# Examining the Effect of Public Health Expenditure on Infant Mortality Rates in Nigeria

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## ABSTRACT

Child mortality remains a critical public health issue worldwide, with significant implications for social and economic development. This study investigates the impact of public health expenditure on child mortality rates in Nigeria between 1990 and 2021. The study sourced data from the CBN statistical bulletin and WDI. Variables under consideration include public health expenditure, government capital expenditure, government recurrent expenditure, gross fixed capital formation, and child mortality rate. Following the stationarity tests, the ARDL Bounds Co-integration test was used to check for long-run relationship among the variables. The Auto Regressive Distributed Lag (ARDL) was employed to estimate the model. Post-estimation tests confirmed that there was no serial correlation in the model. Likewise, both the Breusch-Pagan Godfrey test and the Ramsey reset test indicated the absence of heteroscedasticity and confirmed the linear specification of the model. Findings established co-integration among the variables and revealed mixed effects of government expenditure components and gross fixed capital formation on child mortality rate. While public health expenditure and government capital expenditure exhibited contrasting effects in the short and long run, government recurrent expenditure shows a consistently positive relationship with child mortality rate. Gross fixed capital formation demonstrated significant positive short-term effects but negative long-term effects on child mortality rate. The study recommended investment in medical research and development, such as vaccines and treatments for common childhood diseases. An improvement in health sector is also imperative through enhancement of sanitation and hygiene, such as building new water and sanitation infrastructure and providing waste management services.

*Keywords: child mortality rate, under 5 mortality, economic growth, mortality rate, public health expenditure, government capital expenditure* 

## **INTRODUCTION**

**Health** is a state of individual well-being recognized as a right by the United Nations (United Nations, 2008). This implies that striving to for improvement in healthcare is an imperative for all governments at all levels. In a bid to achieve this noble objective, many developed and emerging countries have been confronted with the daunting problem of allocating resources for the improvement in healthcare (Zaman and Hossain, 2017). One of the most crucial elements in determining the quality of human capital—an element required for economic growth is health (Zhang, *et al.*, 2021). Therefore, the need for health care is derived, and it should be prioritized in both public and private sector spending plans of the economy.

The high mortality rate in West Africa, particularly with regard to children, highlights the need for increased investment in healthcare and an effective healthcare system that guarantees access to affordable healthcare. The World Health Organization (WHO) recognized the significance of the aforementioned and proposed in the 2010 World Health Assembly problems that would address health financing, ensuring high-quality and reasonably priced healthcare services (Ataguba & Akazili, 2010).

Statistical figures for general health in Africa are revealed to be significantly lower than the rest of the globe. According to the World Health Organization (WHO), children born in the WHO African area have a higher chance of dying before the end of their first year or as babies which underscores the urgent need for public and private intervention. This is further highlighted by the fact that the infant mortality rate in the WHO African area is more than six times higher (51 per 1,000 live births) than in the WHO European Region (8 per 1,000 live births) (WHO, 2019). In 2017, 75% of all fatalities among children under the age of five happened within the first year of life in Sub-Saharan Africa (WHO, 2019). Nigeria as a nation has higher percentage of child and newborn mortality (5.47%) than the average of 4.1% found in sub-Saharan Africa in 2023. Simply, the results of the Nigeria Demographic and Health Survey (NDHS) showed that 5.47 out of every 1,000 babies born in Nigeria pass away before turning one. Furthermore, it is disclosed that 115 out of every 1,000 kids pass away before turning five. The figures for poor health are likewise disturbingly high, particularly for newborn health. Nigeria is rated 11th in the world in terms of infant death (UN, 2018). In Nigeria, life expectancy figures are equally poor. Life expectancy in Nigeria is now estimated to be 56 years, which is low when compared to projections of 61 years in the WHO African Region and 78 years in the European Region (WHO, 2019).

The inadequate access to essential health facilities and resources owing to environmental and social constraints (such as rural isolation, a lack of health services in rural regions, and poverty) contributes significantly to the rise in infant mortality. Around 99% of baby deaths occur in underdeveloped nations, with infections, preterm births, problems during delivery, pre-natal asphyxia, and birth traumas accounting for 86% of these deaths (Andrews & Brouillette, 2008). Neonatal infection, diarrhoea, malaria, measles, and malnutrition are other major causes of infant death. Although factors such as a mother's education level, environmental conditions, and a country's political and healthcare infrastructure all contribute to child mortality (Genowska *et al.*, 2015), improvements in sanitation, access to clean drinking water, immunization against contagious diseases, as well as other public health measures can significantly minimize high rates of child mortality.

