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Impact of Government Health Expenditure on Under-Five Child Mortality in Nigeria: Error Correction Model

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Abstract
The study examined the impact of health government expenditure on under-five child mortality in Nigeria. The specific objectives are to: determine the impact of health government expenditure on under-five child mortality in Nigeria; ascertain whether there is long-run relationship between health government expenditure and under-five child mortality in Nigeria and identify direction of causality relationship between health government expenditure and under-five child mortality in Nigeria. This study made use of ex post-facto research design. The pre-estimation and post-estimation tests were descriptive statistics, correlation matrix, ADF-Fisher Unit Root test statistic, Johansen co-integration test, Ramsey Reset test, Breuch-Godfrey Serial Correlation LM Test respectively while the data analytical technique was error correction model technique. These variables of the study consist of under-five child mortality (CHILDMOR); government health expenditure (GHEXP), recurrent health expenditure (RHEXP), capital health expenditure (CHEXP), domestic private health expenditure (DPHEXP), and adult literacy rate (15 and above) (ADULT) for a period of 1986 to 2022 as defined in our model specification. The empirical results show that health government expenditure has positive and significant impact under-five child mortality because probability value of 0.0016 which is less than 0.05; The trace statistics of Johansen co-integration test identify that there are four (4) co-integrating equation(s) at the 5 percent level of significance. Thus, there is a long-run relationship among the variables and there is non-directional relationship between government health expenditure and under-five child mortality while there is bi-directional relationship between adult literacy rate and under-five child mortality. Again, there is no causal relationship among recurrent health expenditure, capital health expenditure, domestic private health expenditure and under-five child mortality. The study recommends that Nigeria government should improve allocation and release of funds to the health sector and monitor same to ensure effective utilization of such fund. This will help to see that such monies are actually channeled into socially desirable targets that can improve the economy.

Keywords: Government Health Expenditure, Under-five Child Mortality, Adult Literacy rate

Background of the Study

The aim of every successive Government in Nigeria as far as public spending on health is concerned is to achieve a desired health outcomes on infant mortality, maternal health, increased life expectancy, curtain the spread of diseases and reduction in the level of morbidity. It is difficult to conclude that there is a match between what is being spent on health and the outcomes that are recorded in the sector. The provision of health care is a key element in the promotion of abroad-based economic growth. Every country devotes huge public fund to health care provision believing that this will improve the health of the citizenry so that they can contribute meaningfully to economic growth and development. While increase in budgetary allocation to social services is highly desirable in a developing country like Nigeria, this is not sufficient to guarantee improvement in service delivery. In Nigeria, for example, despite the huge government expenditure on health provision, the health status of Nigerians is consistently ranked low (Ayomide, Chanimbe & Uchechi, 2022) [1].

Therefore, the level of government expenditure on health determines the level of human capital development, which leads to a productive investment in other sectors of the economy (Muhammad & Khan, 2017) [7]. Childhood immunization, maternal mortality and HIV/AIDS life-saving-anti-retroviral drugs are regarded as some of the most effective public-health interventions in modern history. However, recent statistics regarding Nigeria's health status are disturbing. Average life expectancy at 54 years is below the global average, maternal mortality is 608 per 100,000 live births, twice as high as South Africa's 300 per 100,000 live births and almost 10 times Egypt's 66 per 100,000 live births. Besides, only 3% of HIV-positive mothers receive anti-retroviral treatment (NHIS, 2017) [10].

Health spending as a proportion of the federal government expenditures shrinks from an average of 3.5% in the 1970s to less than 2% in the 1980s and 1990s, but in 2016, general government expenditure on health as a share of current health expenditure for Nigeria was 13%, and consistently less than 15% recommendation of 2000 Abuja Declaration (Olayiwola, Oloruntuyi and Abiodun, 2017; FMOH, 2016) [14, 5]. According to Omeruan et.al (2019) [16], one of the major challenges of Nigeria healthcare system has been un-planned consequences of social policy. Consequently, health services in Nigeria have suffered from decades of neglect, causing harm to the Nigeria health status and national productivity. Nigeria still has one of the highest infant mortality rates and low life expectancy when compared with other developing countries. In addition, there is significant inequality in the distribution of financial and human resources in the health sector. Still, Nigeria's spending in the health sector is lower than 15% of gross domestic product (GDP) (WDI, 2017). Even the significant growth in income per capita over the past few years has had less impact on health spending and health outcomes in Nigeria. Therefore, if public spending is important in improving the healthcare of the citizens, then it is essential to evaluate the impact of government spending on the health status of the Nigerian public. Given this background, this study assesses the impact of government health spending on the health outcomes in Nigeria, using infant mortality rates as health outcomes.

