	-3.4575***	I (1)	-0.1950	-3.2424**	I (1)
	(0.9666)	(0.0050)		(0.9296)	(0.0461)	
Imr	-1.7167	-4.7285***	I (1	-0.2727	-4.9562**	I (1
	(0.4126)	(0.0007)		(0.9186)	(0.0370)	
Lex	-1.7807	-3.6841**	I (1	-0.6188	-3.6841**	I (1
	(0.3829)	(0.0478)		(0.8530)	(0.0278)	
Oope	-2.2662	-5.8352***	I (1)	-3.5033**	-	I (0)
	(0.1883)	(0.0000)		(0.0142)		
Ghe	-2.2585	-5.1304***	I (1)	-2.2382	-5.8301***	I (1)
	(0.1908)	(0.0002)		(0.1973)	(0.0000)	
Gex	-3.4378**	-	I (0)	-3.3983**	-	I (0)
	(0.0166)			(0.0183)		
Pci	-3.8233***	-	I (0)	-3.9483***	-	I (0)
	(0.0064)			(0.0047)		

p-values in parenthesis
Source: Authors' Computation, 2025

The results of the unit root tests using both the Augmented Dickey-Fuller (ADF) and Phillips-Perron (PP) approaches reveal a mix of integration orders. According to the ADF test, *Mmr*, *Imr*, *Lex*, *Oope* and *Ghe* are not stationary at level but are stationary at first difference, indicating they are integrated of order one, I (1). *Gex* and *Pci* however are stationary at level under the ADF test, suggesting they are I (0). From the Phillips Perron statistics, both *Gex and Pci* and *Oope* are stationary at level confirming they are I (0). However, *Mmr, Imr, Lex and Ghe* needed to be differenced once to become stationary rendering them I (1) variables. Overall, the presence of a mix of I (0) and I (1) variables justifies the application of the ARDL modeling technique.

Table 5: ARDL Bound Test

Dependent Variables	F-Statistic	Lower Bound Critical Value @ 5%	Upper Bound Critical Value @ 5%	Decision
Mmr	4.8155	2.56	3.49	Reject H_0
Imr	3.9504	2.56	3.49	Reject H_0
Lex	5.6491	2.56	3.49	Reject H_0

Source: Authors Computation, 2025

The ARDL Bounds Test results indicate the presence of a long-run relationship in all three models. For *Mmr*, *Imr*, and *Lex* as dependent variables, the computed F-statistics (4.8155, 3.9504, and 5.6491 respectively) all exceed the upper bound critical value at the 5% significance level (3.49). Therefore, for each model, we reject the null hypothesis of no level relationship, confirming that a long-run equilibrium relationship exists between the dependent variables and their respective explanatory variables.

4.3 ARDL Model Estimation

Table 6: ARDL Short-Run and Long-Run Result

	Mmr	***Imr***	***Lex***
	Coefficients (T-Statistics)	**Coefficients (T-Statistics)**	**Coefficients (T-Statistics)**
Long-Run			
Oope	2.2204*** (3.1254)	-1.2105 (-0.2680)	-0.1720*** (-3.1694)
Ghe	-2.4043** (2.3219)	-1.8479 (-0.1702)	0.0454 (0.3115)
Gex	0.2657 (0.1366)	-1.6133** (-2.3680)	0.2021 (0.6767)
Pci	1.7872*** (3.1780)	-1.3090** (-2.8629)	-0.0901 (-0.5759)
Short-Run			
D(*Mmr* (-1))	0.6097*** (3.3646)	-	-
D(*Imr* (-1))	-	1.0982*** (33.1325)	-
D(*Lex* (-1))	-	-	0.3479 (2.2916)
D(*Oope*)	1.8901*** (2.9157)	-1.2264** (-2.4691)	-0.0022 (-0.1703)
D(*Ghe*)	-0.9407* (-1.8339)	-0.0250** (-0.5258)	-0.0083 (-0.6006)
D(*Gex*)	-0.8368 (-0.3814)	0.0029*** (0.2174)	0.0041 (0.3043)
D(*Pci*)	-1.4360** (-3.0848)	-0.0087*** (-1.0433)	-0.0244** (-2.2323)
ECM	-0.4368*** (-5.9337)	-0.4827*** (-4.7864)	-0.5166*** (-3.380)

t-statistic in parenthesis, ***, ** & * represent 1%, 5% and 10% respectively
Source: Authors' Compilation, 2025

4.4 Diagnostic Tests

Table 7: Summary of Diagnostic Tests

	Statistic	***Mmr* Model**	***Imr* Model**	***Lex* Model**
Goodness of Fit	R^2	0.71	0.77	0.7
Autocorrelation	D.W	2.14	2.09	1.96
Heteroscedasticity	Breusch-Pagan Godfrey	0.5241	0.448	0.5622
Serial Correlation	Breusch Godfrey	0.6743	0.4955	0.6019
Linearity Test	Ramsey	0.7276	0.5756	0.114
Normality	Jarque Berra	0.6751	0.8394	0.9016

Source: Authors' Computation, 2025

4.5 Discussion of Results and Policy Implications

This study examined the impact of out-of-pocket expenditure on health outcomes in Nigeria. Three variables of health outcomes – maternal mortality rate, Infant mortality rate and life expectancy were used as proxy for health outcomes. The results from the ARDL Model in Table 6 reveal significant policy implications for each of the health outcomes.