In 2023, the Nigerian Federal Government allocated N1.17 trillion to the health sector, following allocations of N826.9 billion in 2022 and N547 billion in 2021 (CBN, 2023). Despite these increases, the funding still falls short of the commitment made by African leaders under the Abuja Declaration. While one would expect child mortality to reduce drastically, Nigeria is still far from achieving the target. It is this line of thought that this study aims pursue. Given the significance of this argument, it will contribute to existing knowledge by empirically examining the effects of public health spending on child mortality rates in the country.

Generally, several theories have presented explanations regarding the link between government spending and social outcomes like health. Musgrave's theory of public expenditure explains that the demand for government services is generally affected by variations in the income elasticity of demand at three stages of per capita income. According to Richard Musgrave, when per capita income is low, the demand for government services is limited because income is channeled to address fundamental necessities. When per capita income rises over a certain level, the demand for public services such as security, energy, health, water, transportation, and education rises, causing public expenditure on these commodities to grow.

The theory argues that when per capita income is high, the government sector growth rate falls since most basic requirements are met in most modern nations (Danladi &Elisha, 2019). This idea is very important, but it has a significant flaw: the size of government expenditure cannot be projected in later phases. It is not always the case that the government sector participation decreases more in subsequent phases. Because the pattern of private spending alters as per capita income grows in the latter phases of industrialization, the public share may rise to meet the increased need for government services such as health, social security, education, and infrastructure. If the government share rises or falls, it will be determined by the citizens' income level and individual requirements.

On the other hand, Wagner's law of increasing state activities argues that there are intrinsic tendencies for different tiers of government (such as federal and state governments) to extend their operations both intensely and comprehensively. There was a functional link between economic development and the expansion of government operations so that the government sector grew faster than the economy. Wagner separated expenditure into two categories to support the rule of growing state activities, namely external expenditure and internal expenditure and explained why both will increase as the economy develops.

Supposedly, external expenditure grows when a government strategy shifts from basic aggression to attack prevention. It also rises when the demand for services such as healthcare in the public sector rises. Internal spending, on the other hand, rises as a result of economic development owing to increased friction between economic units and individuals, higher living standards, better access to money, the upkeep of big administrative units, and so on.

Empirical studies have explored the connection between health spending and child mortality in Nigeria. The availability of extensive literature underscores the importance of the subject matter. For instance, Adeosun and Faboya (2020) empirically examined the impact of healthcare costs on infant mortality as well as Nigeria's neonatal mortality rate. Using time series data from 1986 to 2016. The findings revealed that healthcare spending has a negative correlation with infant and neonatal mortality. Owusu, *et al.* (2021) investigated the effect of health spending on infant and maternal deaths in 177 countries from 2000 to 2015. This study accounted for the 2007-2008 financial crisis in an empirical relationship between health outcome and health expenditure using Panel Quantile Regression. The study discovered that health expenditure had a negative effect on mortality across all percentiles. Infant mortality rates fell between 0.19% and 1.45%, while maternal mortality rates fell between 0.09% and 1.91%.

In more recent studies, Eboh, *et al.* (2022) used time series data from 1980 to 2020 to examine health expenditure, child mortality, and economic growth in Nigeria. The study found that child mortality, government capital expenditure and domestic investment had a positive and significant impact on economic growth. Azuh, *et al.* (2020) investigated the impact of government health spending on under-five mortality in Nigeria. In this study, the autoregressive distribution lag technique was used to examine the long-run effect of public health expenditure on under-five mortality in Nigeria. The study's findings revealed that, while public health spending was statistically significant, it had a positive relationship with under-five mortality.

Furthermore, Oluwaseun (2020) investigated the relationship between Public Health Expenditure and Infant Mortality Rate in Nigeria using time series data from 1991 to 2018. Public health spending, infant mortality rate, female literacy, Diphtheria, Pertussis, and Tetanus were the variables involved in the study. The Fully Modified Ordinary Least Square (FMOLS) analytical method was used to estimate the model. Findings showed that except for Diphtheria, Pertussis, and Tetanus (DPT) immunization and female literacy rate, all variables used positively impacted INFM.