Statement of the Problem

In order to curtail health challenges in Nigeria in particular and Africa in general, African Heads of State met on 27th April, 2001 and signed a declaration to spend at least 15 per cent of their annual budget on health sector. Despite this declaration, the federal government allocation to the health sector is still far below the minimum bench mark recommended by Abuja Declaration. Oluwatoyin, Folasade and Fagbeminiyi (2015) [15] posited that the health capital expenditure of government stood at N3.4billion in 1986 and increased to N4.9b in 1994 and further rose to N9.2b in 1996 and increased further to N27.9b in the year 2000. In 2010, it rose to N151.2b but declined sharply to N97.4b in 2012. In 2019 capital expenditure on health fell to N51.7b and in 2020, the figure dropped to N44.5b.Similarly, the recurrent expenditure also increased substantially from N3.3b in 1986 to N3.02b in 1990 and rose from N40.6b in 2000 to N99.5b in 2010 and in 2014 it rose to N195.9b. However, in 2019 and 2020 it declined to N41.3b and N40.6b respectively. The sharp decline in the allocations to health sector could be attributed to the decline in federal government revenue following the downward swing in the crude oil prices coupled with the outbreak of COVID-19 Pandemic.

Generally speaking, federal government financial allocation to the health care services in Nigeria is not encouraging compared to other African countries such as Bostwana, Rwanda, Zambia, Togo, Ghana, Mali, Malawi, Burkina Faso, Ethiopia, Kenya and Mozambique that spend over 15 percent of their annual total budget on health sector, Nigeria spends less than 7 per cent on the average compared to other African countries. For example, in 1990, percentage allocation to health sector was 4.5 and rose to 7.3 per cent in 2014, 6.85 per cent in 2015, 5.83 per cent in 2016, 5.11 per cent in 2017,5.79 per cent in 2018, 4.22 per cent in 2019 and 4.38 per cent in 2020 respectively (WDI. 2020).

The worry of this study is that, despite the fact that Nigeria is richly endowed with abundant human and material resources which if fully harnessed will transform the country into a fastest growing economy. It is disturbing to note that the world over, Nigeria is one of the countries having the highest infant mortality rate (WDI. 2020). In 2020, infant mortality rate in Nigeria stood at 59.7 per cent as against 32.7 in Ghana, 41.8 per cent in Zambia, 42.3 per cent in Togo, 43.5 per cent in Angola while Cameroon and Kenya had 56.8 and 32.9 per cent respectively. In Nigeria, infant mortality rate is so high because health sector has not been accorded adequate financial attention in the federal government annual budgets and this has adversely affected its overall performance. This study attempts to examine the nexus between federal government health expenditures and under-five child mortality in Nigeria. This study decomposed public health expenditure into two components (health capital expenditure and health recurrent expenditure) with a view to identifying the component that has higher impact on in reducing under-five child mortality in Nigeria.

Objectives of the Study

The aim of the study is to examine the impact of health government expenditure on under-five child mortality in Nigeria. The specific objectives are to:

1. determine the impact of health government expenditure on under-five child mortality in Nigeria.
2. ascertain whether there is long-run relationship between health government expenditure and under-five child mortality in Nigeria.
3. identify direction of causality relationship between health government expenditure and under-five child mortality in Nigeria.

Conceptual Literature

Government Health Expenditure

World Health Organization (2016) defines health expenditure as the financial resources spent for the purpose of improving the health condition of citizens. Jhingan (2010) decomposed public expenditures into two components (capital and recurrent expenditures). Capital expenditure on health referred to the investment on real assets such as building of hospitals, and other social infrastructure while the recurrent expenditure on health consists of payment of workers' salaries and maintenance of already existing facilities.

Health spending measures the final consumption of health care goods and services including personal health care and collective services. Health financing is a critical component of the health system. For it is the synthesis of the financing and spending flows recorded in the operation of a health system, right from funding sources to distribution. Therefore, the concept of health expenditure, as defined by WHO report (2018), is the sum of general government health expenditure and private health expenditure in a given year, calculated in national currency units in current prices. The concept of health expenditure (public), consists of recurrent and capital spending from government (central and local) budgets, external borrowings and grants (including donations from international agencies and nongovernmental organizations), and social (or compulsory) health insurance funds (WHO, 2018).

Under-five Child Mortality

The under-five mortality rate refers to the probability a newborn would die before reaching exactly 5 years of age, expressed per 1,000 live births (WHO, UNICEF, UNFPA & World Bank (2010) [19]. The mortality rate of children aged under 5 years is the probability that a child born in a specific year or period will die before reaching the age of 5 years, subject to the age-specific mortality rates of that period (WHO, 2017). In 2021, 5.0 million children under 5 years of age died. Globally, infectious diseases, including pneumonia, diarrhoea and malaria, remain a leading cause of under-five deaths, along with preterm birth and intrapartum-related complications (UNICEF, 2010) [19].

