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Health Expenditure, Child Mortality and Economic Growth in Nigeria

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Abstract:

Health expenditure, child mortality and economic growth in Nigeria was examined 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. We recommend 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 but rather on implementing a public finance system that is good enough to extend and possibly link particular expenditure and revenue decisions and ensure appropriate usage of the allocated fund as transparently as possible.
Keywords*: Health Expenditure, Child Mortality, Economic Growth*

1. Introduction

Every corporation has goals that it strives to achieve. Achieving these Economic growth, which is the increase in the productive capacity of a country and a change in the GDP growth rate, continues to occupy the most important position among the macroeconomic objectives of developing countries (Picardo, 2020). The production capacity of any economy is determined by the level of economic growth over time (Rasmidatta, 2011). Economic growth brings about rising national output and income (Rasmidatta, 2011). Poverty reduction, increase in the provision of goods and services, as well as jobs and income generation are among the prospects that come with economic growth (Amadeo, 2020; and Rasmidatta, 2011). Globally healthcare especially child health is identified as a core factor for long-run economic growth.

Health as stated by Muthaka (2013) begins at childbirth. Thus, health investment in humans commences at birth. Health also occupies an important

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position in the Sustainable Development Goals (SDGs) by the United Nations (UN). Goal 3 of the SDGs in particular, focused on a considerable reduction in the global maternal and child mortality rates and a significant increase in health financing by the year 2030 (WHO, 2016). A young person being that is not up to the legal age of maturity – specifically 18 years of age is considered as a child (WHO, 2016). The child mortality rate globally is the number of deaths among children below 18 years. Child mortality (sometimes called under-five mortality) involves a child who survives up to 1 year but dies before or at the age of 5years (Muthaka, 2013).

Reducing the mortality rate of children is a way of preserving children to grow up to fulfil their potential (Muthaka, 2013). Children are the future and hope of any nation and, therefore, the strength or weakness of the economic system in the future depends on them, which is also associated with their health today (Muthaka, 2013). Poor health issues such as poor sanitary systems, diarrheal, malnourishment, as well as environmental conditions among other health-related diseases are linked to higher rates of child mortality. Healthcare of children is among the most considered health issues both in the developed and the developing countries. Children are among the poorest and most vulnerable groups in society, and, are concentrated in the poorest regions and countries in the world (Muthaka, 2013). In 2019 an estimated 5.2 million children under 5 years died mostly from preventable and treatable causes. Children aged 1 to 12 months accounted for 1.5 million of these deaths while children aged 1 to 4 years accounted for 1.3 million deaths. Newborns (under 28 days) accounted for the remaining 2.4 million deaths (WHO, 2020). On average, 26.9% of newborns died in their first year of life and 46.2% died before they reached adulthood (Roser, Ritchie & Dadonaite, 2019). In 2017, the number of child death reduces from 12.6 million in 1990 to 5.4 million deaths globally 2017. UNICEF (2020) reported that globally, 1 in 27 children died before reaching age five in 2019, compared to 1 in 11 in 1990.

Progress in reducing child mortality rates has been accelerated in the 2000–2019 period compared with the 1990s, with the annual rate of reduction in the global under-five mortality rate increasing from 1.9 per cent in 1990 – 1999 to 3.7 per cent in 2000–2019. The global under-five mortality rate declined by 59 per cent – 93 deaths per 1,000 live births in 1990 to 38 in 2019 (UNICEF 2020). Globally 3.9% of all children die before reaching the age of five, which means that on average 15,000 children die every day. In 2019, in comparison, the probability of dying after the first month and before reaching age 1 was 11 per 1,000 and the probability of dying after reaching age 1 and before reaching age 5 was 10 per 1,000 (Sharrow, Hug, Liu & Danzhen, 2020). Although the child mortality rate declined around the world there are