In another study, Nyamuranga & Shin (2019) examined the impact of public health expenditures on child mortality in the Southern African Development Community (SADC) region to the developing world as a whole and the Sub-Saharan African region (SSA). This study used panel data extracted from the World Development Indicators database for 98 developing countries, including 15 SADC countries, from 2000 to 2013. The findings showed that public health expenditure has a statistically significant effect on lowering infant and under-five mortality rates in the developing world, with the SADC having the greatest effect. Immunization and female literacy have significantly contributed to the prevention of infant and child mortality in developing countries. Improved water sources and a reduction in HIV prevalence were found to be effective in reducing childhood mortality in the SSA region.

Prior to the covid-19 pandemic, David (2018) used the Autoregressive Distributed Lag (ARDL) bounds testing approach to co-integration and the Granger causality technique to investigate the nature of the relationship between infant mortality and public health expenditure in Nigeria from 1980 to 2016. The empirical findings showed a significant con- integrating (long-run) relationship between infant mortality and government health expenditure (as well as private health expenditure, immunization, and external health resources), as well as a bi-directional causal relationship between infant mortality and government health expenditure.

Attamah (2018) also conducted a similar study and argued that government spending on health has a long-term positive and significant impact on infant mortality in Nigeria. Oyedele (2017) investigated the impact of health-care expenditure on child mortality in West Africa. The findings showed that health-care expenditure had no effect on infant mortality or under-five mortality. There was only one exception in the case of under-five mortality when private health expenditure was found to have a positive effect when health expenditure is assumed to be exogenous.

Barenberg et al. (2017) examined the impact of public health expenditure on infant mortality rate (IMR) using a panel data set of Indian states between 1983-1984 and 2011-2012, after controlling for other relevant covariates such as political competition, per capita income, female literacy, and urbanization. Panel data analysis was employed in the study. Findings revealed that government spending on health care lowered the IMR. The baseline specification indicates that increasing public health spending by 1% of state-level GDP is associated with a reduction in the IMR of about nine infant deaths per 1000 live births. Political competition, female literacy, and urbanization all reduce the IMR.

Also, Wambugu et al. (2015) investigated the effect of health expenditure on child

health in Sub-Saharan Africa using governance perspective. The findings show that increasing public health spending relative to private health spending resulted in a decrease in under-five mortality rates in SSA. The effectiveness of public health expenditure on reducing under-five mortality was evident when corruption was controlled. Furthermore, regional variations in the effectiveness of health expenditure on under-five mortality were discovered. Reduced corruption in SSA countries is likely to benefit the effectiveness of health expenditure on child health outcomes.

There have been several existing literature on the topical issue that public health expenditure affects child mortality in Nigeria. Bashir (2016), for example, examined the impact of government spending on infrastructure on the performance of the Nigerian health sector from 2000 to 2013. The study discovered a strong and significant inverse relationship between government health expenditure and infant mortality, and a weak positive relationship between public health spending and life expectancy. Also, Ude and Ekesiobi (2014) used multiple regression analysis to empirically analyze the effect of per capita health expenditure on child mortality proxy by infant, under-5, and neonatal mortality rates. The study found an inverse relationship between per capita health expenditure and child mortalities, indicating a decline in child mortalities as per capita income and per capita health expenditure increase.

#### **METHODS**

This study investigates the impact of public health expenditure on infant mortality rates in Nigeria, grounded in the Musgrave Theory of Public Expenditure. The Musgrave Theory posits that public expenditure serves three main functions: allocation, distribution, and stabilization. The allocation function is particularly pertinent as it focuses on the efficient provision of public goods and services, such as healthcare, which is crucial for improving population health outcomes.

The Musgrave Theory suggests that efficient and targeted public health expenditure (PHE) is essential for improving health outcomes. In this study, we hypothesized that:

- PHE has a direct negative effect on CMR (Child Mortality Rate). Higher PHE leads to better healthcare services and accessibility, thus reducing child mortality rates.
- GOVCEX (Government Recurrent Expenditure) and GOVREX (Government Capital Expenditure) positively contribute to healthcare infrastructure and service quality, which in turn, lowers CMR.
- GFCF (Gross Fixed Capital Formation) indirectly affects CMR by enhancing overall economic conditions and infrastructure, facilitating better healthcare delivery.

This theoretical framework sets the stage for empirically examining the relationships between public health expenditure and infant mortality rates in Nigeria, guided by the principles of the Musgrave theory of public expenditure. These are dealt with in the model specification below.