The global under-five mortality rate declined by 59 per cent, from 93 deaths per 1,000 live births in 1990 to 38 in 2021. Despite this considerable progress, improving child survival remains a matter of urgent concern. In 2021 alone, roughly 13,800 under-five deaths occurred every day, an intolerably high number of largely preventable child deaths.

Child mortality, that is death between the first and the fifth birthday, is measured by a rate equal to the ratio of the deaths of this age and the average population in the same age range. (This is different from the infant mortality rate, which is obtained by dividing the number of deaths by births). In most industrialized countries this rate is under 0.5 deaths per 1,000 children of this age; the lowest rate in 1995 was 0.17 per 1,000 in Sweden. Only a few Central and Eastern European countries have a rate above 0.5 per 1,000, particularly Estonia, Moldova, Romania, and Russia, where it is over 1 per 1,000. Child mortality is much lower than infant mortality, as the rate of death between one and five years on average is one twentieth of rates during the first year of life.

Theoretical Literature

Theory of Public Expenditure by Musgrave (1910-2007)

In (1964), Musgrave propounded the theory of public expenditure. He discovers that the need for government services is in three stages of per capita income experience changes in the income elasticity of demand. Musgrave opined that when the per capita income is low the need for government services will be low because the income will be channeled to meet basic needs. In the situation that the per capita income increases above the low level, the demand for public services like security, electricity, health, water, transport and education begin to increase, hence moving public expenditure on these items to rise. Musgrave notice that, when the per capita income is high, there will befall in the government sector growth rate since most primary needs are provided, in most advanced countries (Danladi *et al*., 2019).

This theory is quite imperative; however, it has a strong shortcoming, the size of government expenditure cannot be forecasted in later stages. It is not always the case that the share of the government sector further falls during later stages. Because the pattern of private consumption changes because of increasing per capita income in the later industrialization stages, the public share might rises also to satisfied the growing need for government services like health, social security, education, and infrastructure, and. It, therefore, depends on the income level and the individual needs of the citizens if the government share increases or fall. In addition, it is also always difficult to identify one single level of development for any economy in particular. In underdeveloped countries like Nigeria, different levels can be seen simultaneously: Whereas in towns and cities the economy might be placed in a higher level of development, villages and ghettos are still often far behind and are situated in the lower level of development.

Empirical Literature

Eboh, Ebikabowei and Onwughalu, (2022) [4] determined the relationship between health expenditure, child mortality and economic growth in Nigeria using time series data covering the 1980 – 2020 sample periods. The Ordinary Least Square (OLS) technique was employed in analyzing the data. Empirical results showed a negative and insignificant impact of government health expenditure on under-five child mortality. It was also found that government capital expenditure had a negative and insignificant impact on under-five mortality, while government recurrent expenditure had a negative and significant impact on under-five mortality. Gross fixed capital formation had a positive and significant impact on under-five child mortality. It was also found that child mortality, government capital expenditure and domestic investment had a positive and significant impact on economic growth, while inflation had a negative and significant impact on economic growth. The study recommends an increase in the yearly budgetary allocation to the health sector. However, the key to good outcomes is dependent not on the only mere increase in budgetary allocation and ensure appropriate usage of the allocated fund as transparently as possible.

Sakiru and Sam-wobo, (2022) [17] examined the effect of government health expenditure on maternal health outcome in Nigeria. Specifically, the study sought to verify the effect of government health expenditure, number of physicians per thousand, GDP per capita, female school enrolment on maternal mortality ratio. Data were sourced from the World Development Indicator (WDI) from 1980 – 2018; and analyzed within the ARDL framework due to the different orders of integration of the series. The results showed that lagged maternal mortality ratio – MMR ($P<0.050$), government health expenditure - GHEXP ($P<0.05$), number of physicians per thousand LPHY ($P<0.05$) and GDP per capita ($P<0.1$) reduced maternal mortality rate significantly in the short run, while GHEXP ($P<0.05$), female school enrolment - FSEN ($P<0.05$), and GDPPC ($P<0.05$) significantly reduced MMR in the long run. Based on these findings, the study recommended improved funding of the health sector among others, in order to reduce maternal mortality in Nigeria and be able to meet up with SDG3 target.