For the Maternal Mortality Rate (Mmr) model, clear patterns emerged. In the long run, a one-unit increase in OOPE leads to a significant 2.22-unit rise in Mmr at the 5% level. This demonstrates the harmful long-run effect of high OOPE on maternal healthcare, as reliance on private spending reduces access to essential skilled care during pregnancy and childbirth. In the short run, OOPE remains significant, causing a 1.89-unit increase in Mmr, reinforcing its immediate harmful effect. These findings align with Boundioa and Thiombiano (2024), Fofack and Sarpong (2019), Ai et al. (2023), and Udeorah et al. (2024). The implication is that the government must urgently expand the National Health Insurance Authority (NHIA) to cover informal sector workers and vulnerable groups, while subsidizing premiums for the poorest households. Without reducing financial barriers, Nigeria will not achieve Sustainable Development Goal 3.1 on maternal mortality.

Government health expenditure (Ghe) shows a significant long-run effect in reducing Mmr, where a one-unit increase in Ghe leads to a 2.40-unit decline at the 5% level. This finding is consistent with Boundioa and Thiombiano (2024), Udeorah et al. (2024), and Atuhaire et al. (2023), highlighting the effectiveness of public health funding. However, in the short run, Ghe has a negative but insignificant effect, possibly due to delays in disbursement, leakages, or weak program implementation. Hence, merely increasing allocations is not enough. Nigeria must adopt a structured, time-bound strategy to achieve the Abuja Declaration target of 15% of the national budget for health. This should include earmarking funds for skilled birth attendants, emergency obstetric care, and maternal health infrastructure, while also strengthening budget execution and procurement systems.

Government education expenditure (Gex) is positive but insignificant in both the short and long runs for Mmr. While education improves maternal awareness and long-term health-seeking behavior, its insignificance suggests that resources are being mismanaged or misallocated. Corruption and weak oversight mean that funds fail to translate into programs with direct maternal health benefits. The policy implication is that the Ministry of Education must strengthen accountability in resource utilization and integrate maternal and child health awareness into curricula. Without such reforms, the potential of education spending to improve maternal survival will remain unrealized.

Per capita income (Pci) has a significant positive long-run effect on Mmr, suggesting that Nigeria's economic growth has not translated into better maternal health outcomes. This reflects structural inequality, where growth benefits a minority, while poor women remain excluded from quality healthcare. In the short run, however, Pci significantly reduces Mmr, suggesting that income gains can temporarily support maternal needs. This duality highlights the counterintuitive nature of growth effects: rising incomes without equity-oriented policies may exacerbate health inequality, while short-lived gains may allow wealthier households to afford care. The policy implication is that growth alone is insufficient; equity-focused strategies such as targeted subsidies for maternal care, conditional cash transfers, and rural health investments are required to ensure that rising incomes reduce maternal deaths.

For the Infant Mortality Rate (Imr) model, OOPE has a negative but insignificant effect in the long run, indicating that household spending does not yield sustained improvements in child survival. In the short run, however, OOPE significantly reduces infant mortality by 1.23 units,

suggesting that households' emergency spending can temporarily avert infant deaths. This dual finding resonates with Okekwu (2023) and Kiross et al. (2020), and highlights the unsustainability of OOPE as a financing mechanism. The policy implication is that Nigeria must reduce reliance on household spending by expanding preventive and primary healthcare services under NHIA coverage, ensuring that infant survival is not dependent on households' ability to pay at the point of care.

Government health expenditure (Ghe) is insignificant for Imr in both the short and long runs, reflecting the inadequacy of funding, weak governance, and poor targeting of child health programs. The policy implication is that the Federal Ministry of Health and the National Primary Health Care Development Agency (NPHCDA) must design and finance specific child survival interventions such as expanded immunization, neonatal intensive care, and nutrition programs rather than spreading resources too thinly.