This research made use of secondary data sourced from the Central Bank of Nigeria Statistical Bulletin (2021) and World Development Indicator (WDI, 2021), covering a period of 32 years (1990 – 2021). The variables examined in this study are public health expenditure, government capital expenditure, government recurrent expenditure, gross fixed capital formation and per capita income as independent variables and child mortality rate as dependent variable.

The model adapted is from Eboh, *et al.* (2022) with minor adjustment by including income per capita in the model to meet the present needs of this study.

Thus, the model in this study is developed in its functional form as:

IMR = f (PHE, GOVCEX, GOVREX, GFCF, PCI) (1)

Econometrically, we rewrite the model based on the above functional relation as:

$$=\beta_1 LNPHE_t + \beta_2 LNGOVCEX_t + \beta_3 LNGOVREX_t + \beta_4 LNGFCF_t + \beta_5 PCI_t + \mu_t (2)$$

Where: CMR = Child Mortality Rate, PHE = Public Health Expenditure, GOVCEX = Government Capital Expenditure, GOVREX = Government Recurrent Expenditure, GFCF = Gross Fixed Capital Formation, PCI = Per Capita Income, LN = Represents natural log,  $\beta_0$  = Intercept,  $\beta_1$ ,  $\beta_2$ ,  $\beta_3$ ,  $\beta_4$  and  $\beta_5$  = Slope coefficients of each respective independent variable,  $\mu$  = Stochastic error term and t = Time trend.

The autoregressive distributed lag model is expressed thus:

Where:  $\beta_1 = \text{coefficient}$  of infant mortality rate,  $\beta_2 - \beta_6 = \text{coefficients}$  of the independent variables,  $\delta_1 = \text{short-run coefficient}$  of infant mortality rate,  $\delta_2 - \delta_6 = \text{short-run coefficients}$  of the independent variables, o, p, q, r and s = lag orders of the variables,  $\Delta$  = changes in the short run,  $\mu = \text{Error term}$ , ln = natural log, t = time period and t – 1 = time period of the previous year. The rest of the parameters are as defined above.

## FINDINGS

This section presents the empirical analysis on the relationship between Public

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Health Expenditure and Child Mortality Rate, however, prior to the estimation, preliminary tests were conducted using the Augmented Dickey Fuller unit root test and the Phillip Peron unit root test. The result of the unit root tests is presented in Tables 1 and 2.

Test Critical values					
Variable	ADF t-Statistic	(at 5%)	Prob.	Order of integration	
LNCMR*	-4.2673	-2.9862	0.0028	l (0)	
LNPHE*	-4.2354	-2.9981	0.0034	l (0)	
LNGOVCEX*	-6.4373	-2.9678	0.0000	l (1)	
LNGOVREX*	-7.5596	-2.9678	0.0000	l (1)	
LNGFCF*	-3.6117	-2.9678	0.0118	l (1)	
LNPCI*	-3.8252	-2.9639	0.0068	l (1)	

 Table 1: Augmented Dickey Fuller unit root test results

Source: Authors' computation, 2024

Test Critical values					
Variable	ADF t-Statistic	(at 5%)	Prob.	Order of integration	
LNCMR*	-3.6903	-2.9639	0.0344	l (0)	
LNPHE*	-11.007	-2.9678	0.0000	l (1)	
LNGOVCEX*	-6.3799	-2.9678	0.0000	l (1)	
LNGOVREX*	-4.6627	-2.9639	0.0000	l (0)	
LNGFCF*	-3.5431	-2.9678	0.0138	l (1)	
LNPCI*	-3.8252	-2.9639	0.0068	l (1)	

#### **Table 2: PP-Unit Root Test Results**

Note: \* denotes stationarity at intercept; \*\* denotes stationarity at intercept and trend stationary at 5% critical level. Source: Authors' computation, 2024

Following the ADF unit root test at 5% level of significance, it was observed that all the variables were stationary at first difference except Child Mortality Rate (CMR) and Public Health Expenditure (PHE) which were stationary at levels I. Using the Phillips-Perron unit root rest at 5% level of significance, Child Mortality Rate (CMR) and Government Recurrent Expenditure (GOVREX) were stationary at levels while the other variables were stationary at first difference. As a result of the unit root tests, the variables have a mixed order of integration. Thus, the Auto-Regressive Distribution Lag (ARDL) bounds co-integration test was used to check if the variables have a long-run relationship.