still many countries in which the mortality rate is higher than 2.5%. The under-five mortality ratio in Nigeria is 201 per 1000 live births meaning that one in five Nigerian children never reach the age of 5. Infant deaths, which account for half of the child mortality, have increased from what they were in 1990. In 2018, the under-five mortality rate in Nigeria is 132 per 1,000 live births meaning that 1 in 8 Nigerian children never reach the age of 5. Infant deaths, which account for half of the child mortality, have declined from 87 per 1000 live births in 1990 to 67 in 2018 (Ufere, 2019). In Nigeria, in 2019, the child mortality rate for Nigeria was 117.2 deaths per 1,000 live births. The child mortality rate of Nigeria fell gradually from 281.4 deaths per 1,000 live births in 1970 to 117.2 deaths per 1,000 live births in 2019 (United Nations, 2020; Ufere, 2019). On this basis, public expenditure on health is identified by authorities including the UNs as the most guaranteed way of bringing reduction in child mortality.

Sufficient and efficient public spending on health can inevitably improve the health status of individuals, especially children. This is because government expenditure on health goes directly into the health sector of the economy, which has a direct impact on the health status of the people including children. Sufficient healthcare financing is a more sure way of ensuring the availability and accessibility of healthcare, and affordability of services provided by the healthcare system goes a long way in determining the rate of child mortality. Government expenditure on health, if sufficient and efficiently utilized, has a high tendency for quality improvements in the healthcare system, which no country can afford to compromise. It is the source of low-cost healthcare interventions like child immunization and management of diarrhoea and malaria, which are vital for child mortality rate reduction (Raghupathi & Raghupathi, 2020; Obansa & Orimisan, 2013). BudgIT (2018) reported that the government of Nigeria through the national immunization financing task team makes an expenditure of approximately $36 to get a Nigerian child vaccinated. With an estimated 7.4 million yearly born children, about $295 million is required to get every child immunized. Government funding on child healthcare is supported by the Global Alliance for Vaccines and Immunization (GAVI) funding initiative when Nigeria became a part. Nigeria funds part of the funding needs through the GAVI initiative, while the rest of the funding needs are supported by donors. There has been a 20 per cent reduction in the support by the GAVI funding initiative, which has created a funding gap. Besides, it is expected that Nigeria will exit by 2022, which will compound the already existing funding challenges. In addition to the counterpart funding for health are the contributions of the National Health Insurance Scheme, allocations to the State House medical centre and medical expenses are among the cross-

sectoral health related-expenses by the federal government of Nigeria (Eke, 2018).

There are symptoms of sub-optimal population health. The country has records of an imbalance share of the world's burden of child and maternal morbidity and mortality (WHO, 2020). About 75.7 infant mortality rates per 1,000 live births were recorded in 2018 (WHO, 2020). As of 2020, the infant mortality rate declined to about 59.2 deaths per 1,000 live births, which is quite very high despite the decline of 2.44 per cent from the 2019 records (Macrotrends, 2020; WHO, 2020). The Global Alliance for Improved Nutrition estimated that not less than 33% of under-five children in Nigeria have stunted growths with Severe Acute Malnutrition (UNICEF, 2020; Macrotrends, 2020; WHO, 2020). These high child mortality rate records should be worried about, which could be attributed to poor accessibility and substandard health services delivery, as well as suboptimal government expenditure on health.

The public healthcare system of Nigeria is characterized by several challenges including lack of trained medical personnel, shortage of community ownership and partnerships in addressing abysmal health outcomes as well as poor health infrastructure and service delivery in most parts of the country. These led to healthcare taking place at the homes, which could be a reason for the occurrence of high child mortality rates in the country. Issues of malnutrition and/or stunted growth are prevalent with a lot of under-five Nigerian children that can defame them from children's cognitive abilities capable of affecting their productivity at adult age, which can put the economy in danger. Public expenditure on health is identified as a key player in ensuring the reduction in child mortality and efforts have been made in providing adequate healthcare through government expenditure on health. Efforts have been made by Nigeria, in providing good healthcare facilities by improving the amount of government expenditure on health. However, there has been a lack of consistency in government efforts towards ensuring a quality healthcare system. Between 2000 and 2007, an average of 2.1% to 5.8% of total government expenditure was spent on health. In 2018, 4% of the total budget of 8.612trillion was allocated for healthcare expenditure, which is far below the April 2001 Abuja Declaration on health which mandates African Union Countries to commit at least 15 per cent of their national budget to healthcare (Pate, 2017). In 2020, the health allocation was4.14% of the total budget. This compared to security and education, which was 19.23% and 6.32% respectively, indicates that the priority of government is shifting away from healthcare (Olufemi, 2019).