Government education expenditure (Gex) significantly reduces Imr in the long run, lowering it by 1.61 units at the 5% level. This supports Okekwu (2023) and Nwobia et al. (2024), who emphasise the role of maternal literacy and education in sanitation, child feeding, and health-seeking behavior. In the short run, Gex is insignificant, as educational benefits take time to materialize. The policy implication is that education investments must be protected from corruption, and intersectoral collaboration between Ministries of Education and Health should be strengthened to ensure that health literacy and child care knowledge are emphasised in curricula.

Per capita income (Pci) significantly reduces Imr in the long run, showing that income growth can enhance living standards and healthcare access. However, its short-run effect is insignificant, likely due to uneven income distribution and infrastructural gaps. The policy implication is that income growth must be paired with investments in healthcare infrastructure and poverty-targeted programs to ensure that rising incomes translate into better child health outcomes.

For Life Expectancy (Lex), OOPE has a significant long-run negative effect, where a one-unit increase reduces Lex by 0.17 units at the 1% level. This underscores the harmful effect of relying on household spending for healthcare, which undermines access to consistent care and shortens lifespans. In the short run, OOPE remains negative but insignificant. This finding is consistent with Dang et al. (2024) and contradicts some Nigerian studies (Udochukwu et al., 2023; Iyakwari et al., 2023; Akintunde et al., 2024). The policy implication is that scaling up public financing and health insurance is critical for extending life expectancy, as reliance on OOPE is unsustainable.

Government health expenditure (Ghe) and government education expenditure (Gex) are insignificant for Lex in both the short and long runs. This suggests that corruption, inefficiencies, and poor targeting dilute the potential benefits of public spending. Life expectancy also depends on broader structural determinants beyond education and health spending. The policy implication is that reforms must address governance bottlenecks, while also investing in determinants of longevity such as environmental health, clean water, and rural health infrastructure.

Per capita income (Pci) shows a counterintuitive significant negative long-run effect on Lex, indicating that rising incomes may be associated with inequality, urban stress, or environmental degradation that offset health improvements. This mixed finding highlights the complexity of Nigeria's growth path: income gains alone may not extend life expectancy unless paired with redistribution, environmental safeguards, and investments in social services. The policy

implication is that growth policies must be made inclusive, with redistributive measures and targeted investments to ensure that economic gains translate into healthier lives.

The error correction terms (Ecm) across all three models are negative and significant, confirming rapid adjustment to long-run equilibrium and the robustness of the ARDL framework. Specifically, about 44% of disequilibrium in Mmr, 48% in Imr, and 52% in Lex is corrected annually. These speeds of adjustment suggest that sustained reforms will yield visible improvements within a relatively short horizon. For policymakers, this is encouraging: scaling up NHIA coverage, strengthening maternal and child health interventions, and investing in equitable growth will not only have long-run effects but also deliver measurable short-run corrections.

The diagnostic tests results in Table 7 show that all the three models have a good fit with the explanatory variables accounting for 71%, 77% and 70% of the variations in Mmr, Imr and Lex respectively. In addition, other post estimation tests results show that the model do not suffer from econometric issues such as the serial correlation, heteroscedasticity, model misspecification and normality. Hence, the model is robust and suitable for prediction and policy.

5. CONCLUSION AND POLICY RECOMMENDATION

This study investigated the effect of out-of-pocket expenditure (OOPE) on health outcomes in Nigeria, using maternal mortality ratio, infant mortality rate, and life expectancy as proxies within an ARDL framework. The results show that OOPE has a significant negative effect on population health, highlighting the vulnerability of women and children in a system reliant on private spending. Nigeria's current health financing structure is therefore inequitable and unsustainable.

A closer look at the coefficients reveals important insights. While OOPE consistently worsens health outcomes, the effect of per capita income (PCI) is mixed: in some models PCI improves life expectancy, but in others it reduces it. This counterintuitive finding may stem from inequality, environmental stress linked to growth, or measurement issues, underscoring that rising income alone is insufficient without equitable distribution and investment in social determinants. The error correction terms suggest a meaningful speed of adjustment toward equilibrium, implying that well-designed reforms could deliver benefits in the medium term. Insignificant variables, such as government education spending, may reflect inefficiency, corruption, or weak data rather than true irrelevance, and point to institutional gaps that undermine resource effectiveness.

Policy lessons follow directly. First, government should scale up the National Health Insurance Authority (NHIA) to cover the informal sector and poor households, through subsidized premiums, stronger enforcement, and integration of community-based schemes. Second, public health spending must rise toward the Abuja Declaration target of 15%, prioritizing primary healthcare, maternal services, and skilled birth attendance. Third, progressive health financing (tax-based or income-sensitive insurance) and investment in rural infrastructure, clean water, and sanitation are required to address inequities revealed by the PCI results. Finally, safety nets such as emergency health funds and conditional cash transfers should protect vulnerable households from catastrophic expenditures.

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