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Model F-statistics		atistics	
LNCMR = f (LNPHE, LNGOVCEX, LNGOV- REX, LNGFCF, LNPCI)	5.074184		
	k=4		
Critical value	Lower bound	Upper bound	
10%	2.2	3.09	
5%	2.56	3.49	
2.50%	2.88	3.87	
1%	3.29	4.37	

#### Table 3: Bounds test result

Source: Authors' Computation, 2024

From the Bounds co-integration test in Table 3, the F-Statistics value of 5.074184 is greater than the lower critical value at the 5% level of significance but less than the upper critical values at the 5% level of significance. This implies that there is a long-run relationship between the variables; that is long-run causality runs across government health spending and child mortality in Nigeria. Thus, the long-run and short-run ARDL relationship were estimated and presented in Tables 4 and 5.

Table 4: Short-run ARDL estimates
Dependent Variable: LNCMR

Variable	Coefficient	t-statistic	Std. error	Prob.
D(LNPHE)	-0.0111	0.0101	-1.0968	0.2943
D(LNGOVCEX)	0.0004	0.0086	0.0512	0.9601
D(LNGOVREX)	0.0003	0.0216	0.0129	0.9899
D(LNGFCF)	0.0793	0.0206	3.8582	0.0023
D(PCI)	0.0355	0.0285	1.2461	0.0068
CointEq(-1)*	-0.0835	0.0127	6.5674	0.0000
Adjusted R-Squared = 0.	.7331			

Source: Authors' Computation, 2024

As shown on table 4, it is observed that the log of public health expenditure had a negative effect on log of child mortality rate in the short-run, with an elasticity of -0.0111. Therefore, a one percent increase in the log of public health expenditure will cause a 1.11% decrease in the log of child mortality rate. That is as government spends more on public health, more health infrastructure will drive the implication of reducing child mortality. The result however, is not statistically significant at 5% level of significance. The log of government capital expenditure had a positive effect on the log of child mortality rate in the short-run, with a short-run elasticity of 0.0004. Therefore, a one percent increase in the log of government capital expenditure will cause a 0.04% increase in child mortality rate. This result fails to conform with theoretical idealization; this may be owing to the fact that other factors other than capital health expenditure have stronger impact on child mortality in Nigeria. The result is also not statistically significant at 5% level of significance.

It is also observed that the log of government recurrent expenditure had a positive effect on the log of child mortality rate in the short-run, with an elasticity of 0.0003. Therefore, a one percent increase in the log of government recurrent expenditure will cause a 0.03% increase in the log of child mortality rate. The result, however, is not statistically significant at a 5% level of significance. Again, the log of gross fixed capital formation had a positive effect on the log of child mortality rate in the short-run, with an elasticity of 0.0793. Therefore, a one percent increase in the log of gross fixed capital formation will cause a 7.93% increase in the log of child mortality rate. The result is statistically significant at 5% level of significance. Further, a one percent increase in the log of per capita income will cause a 3.534% increase in the log of child mortality rate in the short run. The result is statistically significant at 5% level of significant at

The error correction term has a coefficient of -0.0835. It is negative, less than one and statistically significant. It represents how quickly deviations from a long-term equilibrium in the model are corrected in the short run. The ECT of -0.08 means that approximately 8% of any deviation from the long-term equilibrium is corrected within one period. The adjusted R-squared is used to evaluate the explanatory power of the model. The Adjusted R-squared is 0.7331. This means that about 73.3% of the total variations in the child mortality rate are explained by the regressors; government capital and recurrent spending, income level per capita and gross fixed capital formation Therefore, the model proves to be a good fit and has a high explanatory power in explaining the variations in the dependent variable.

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LNPHE	0.1507	0.4962	0.3038	0.7665
LNGOVCEX	-0.0739	0.3249	-0.2277	0.8237
LNGOVREX	0.3446	1.3218	0.2607	0.7987
LNGFCF	-0.765	2.0469	-0.3738	0.7151
LNPCI	0.0355	0.0285	1.2461	0.0068

## Table 5: Long-Run ARDL estimates Dependent Variable: LNCMR

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Variable	Coefficient	Std. Error	t-Statistic	Prob.
С	9.1011	8.7345	1.0419	0.3180

Source: Authors' Computation, 2024

LNCMR<sub>t</sub> = 9.1011 + 0.1507LNPHE-0.0739LNGOVCEX + 0.3446LNGOVREX-0.7651LNGFCF+0.0354LNPCI+ μi......(5)