Notwithstanding, there has been inconsistency in healthcare expenditures towards ensuring quality healthcare delivery. In 2018, for example, 8.612

trillion naira, counting for about 4 per cent of the total budget was allocated to healthcare. This is a concern, given the fact that it is far below 15 per cent of the budget recommended of the Abuja Declaration on health for African Union Countries (Olufemi, 2019). In 2020, the government budgetary allocation on health stood at 4.14 per cent of the national budget. This compared to the 2018 allocation showed that not many changes take place between 2018 – 2020, compared to the 19.23 per cent and 6.32 per cent figures of security and health respectively (Olufemi, 2019). The increasing out-of-pocket health expenditure alongside the low budget framework for healthcare means that government policies are not closing the healthcare financing gap, which could have implications for child mortality and economic growth. Lack of access and failures of health services delivery, suboptimal government expenditure on health can contribute directly to child mortality, which is 157/1,000 – equivalent to 1 million deaths per year or approximately 10% of the global total (Pate, 2017). Federal government funding for nutrition-related investments needed to turn around the trend of malnutrition has been grossly inadequate. The federal government allocation for the procurement of Ready-to-Use Therapeutic Food (RUTF) was about N1.1 billion naira in 2018, which is below the N1.23 billion allocations in 2017. In 2018, N1.2 billion was allocated to counterpart funding mainly for procurement and distribution (nationwide) of contraceptive commodities.

Most of the previous studies focused on the impact of public health expenditure on economic growth in Nigeria. Also, most of the studies do not show country-specific evidence on this issue. Relying on cross-country evidence for child health policy may not be sufficient, given the institutional and income level differences across countries. Specifically, the closest study to this study is Edeme, Emecheta & Omeje (2017) and Matthew, Adegboye & Fasina (2015). These studies, however, do not use indicators such as the under-five mortality rate, which are the most vulnerable group (and, is supposed to be the most targeted group) in terms of child mortality rate in Nigeria. On this basis, the specific objectives of the study are to examine: (i) the impact of government health expenditure on under-five child mortality, and (ii) the impact of child mortality on economic growth.

2. Theoretical Background

Health expenditure according to Boussalem, Boussalem & Taiba (2014) is a function of income or resources available both in private and public sectors. However, the Australian Institute of Health and Welfare (2016) explains that Health expenditure occurs when money is spent on health goods and services. According to the institute, it occurs at different levels of government, as well

as by non-government entities such as private health insurers and individuals. The institute defined health expenditure following the definition provided by the Organization for Economic Co-operation and Development's (OECD) System of Health Accounts (SHA) (OECD 2001). The concept is viewed as expenditure on health goods and services and health-related investment (OECD 2001). It includes the expenditure that may have a 'health' outcome but that is incurred outside the health sector (such as expenditure on building safer transport systems and educating health practitioners) and expenditure on personal activities not directly related to maintaining or improving personal health.

Health expenditure is divided into recurrent expenditure and capital expenditure. Recurrent expenditure was defined as expenditure on health goods, such as medications and health aids and appliances; health services, such as hospital, dental and medical services consumed within a year; and public health activities and other activities that support health systems, such as research and administration. In this study, health care expenditure (PHCE) is referred to total public expenditure from government budgetary allocation and financial aid that the Nigerian health sector spends annually on health care delivery systems.

Child Mortality

Mortality is described as the number of deaths is given by society and at a given period, which is measured per 1000 population (Denno & Stewart, 2013). A mortality rate indicates the rate and trends in mortality and the difference between the population subgroups in a country or place (Denno & Stewart, 2013). Child mortality is defined as the death of infants and children below the age of five (Denno & Stewart, 2013). The United Nations Children's Fund - UNICEF (2019) described child mortality as a child dying before getting to the age of 5 years if subjects to age-specific child mortality rates of a given period, estimated in per 1000 live births. The Organisation for Economic Co-operation and Development – OECD (2019) defined child mortality as several deaths among children who are not up to 5 years of age. In this study, child mortality is defined similarly to the definition by OECD (2019) – as earlier defined.