Ayomide, Chanimbe and Uchechi, (2022) [1] conducted a study to examine effect of public health expenditure on health outcomes in Nigeria and Ghana. Specifically, the study sought to verify the relationship between public health expenditure and health outcomes (infant mortality, maternal mortality, malaria mortality and HIV/AIDS mortality) in Nigeria and Ghana and identify how the United Nations General Assembly's fulfilment of the MDGs (now known as the SDGs) and the Abuja Declaration affect health outcomes between 2000 and 2018. Using the health expenditure commitment at the 1999 United Nations General Assembly and the Abuja Declaration of 2000, we also assessed public policy's role in this relationship via linear regression analysis. With hindsight, our findings disclosed a low public health expenditure in both countries despite the Ghanaian

case revealing a negative relationship, which was primarily insignificant whilst Nigeria indicated a positive one. These empirical evidences accentuate the need to augment public health expenditure in both countries to boost health outcomes whilst bringing to bear the significant influence of GDP, school enrolment and residing in urban areas on health outcomes.

Yaqub, Ojapinwa and Yussuff, (2021) [23] conducted a study examined the impact of public health expenditure on health outcome in Nigeria. Specifically, the study sought to investigates how the effectiveness of public health expenditure is affected by governance in Nigeria. Data on public health expenditure and governance variable captured by the corruption perception index were regressed on infant mortality, under-five mortality and life expectancy, using both the ordinary least squares and the two-stage least squares. The result obtained showed that public health expenditure has negative effect on infant mortality and under-5 mortalities when the governance indicators are included. The policy implication is that achieving the Millennium development goal of lowering infant mortality by two-thirds by 2015; reducing under-5 mortality rate and raising life expectancy in Nigeria may be unattainable if the level of corruption is not reduced considerably

Olayiwola, Adebayo and Olusanya, (2020) [13] conducted a study to examine the impact of government health expenditure on health outcomes in Nigeria. The specific objective were to investigate the impact government health expenditure on infant mortality, maternal mortality, and life expectancy in Nigeria. The methods of data analysis were cointegration technique and the Error Correction Model (ECM) methods of analysis. The study found that increase in government health expenditure increase life expectancy while it reduced infant mortality rate and maternal mortality rate. Environmental pollution and macroeconomic instability were found to negatively affect life expectancy; infant mortality rate and maternal mortality rate. Remarkably, the study found a long-run relationship between government health expenditure, infant mortality, maternal mortality, and life expectancy. The study concludes that adequate and sustainable financing for the health sector can improve health outcomes. The study recommends that government should ensure adequate budgetary allocation for the health sector and guarantee judicious management of public health spending to improve health outcomes.

Salami, Ebeh, and Muhammad, (2019) [18] investigated the impact of health expenditure on child mortality rate in Nigeria within the period of 1980-2015. The specific objectives of the study were to examine effect of public health expenditure, private health expenditure and per capital income on child mortality rate in Nigeria. Autoregressive Distributed Lagged (ARDL) model was used to expose the long-run relationship that exists among the variables. The variables were first subjected to unit root test, co-integration test, error correction mechanism. Since the variables were not stationary at level, ARDL Bound Co-integration test was used to determine the long run relationship among the variables and they were found to be co-integrated and the ECM was statistically significant indicating short run adjustment to equilibrium in the long run. The long run and ECM results obtained revealed that all the variables used have negative impacts on infant mortality rate and also statistically significant. Thus, in reducing infant mortality rate in Nigeria, there is need for government and private stakeholders to invest adequately in health sector in order to ensure health service that is accessible and affordable to the teeming population of the country.

Methodology

This study made use of ex post-facto research design. The pre-estimation and post-estimation tests were descriptive statistics, correlation matrix, ADF-Fisher Unit Root test statistic, Johansen co-integration test, Ramsey Reset test, Breuch-Godfrey Serial Correlation LM Test respectively while the data analytical technique was error correction model technique. These variables of the study consist of under-five child mortality (CHILDMOR); government health expenditure (GHEXP), recurrent health expenditure (RHEXP), capital health expenditure (CHEXP), domestic private health expenditure (DPHEXP), and adult literacy rate (15 and above) (ADULT) for a period of 1986 to 2022 as defined in our model specification. All the variables were sourced from World Bank development indicator (World Bank database) and Central Bank of Nigeria's (CBN) statistical bulletin. The study employed e-view version (9) statistical application software to analysis the data because it is user- friendly software.

Theoretical Framework

The study adopted Musgrave theory of government expenditure in 1964. The theory stipulated three causes of growth in government expenditure namely: demand for public goods and services, increase in per capita income and size of government expenditure.

$$GOEXP = f\ (DPGS, PCIN, SIZE) \quad (1)$$

Where GOEXP stands as government expenditure, DPGS is demand for public goods and services, PCIN is increase in per capita income and SIZE is size of government expenditure.