From table 5 above, the log of public health expenditure had a positive effect on log of child mortality rate in the long-run, with an elasticity of 0.1507. Therefore, a one percent increase in log of public health expenditure will cause a 15.07% increase in log of child mortality rate. This implies that public expenditure on health does not in fact reduce child mortality in the long run. Several possible factors may account for this such as mismanagement of such public funds and poor allocation of budgets. Secondly, the log of government capital expenditure had a negative effect on log of child mortality rate in the long-run, with an elasticity of -0.0739 meaning that one percent increase in log of government capital expenditure will cause a 7.40% decrease in log of child mortality rate.

As shown on Table 5, the log of government recurrent expenditure had a positive effect on log of child mortality rate in the long-run, with an elasticity of 0.3445. Therefore, a one percent increase in log Ofin government recurrent expenditure will cause a 34.46% increase in log of child mortality rate. The log of gross fixed capital formation had a negative effect on the log of child mortality rate in the long-run, with an elasticity of -0.7651. a one percent increase in the log of gross fixed capital formation will cause an 76.51% decrease in log of child mortality rate. The result is however, not statistically significant at 5% level of significance. Lastly, the log of per capita income had a positive effect on the log of child mortality rate in the long run, with an elasticity of 0.0354. This result was statistically significant implying that as income per head increases, there exists a higher risk of child mortality. Plausibly, the skewed income distribution in Nigeria backs this result. The constant of the regression model had a coefficient of 9.101148. Its p-value of 0.3180 > 0.05 means that the constant was not significant at the 5% level of significance.

The results showed that public health expenditure had a negative effect on child mortality rate in the short-run but a positive effect in the long-run. Therefore, the increase in public health expenditure in the economy leads to a decrease in the child mortality rate in the short-run, while the increase in public health expenditure in the economy leads to an increase in the child mortality rate in the long-run. However, it was statistically insignificant in both the short-run and long-run. Thus, increasing public spending on the health sector has not significantly improved or reduced the performance of the child mortality rate in the economy if processes are not put in place to ensure that those spending are not plundered and are actually used for their intended purposes. This finding is similar to the work of Adeosun and Faboya (2020) who found that public health expenditure possesses a negative relationship with child mortality.

Secondly, the results showed that government capital expenditure had a positive effect on child mortality rate in the short-run but a negative effect in the long-run. However, it was statistically insignificant in both the short-run and long-run. Thus, increasing spending on the development of equipment, machinery, buildings and health facilities has not significantly improved or reduced the performance of the child mortality rate in the economy. This finding is contrary to the work of Eboh, *et al.* (2022) who found that government capital expenditure has a significant relationship with child mortality. The positive effect in the short run suggests that increases in government capital expenditure (such as spending on equipment, machinery, buildings, and health facilities) might initially correlate with higher child mortality rates. This could be due to disruptions or inefficiencies in the initial phases of project implementation. However, the negative effect in the long-run indicates that, over time, these expenditures are intended to reduce child mortality rates, even though this effect is not statistically significant.

Further, the results showed that government recurrent expenditure had a positive effect on child mortality rate in both the short- and long-run. Thus, increasing the spending on public goods and services, wages and salaries, interest payments, subsidies and transfers has not significantly improved or reduced the performance of the child mortality rate in the economy. This finding is contrary to the work of Eboh, *et al.* (2022) who found that government recurrent expenditure has a negative and significant relationship with child mortality.

Also, the results showed that gross fixed capital formation had a positive effect on child mortality rate in the short-run but a negative effect in the long-run. Therefore, the increase in gross fixed capital formation in the economy leads to an increase in the child mortality rate in the short-run, while the increase in gross fixed capital formation in the economy leads to a decrease in the child mortality rate in the long-run. However, it was only statistically significant in the short-run. This finding is in line to the work of Oyedele (2017) who found that gross fixed capital formation has a positive and significant relationship with child mortality.

## **Post-Estimation tests**

The results of the post estimation tests performed in this study are presented in table 7.