Economic Growth

Economic growth is the rate at which real GNP is increasing. Tombofa (2004) defined economic growth as the process by which the productive capacity of an economy changes over time. In this study, economic growth is viewed as the increase in the productive capacity of the economy leading to an increase in the availability of goods and services in the economy over a

given period. It is also viewed as the rise in per capita income and national product. The relationship between health expenditure and economic growth is that; expenditure on health care increases and contributes to a greater quantity and quality of life. Increased health expenditure produces more opportunities for better health care services. Therefore, reducing incapacity, weakness, and the number of days lost to sick leave. Workers are physically and mentally more energetic and thus has a positive effect on individual productivity and economic growth rates. Also, health expenditure makes effective health services available. The availability of the health services will create better access to healthcare facilities and change the total amount of effective health services consumed by the (children) population.

Empirical Literature Review and Value Added

There are many empirical studies in this area of research. Recent studies include the study by Mohapatra (2019) who examined the effect of revenue and capital components of public health expenditure on selected health outcomes in India. The study considered three time periods of 1992-93, 1998-99 and 2005-06. The structural equation modelling technique was employed by the author. The study found that the revenue component of public health spending significantly affected major health outcomes, while capital components of public spending were found to had a significant effect on only select health outcomes. The effects of public and private health expenditures on life expectancy at birth and infant mortality were examined by Ray & Linden (2019) on a global scale with 195 countries. The periods of the study span through the 1995–2014 study periods. The *GMM* estimator technique was employed. The study found public health expenditures to be more health-promoting than private expenditures. Though, the health effects were found not to be as great as primary education effects. Baker, Hone, Reeves, Avendano & Millett (2018) examined the relationship between government expenditure inequalities in infant mortality rates in low- and middle-income countries.

Country-level fixed-effects panel regressions for 48 low- and middle-income countries were estimated. It was found that an increase in total government expenditure leads to a decrease in infant mortality rates. The result showed that lower infant mortality rates were affected by higher non-health government expenditure. Using a Simple Ordinary least squares (OLS) method, Kato, Mugarura, Kaberuka, Matovu & Yawe (2018) examined the relationship between public health spending and under-five mortality rate in Uganda. It was found that recurrent health expenditure; capital health expenditure, women literacy rate and percentage of the population living in urban areas strongly affected under-five mortality rate. In a panel study of

161 countries, Rana, Alam & Gow (2018) examined the relationship between health expenditure and health outcomes over the period 1995–2014.

Infant, under-five and maternal mortality along with life expectancy at birth was selected as health outcome measures. Panel autoregressive distributed lag model was adopted and the finding showed that health expenditure and health outcome link is stronger for low-income compared to high-income countries. It was also found that rising health expenditures reduce child mortality but had an insignificant relationship with maternal mortality at all income levels. Lower-income countries are more at risk of adverse impacts on health because of negative shocks to health expenditure. Dhrifi (2018) examined the effect of healthcare spending on the child mortality rate for 93 developed and developing countries using a simultaneous equation model. The data covered the 1995 - 2012 sample periods. The study found a positive effect of health expenditure on (reducing) child mortality for upper-middle-income and high-income countries. However, no significant effect was found for low-income and lower-middle-income countries. The effect of public health expenditure on health outcomes in Nigeria from 1981 – 2014 was examined by Edeme, Emecheta & Omeje (2017). The health outcomes considered in their study were life expectancy at birth and infant mortality rates.

Using the ordinary least square technique, the study found that an increase in public health expenditure improves life expectancy and reduces infant mortality rates. The study also showed that the urban population and HIV prevalence rate significantly affects health outcomes, whereas per capita income indicated no effect on health outcomes in Nigeria.