Model Specification

This study specifically adopts the model of Sakiru and Sam-wobo, (2022) [17] examined the effect of government health expenditure on maternal health outcome in Nigeria. The functional relationship is expressed as:

$$MAMR = (GEP, NUPPY, FESCH, GDPPC) \quad (2)$$

Where: MAMR is the maternal mortality ratio; *GEP* is the government expenditure, *NUPPY* is the number of physician per thousand; *FESCH* is the female school enrolment. Specifically, to achieve the objective of this study and based on the property of the linearity of variables, the functional relationship is modeled in a linear equation to yield Equation 2:

$$MAMR_{it} = a_o + \beta_1 GEP + \beta_2\ NUPPY + \beta_1 FESCH + \beta_1 GDPPC + \mu^{it} \quad (3)$$

Where: $\beta 0$ = Constant term, β_1 to β_6 = Regression coefficient and Ut = Error Term.

Model Specification for the Study

The functional form of the model used in this work was

specified in equation 4 as

$$CHILDMOR = F\ (GHEXP,\ RHEXP,\ CHEXP,\ DPHEXP,\ ADULT) \quad (4)$$

Where CHILDMOR is the under-five child mortality ratio; GHEXP is the government health expenditure, RHEXP is the recurrent health expenditure, CHEXP is the capital health expenditure, DPHEXP is the domestic private health expenditure and ADULT is that adult literacy rate (proxy of tertiary school enrolment rate). Equation (4) was therefore re-written in linear form as follows:

$$CHILDMOR = \beta_0 + \beta_1 GHEXP + \beta_2\ RHEXP + \beta_3\ CHEXP + \beta_4\ DPHEXP + \beta_5\ ADULT + \mu t \quad (5)$$

Where: β0 = Constant term, β_1 to β_6 = Regression coefficient and Ut = Error Term.
To reduce the outliers among the variables, all variables will be expressed in logarithmic form.

$$CHILDMOR = \beta_0 + \beta_1\ Log\ GHEXP + \beta_2\ Log\ RHEXP + \beta_3\ Log\ CHEXP + \beta_4\ Log\ DPHEXP + \beta_5\ ADULT + \mu t \quad (6)$$

Where: β0 = Constant term, β_1 to β_5 = Regression coefficient and Ut = Error Term.

Results and Discussion

Table 1: Descriptive Statistics of the Variables

	CHILDMOR	GHEXP	RHEXP	CHEXP	DPHEXP	ADULT
Mean	49.02186	1062951.	401481.5	276705.0	598642.8	33.42757
Median	48.44100	59788.30	93768.00	241688.6	182542.1	31.87000
Maximum	63.27000	4430132.	1613579.	654110.8	1773673.	56.21000
Minimum	45.48700	223.9000	653.5000	4100.100	4846.700	23.00000
Std. Dev.	3.583742	1648400.	567165.8	251249.3	647166.0	9.370617
Skewness	1.682506	1.153478	1.103505	0.209769	0.488526	0.557759
Kurtosis	7.576643	2.498413	2.512462	1.370332	1.493803	2.105762
Jarque-Bera	49.74799	8.592690	7.875735	4.365739	4.969195	3.151231
Probability	0.000000	0.013618	0.019490	0.112718	0.083359	0.206880
Sum	1813.809	39329175	14854817	10238084	22149785	1236.820
Sum Sq. Dev.	462.3554	9.78E+13	1.16E+13	2.27E+12	1.51E+13	3161.104
Observations	37	37	37	37	37	37

Source: e-view's Result

The table shows descriptive statistics of the variables. In the model established in the study, there is one dependent variable and five independent variables. The descriptive statistics of the variables show the nature and status of mean, median, maximum, minimum, sum of the variable respectively.

Table 2: Result of Correlation Matrix

	CHILDMOR	GHEXP	RHEXP	CHEXP	DPHEXP	ADULT
CHILDMOR	1.000000	0.524823	0.774166	0.853627	0.888586	0.787024
GHEXP	0.524823	1.000000	0.808307	0.728128	0.767401	0.835134
RHEXP	0.774166	0.808307	1.000000	0.837934	0.889031	0.839563
CHEXP	0.853627	0.728128	0.837934	1.000000	0.929205	0.901577
DPHEXP	0.888586	0.767401	0.889031	0.929205	1.000000	0.897109
ADULT	0.787024	0.835134	0.839563	0.901577	0.897109	1.000000

Source: e-view's Result

This correlation matrix presents a table showing correlation coefficients between sets of variables. This result of correlation matrix helps to identify which pairs of variables have the highest correlation. This test is to detect whether exact or perfect relationship exist among explanatory variables (multicollinearity). The result of correlation matrix showed that every explanatory variable in the study is linearly independent of each other.