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Tests	F-statistic	Prob.	Result
Serial correlation test: Breusch-Godfrey Serial Correlation LM Test	1.9017	0.1998	No serial correlation
Normality test: Jarcque-Bera Test	0.0243	0.9879	There is normality
Ramsey RESET Linearity Test	0.9614	0.3570	The model is correctly specified
Heteroskedasticity Test: ARCH-LM	0.0027	0.9587	No heteroscedasticity

 Table 7:
 Post-Estimation test results

Source: Authors' Computation, 2024

Table 7 presents the diagnostic test outcomes for the model. It is observed that the Breusch-Godfrey test has a p-value of 0.1998, indicating no serial correlation since it exceeds the statistical threshold of 0.05. Likewise, both the Breusch-Pagan Godfrey test and the Ramsey reset test indicated the absence of heteroscedasticity and confirmed the linear specification of the model. Furthermore, the Jarque-Bera Normality Test affirmed that the error term in the model follows a normal distribution.

### DISCUSSION

The analysis of public health expenditure reveals an unexpected long-run positive relationship with child mortality, with an elasticity of 0.1507. This suggests that a 1% increase in public health expenditure is associated with a 15.07% increase in child mortality. Such counterintuitive results may be attributed to factors like mismanagement of public funds, corruption, and ineffective allocation of health budgets. This implies that merely increasing the budget for health care without addressing systemic issues in fund utilization and allocation does not lead to improve health outcomes. This finding aligns with previous studies like Adeosun and Faboya (2020), which also observed that public health expenditure does not necessarily reduce child mortality unless there are efficient mechanisms to ensure proper use of funds.

On the other hand, government capital expenditure exhibits a negative relationship with child mortality in the long run, with an elasticity of -0.0739. This indicates that a 1% increase in capital expenditure results in a 7.40% decrease in child mortality, although this relationship is statistically insignificant. In the short run, however, capital expenditure has a positive effect on child mortality. This initial positive effect might be due to the temporary disruptions and inefficiencies during the implementation phase of health projects. Over time, as the infrastructure and health facilities become operational and effective, the long-run negative effect suggests that such investments could potentially lower child mortality rates, provided they are well-managed and efficiently executed, contrary to the findings of Eboh et al. (2022). Government recurrent expenditure and gross fixed capital formation present complex dynamics. Recurrent expenditure, with an elasticity of 0.3445, consistently increases child mortality in both the short and long run, likely due to inefficiencies in recurring expenditures such as salaries, subsidies, and operational costs. These results emphasize the need for careful planning and oversight of both types of expenditures to ensure they contribute positively to health outcomes.

## CONCLUSION

Reducing child mortality is not only a moral imperative but also essential for fostering sustainable development, as it directly affects the health, productivity, and economic stability of a nation. Observably, addressing child mortality requires more than just increased spending; it necessitates a comprehensive strategy that includes efficient allocation of resources, improved healthcare delivery systems and addressing broader socio-economic determinants of health. The study thus investigated the relationship between health spending and under five mortalities in Nigeria. The findings suggested that public health expenditure, government capital expenditure, and government recurrent expenditure had statistically insignificant impacts on child mortality in Nigeria. This insignificance may be attributed to insufficient allocation of funds or diversion of resources, which fail to effectively reduce child mortality rates in Nigeria.

Interestingly, public health expenditure exhibited a negative impact in the shortrun but became positive in the long-run, while government capital expenditure showed a positive effect in the short term but turned negative in the long term. Conversely, government recurrent expenditure remained consistently positive in both the short and long run. This underscores the need for more targeted and effective allocation of resources to address the persistent issue of child mortality. Also, the varying short-term and longterm effects of different types of government expenditure highlighted the importance of comprehensive and sustainable healthcare policies and investments to improve child health outcomes in Nigeria.

Based on findings of the study, the study recommends the following: There is a need for the government to strengthen policies that will improve Nigeria's health sector. This will help to reduce the rate of child mortality in the economy. For instance, the government can use public health expenditure to increase vaccination coverage for children by providing free vaccines, improving vaccine distribution systems, and increasing awareness about the importance of vaccination.

More funds should be invested in medical research and development, such as developing new vaccines and treatments for childhood diseases. This can help reduce the incidence of childhood illnesses and improve health outcomes.

There is an urgent need for government to increase public health campaigns that promote healthy behaviours and lifestyles, such as proper nutrition and exercise. This can help reduce the incidence of childhood illnesses and improve overall health outcomes. Another way is to invest in the health sector by improving sanitation and hygiene, such as building new water and sanitation infrastructure, providing waste management services, and promoting handwashing. This may aid in lowering the prevalence of illnesses that may be especially dangerous to children.

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