Also, Kurt (2015) tested the direct and indirect (external) effects of health expenditures on economic growth using the Feder–Ram model. The period of the study spans from 2006 -to 2013 using seasonally adjusted and real monthly data. The author found that in general, the direct impact of government health expenditures on economic growth in Turkey was positive and significant but its indirect impact was negative and significant. It was further added that there were no significant differences between the government health sector and other sectors. The relationships between health care expenditure, life expectancy and economic growth in Iran have been studied by Memarian (2015). The study covered the periods 1989 to 2011. Also, the Autoregressive Distributed Lag econometric technique was employed by the author. The study revealed that life expectancy and health care expenditure have a significant positive impact on GDP both in the short-term and in the long term. Pekkurnaz (2015) also examined the convergence in health expenditure across 22 OECD countries between 1980 and 2012 by implementing panel unit root tests. Almost 23 per cent of the countries were

found to be converging by employing the nonlinear asymmetric panel unit root test.

The relationship between health expenditure and economic growth has been empirically investigated intensely and there is empirical evidence that health is vital for economic growth, although, the evidence is mixed (see Mohapatra, 2019; Ray & Linden, 2019; Kato, Mugarura, Kaberuka, Matovu, & Yawe, 2018; Rana, Alam & Gow, 2018; and Dhrifi, 2018). But none of the studies has examined the relationship between health expenditure and child mortality. There is little research on the relationship between health expenditure and child mortality in particular in Nigeria. Most of the empirical studies have focused on developed countries. Therefore, a country-specific study on developing countries such as Nigeria is relatively scarce. Therefore, it is fair to say that this issue is still in its infancy in Nigeria. The few studies in Nigeria have either considered health outcomes such as life expectancy and infant mortality rate and economic growth, health expenditure and health outcomes, or determinants of health expenditure

3. Methodology

Theoretical Framework

The Solow human-capital-growth model is used as the theoretical framework of the study. The basic assumption is that output will increase if human capital or workers' quality is improved. This is in line with postulations of the human capital theory that health or workers' healthcare contributes to productivity. The model is presented as:

$$Y = AK^{\delta}(hl)^{\vartheta} \qquad (1)$$

where:

Y = level of output

K = recurrent and capital expenditure

(hl) = total stock of human capital (where h = level of human capital and L = labor force)

A = total factor productivity

α = capital input elasticity with respect to output

β = labour input elasticity with respect to output

In equation (1), the level of output (Y) can be specified as a function of real GDP growth (RGDP) as given in equations (2).

$$Y = RGDP \qquad (2)$$

Also, total factor productivity (A) in equation (1) is influenced by previous investments into physical capital, shown as:

$$A = (DIV) = DIV^{\varphi} \qquad (3)$$

Where DI is a domestic investment. We take gross fixed capital formation (GFCF) to represent a domestic investment. Also, the stock of physical capital (K) is represented by recurrent and capital expenditures, while the total stock of human capital (hl) is taken as government health expenditure (GHEXP). On that basis, we substitute equations (2) and (3) into (1):

$$\mathrm{RGDP} = \mathrm{GFCF}^{\varphi}\mathrm{RCEXP}^{\lambda}, \mathrm{CEXP}^{\delta}(\mathrm{GHEXP})^{\vartheta} \qquad (4)$$

By taking the log, we linearize equation (4) as follows:$\mathrm{RGDP} = \varphi\mathrm{gfcf} + \lambda\mathrm{rcexp} + \delta\mathrm{cexp} + \vartheta\mathrm{ghexp}$ (5)

Where RGDP is real GDP growth. Hence, child mortality and economic growth are functions of gross fixed capital formation, recurrent expenditure, capital expenditure, and government health expenditure. The parameters$\varphi\ \lambda,\ \delta$, and ϑ measure the output elasticities of gross fixed capital formation, recurrent expenditure, capital expenditure, and government health expenditure respectively.

Data and Data Sources

The data for this study is an annual time series data, from 1981 - 2020. The data for the variables respectively are sourced from the Central Bank of Nigeria (CBN) statistical bulletin, 2020. The dependent variable is economic growth, measured by GDP growth rate, while the main independent variables are government health expenditure and child mortality rate.