Unit Root Test using Augmented Dickey-Fuller Fisher Test

Table 3: Results of Stationarity (Unit root) test

Variables	Variables' Name	ADF-Statistic	5% Critical Value	Remark
CHILDMOR	Under-five Child Mortality	-5.057598	-2.941145	1(1)
GHEXP	Government health expenditure	-5.484595	-2.941145	1(1)
RHEXP	Recurrent health expenditure	-5.535829	-2.941145	1(1)
CHEXP	Capital health expenditure	-4.651514	-2.941145	1(1)
DPHEXP	Domestic private health expenditure	-7.374461	-2.941145	1(1)
ADULT	adult literacy rate (15 and above)	-5.945844	-2.941145	1(1)

Source: Author's computation

In the table 3, the variables that were tested with unit root are shown, the values for Augmented Dickey Fuller (ADF) statistics are presented, the lag level of each variable was identified, and the P-values at 5% level of significant were pointed out. The order of integration of each variable was enumerated. The test detected that under-five child mortality (CHILDMOR); government health expenditure (GHEXP), recurrent health expenditure (RHEXP), capital health expenditure (CHEXP), domestic private health expenditure (DPHEXP), and adult literacy rate (15 and above) (ADULT) were stationary at difference one. It is now referable to use error correction model o estimate the parameters.

Co-integration Test Results

Ho = There is no co-integration (no long run relationship among Variable)

Table 4: Co-integration Test Results

Date: 03/13/23 Time: 09:07				
Sample (adjusted): 1988 2022				
Included observations: 35 after adjustments				
Trend assumption: Linear deterministic trend				
Series: CHILDMOR GHEXP RHEXP CHEXP DPHEXP ADULT				
Lags interval (in first differences): 1 to 1				
Unrestricted Cointegration Rank Test (Trace)				
Hypothesized		Trace	0.05	
No. of CE(s)	Eigenvalue	Statistic	Critical Value	Prob.**
None *	0.952284	227.8572	95.75366	0.0000
At most 1 *	0.778419	121.3703	69.81889	0.0000
At most 2 *	0.668401	68.62644	47.85613	0.0002
At most 3 *	0.344528	29.99242	29.79707	0.0475
At most 4	0.235519	15.20841	15.49471	0.0552
At most 5 *	0.152927	5.808884	3.841466	0.0159
Trace test indicates 4 cointegrating eqn(s) at the 0.05 level				
* Denotes rejection of the hypothesis at the 0.05 level				
**MacKinnon-Haug-Michelis (1999) p-values				

Source: E-view Results

The co-integration results in table 4.2.1 for the model CHILDMOR; GHEXP, RHEXP, CHEXP, DPHEXP, and ADULT) reveals that both trace test and the Max-eigenvalue test indicates 4 co-integrating equation(s) at the 5 percent level of significance. Thus, there is a long-run relationship among the variables (CHILDMOR; GHEXP, RHEXP, CHEXP, DPHEXP, and ADULT). We therefore reject the null hypothesis of no co-integration amongst the variables and accept the alternative hypothesis.

Estimation of Regression Model

Table 5: Empirical Results of the Error Correction Model (ECM)

Dependent Variable: D(CHILDMOR,1)				
Method: Least Squares				
Date: 03/13/23 Time: 09:28				
Sample (adjusted): 1987 2022				
Included observations: 36 after adjustments				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	1.159406	0.176408	6.572300	0.0000
D(LOGCHEXP,1)	0.080009	0.457871	0.174741	0.8625
D(LOGDPHEXP,1)	1.270388	0.418675	3.034308	0.0050
D(LOGGHEXP,1)	0.635524	0.182462	3.483050	0.0016
D(LOGRHEXP,1)	0.490924	0.396156	1.239218	0.2252
D(ADULT,1)	0.117186	0.039531	2.964384	0.0060
ECM-1	-0.915763	0.087512	-10.46438	0.0000
R-squared	0.805453	Mean dependent var		0.470917
Adjusted R-squared	0.765202	S.D. dependent var		1.715905
S.E. of regression	0.831458	Akaike info criterion		2.641393
Sum squared resid	20.04833	Schwarz criterion		2.949300
Log likelihood	-40.54508	Hannan-Quinn criter.		2.748861
F-statistic	20.01075	Durbin-Watson stat		0.949687
Prob(F-statistic)	0.000000			

Source: E-view Results

The error correction model specification was carried out to examine parameters estimates. In testing this hypothesis, government health expenditure (GHEXP), recurrent health expenditure (RHEXP), capital health expenditure (CHEXP), domestic private health expenditure (DPHEXP), and adult literacy rate (15 and above) (ADULT) were regressed against under-five child mortality (CHILDMOR). The empirical result shows that the coefficient of capital health expenditure (CHEXP) has positive and insignificant impact on under-five child mortality (CHILDMOR) because [P-value (0.8625) was greater than its significant value (0.05]. The domestic private health expenditure (DPHEXP) has positive and significant impact on under-five child mortality (CHILDMOR) because [P-value (0.0050) was less than its significant value (0.05]. The government health expenditure (GHEXP) has positive and significant impact on under-five child mortality (CHILDMOR) because [P-value (0.0016) was less than its significant value (0.05]. The recurrent health expenditure (RHEXP) has positive and insignificant impact on under-five child mortality (CHILDMOR) because [P-value (0.2252) was greater than its significant value (0.05]. The adult literacy rate (15 and above) (ADULT) has positive and significant impact on under-five child mortality (CHILDMOR) because [P-value (0.0060) was less than its significant value (0.05]. The result of the F – statistical test shows that the overall regression of the variables was statistically significance because [P-value (0.0000) was less than its significant value (0.05]. Again, our empirical result shows that the R-squared (R^2) is 0.8054. The coefficient of ECM statistic is (-0.9157). The ECM result indicates that 91% of errors have been corrected from short run adjustment to the long run. In other words, ECM statistic shows that the model has 91 percent degree of adjustment from short-run to long-run equilibrium. This is a high speed of adjustment to equilibrium after a shock.

Granger Causality Test Result

The essence of causality analysis, using the Granger causality test, is to ascertain whether a causal relationship exists between two variables of interest.

Table 6: Result of Causality Test

Pairwise Granger Causality Tests			
Date: 03/13/23 Time: 10:05			
Sample: 1986 2022			
Lags: 1			
Null Hypothesis:	Obs	F-Statistic	Prob.
LOGCHEXP does not Granger Cause CHILDMOR	36	0.06415	0.8016
CHILDMOR does not Granger Cause LOGCHEXP		1.75477	0.1944
LOGDPHEXP does not Granger Cause CHILDMOR	36	0.25456	0.6172
CHILDMOR does not Granger Cause LOGDPHEXP		0.59862	0.4446
LOGGHEXP does not Granger Cause CHILDMOR	36	2.61796	0.1152
CHILDMOR does not Granger Cause LOGGHEXP		0.31930	0.5759
LOGRHEXP does not Granger Cause CHILDMOR	36	0.04408	0.8350
CHILDMOR does not Granger Cause LOGRHEXP		0.03870	0.8453
ADULT does not Granger Cause CHILDMOR	36	4.19631	0.0485
CHILDMOR does not Granger Cause ADULT		8.88144	0.0054

Evaluating the results in table 4.6, based on the decision rule, the result of pairwise Granger causality test shows that capital health expenditure (CHEXP) does not granger cause under-five child mortality (CHILDMOR) because its Prob. value (0.8016) was greater than its Prob. Value (0.05) while under-five child mortality (CHILDMOR) does not granger cause capital health expenditure (CHEXP) because its Prob. value (0.1944) was greater than it Prob. Value (0.05). The

result of pairwise granger causality test shows that domestic private health expenditure (DPHEXP) does not granger cause under-five child mortality (CHILDMOR) because its Prob. value (0.6172) was greater than it Prob. Value (0.05) while under-five child mortality (CHILDMOR) does not granger cause domestic private health expenditure (DPHEXP) because its Prob. value (0.1944) was greater than it Prob. Value (0.05). The result of pairwise granger causality test shows that government health expenditure (GHEXP) does not granger cause under-five child mortality (CHILDMOR) because its Prob. value (0.1152) was greater than it Prob. Value (0.05) while under-five child mortality (CHILDMOR) does not granger cause government health expenditure (GHEXP) because its Prob. value (0.5759) was greater than it Prob. Value (0.05). The result of pairwise granger causality test shows that adult literacy rate (15 and above) (ADULT) granger cause under-five child mortality (CHILDMOR) because its Prob. value (0.0485) was less than it Prob. Value (0.05) while under-five child mortality (CHILDMOR) granger cause adult literacy rate (15 and above) (ADULT) because its Prob. value (0.0163) was greater than it Prob. Value (0.05).

Econometric /Second Order Test

Table 7: Result of Breuch-Godfrey Serial Correlation LM Test

Breusch-Godfrey Serial Correlation LM Test:			
F-statistic	5.818576	Prob. F(2,26)	0.0082
Obs*R-squared	11.13096	Prob. Chi-Square(2)	0.0038
Test Equation:			
Dependent Variable: RESID			
Method: Least Squares			
Date: 03/13/23 Time: 15:18			
Sample: 1987 2022			
Included observations: 37			
Presample missing value lagged residuals set to zero.			

Source: Author's Computation from E-view 9

The Breuch-Godfrey Serial correlation LM Test was used to identify whether the model suffers from autocorrelation problem. The autocorrelation problem violates ordinary least squares assumption that says there is no correlation among error terms of different observation. Breuch-Godfrey Serial correlation LM Test is a statistic that ensures that the assumption of ordinary least squares was not violated. The f-statistic result of Breuch-Godfrey Serial correlation LM Test is (5.8185) and it P-value is (0.0082). From the results of the above test, the probability values for Lagrange multiplier (LM) test (0.0082) is less than 0.05. We reject the null hypothesis and accept alternative hypothesis. This implies that there is no serial correlation problem.

Result of Ramsey Reset Test

The null hypothesis; there is Specification Error.

This second order test checks whether the model of the study suffers model specification error. The null hypothesis; there is model specification error. From the results of the Ramsey Reset test, the probability values (0.0000) for Ramsey Reset's t-statistics is less than 0.05. We reject the null hypothesis and accept alternative hypothesis. This implies that model include core variables in the model. It does not include superfluous variables. The functional form of the model is very well specified, there is no error of measurement in the regressand and regressors.

Table 8: Result of Ramsey Reset Test

Ramsey RESET Test			
Equation: UNTITLED			
Specification: D(CHILDMOR,1) C D(LOGCHEXP,1) D(LOGDPHEXP,1) D(LOGGHEXP,1) D(LOGRHEXP,1) D(ADULT,1) ECM-1			
Omitted Variables: Squares of fitted values			
	Value	df	Probability
t-statistic	16.21984	28	0.0000
F-statistic	263.0833	(1, 28)	0.0000
Likelihood ratio	84.29058	1	0.0000
F-test summary:			
	Sum of Sq.	df	Mean Squares
Test SSR	18.11984	1	18.11984
Restricted SSR	20.04833	29	0.691322
Unrestricted SSR	1.928497	28	0.068875
LR test summary:			
	Value	df	
Restricted LogL	-40.54508	29	
Unrestricted LogL	1.600214	28	
Unrestricted Test Equation:			
Dependent Variable: D(CHILDMOR,1)			
Method: Least Squares			
Date: 03/13/23 Time: 10:39			
Sample: 1987 2022			
Included observations: 36			

Source: Author's Computation from E-view 9

Summary of Findings

The following are the major findings of the study**:**

1. The empirical result shows that the coefficient of health government expenditure has positive and significant impact under-five child mortality because probability value of 0.0016 which is less than 0.05. The empirical finding reveals that health government expenditure has positive and significant impact on under-five child mortality in Nigeria during period covered by the study. The health government expenditure has 63 percent positive and significant impact on under-five child mortality in Nigeria. A percent change in health government expenditure results to 63 percent increase in under-five child mortality in Nigeria.
2. The trace statistics of Johansen co-integration test identify that there are four (4) co-integrating equation(s) at the 5 percent level of significance. Thus, there is a long-run relationship among the variables.
3. The empirical result shows that there is non-directional relationship between government health expenditure and under-five child mortality while there is bi-directional relationship between adult literacy rate and under-five child mortality. Again, there is no causal relationship among recurrent health expenditure, capital health expenditure, domestic private health expenditure and under-five child mortality.

Conclusion

This study concludes that health government expenditure has positive and significant impact on under-five child mortality in Nigeria. The study implies that increase in government health expenditure, availability of medical personnel, female enlightenment (education) and improved economic condition will reduce under-five child mortality in Nigeria. It is clear that even with the increase in government health spending in Nigeria, it still poses little impact on infant mortality rate as compared to the effect of private

health expenditure of reducing infant mortality in the country. Furthermore, the claims of fund mismanagement can however be upheld since the fund injected into the health sector by the private sector which is more effective in combating infant mortality is way lesser than the expenditure of the public sector.

Recommendations of the Study

Based on the findings of this study, the following recommendations were made.

1. Nigeria government should improve allocation and release of funds to the health sector and monitor same to ensure effective utilization of such fund. This will help to see that such monies are actually channeled into socially desirable targets that can improve the economy. Improved girl-child education should be pursued with more enlightenment and incentives.
2. Nigeria government should provide child health insurance measures that will allow under-five children to have a special preference in medical treatment is also appropriate. Capital expenditure on capital projects should also be a priority in government development plans if economic growth must be achieved. Finally, the cost of training of medical professionals should be further subsidized in order to be able to train more; while such professionals are advised to join in providing better medical care to the people.
3. Nigeria government should identify that there is need for the country to be more serious on the war on corrupt practices especially at places of high authority. In addition, full-fledged probe and prosecution of officers responsible for fund diversion and mismanagement in the public health sector should be undertaken so as to purge out the bad eggs in the sector and set an antecedent for other erring officers.

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