Model Specification

To capture the impact of government health expenditure on under-five child mortality, the following functional model is specified:

$$\mathrm{CM} = \mathrm{f}(\mathrm{GFCF}, \mathrm{RCEXP}, \mathrm{CEXP}, \mathrm{GHEXP}) \qquad (6)$$

Where CM is the under-five child mortality rate, GFCF is gross fixed capital formation, RCEXP is a recurrent expenditure, CEXP is capital expenditure, and GHEXP is government health expenditure. Specifying equation (6) in econometric form yields the following:

$$\mathrm{CM} = \mathrm{b}_0 + \mathrm{b}_1\,\mathrm{gfcf} + \mathrm{b}_2\,\mathrm{rcexp} + \mathrm{b}_3\mathrm{cexp} + \mathrm{b}_4\mathrm{ghexp} + \varepsilon_{2t} \qquad (7)$$

Where all the variables remained as defined above, whileε_{2t} is the stochastic error term. Small lettered variables are logged variables. CM is not logged

because the variable is already in rate. b_0, b_1, b_2, b_3, and b_4, are respectively the coefficients of the variables in equation (7).

As regards the impact of child mortality on economic growth, the following functional model is specified:

$$\mathrm{RGDP} = \mathrm{f}(\mathrm{CM}, \mathrm{AGEXP}, \mathrm{GFCF}, \mathrm{INF}) \qquad (8)$$

Where RGDP is Real GDP growth – a proxy for economic growth, CM is the child mortality rate, AGEXP is aggregate government expenditure, GFCF is gross fixed capital formation, and INF is the inflation rate. Specifying equation (8) in econometric form yields the following:

$$\mathrm{RGDP} = \beta_0 + \beta_1\,\mathrm{CM} + \beta_2\,\mathrm{agexp} + \beta_3\mathrm{gfcf} + \beta_4\mathrm{INF} + \varepsilon_{3t} \qquad (9)$$

Where all the variables remained as defined above, while ε_{3t} is the stochastic error term. Small lettered variables are logged variables. RGDP, CM and INF are not logged because the variables are already in rate.

All the equations would be estimated using the Ordinary Least Square (OLS) technique. The OLS technique is generally known as the Best Linear and Unbiased Estimator (BLUE) among all other available estimators if: the variables are linearly related; the average or expected values $E(\hat{a}_i)$ of each of the variables are equal to the true value a_i, and the variables have minimum variance in the class of all such linear unbiased estimators with the least variance. The variables will be tested for unit roots using the Augmented Dickey-Fuller unit root test. After that, the series shall be tested for cointegration. Johansen's cointegration test is used in this study because there are more than two variables in our model, and there is the possibility of having more than one cointegrating equation

4. Empirical Findings/Result

Unit Root Test

The Augmented Dickey-Fuller and Philips Perron unit root tests were employed to test for the order of stationarity. The results are reported in Table 1 below,

Table 1. Augmented Dickey-Fuller and Philips–Perron unit root test results

Variable	Augmented Dickey-Fuller Result		Philips–Perron Result		Lag order	~I(d)
	Level	1st Difference	Level	1st Difference		
CM	-1.166	-3.064*	-1.282	-6.413*	2	I(1)
RCEXP	-1.853	-3.792*	-2.059	-5.627*	2	I(1)
CEXP	-2.105	-3.975*	-2.407	-6.758*	2	I(1)
GHEXP	-1.836	-3.472*	-2.069	-5.336*	2	I(1)
RGDP	-2.617	-3.751*	-2.614	-10.029*	2	I(1)
AGEXP	-1.942	-3.891*	-2.167	-5.962*	2	I(1)
INF	-2.554	-4.512*	-2.114	-6.452*	2	I(1)
GFCF	-2.617	-3.840*	-2.756	-4.709*	2	I(1)

Where * denotes significance at 5% and the rejection of the null hypothesis of the presence of unit root. The optimal lag lengths were chosen according to Akaike's Final Prediction Error (FPE), and Akaike's information criteria. The ADF 5% critical value is -2.969 at level, while at 1st difference is -2.972. Philip- Perron 5% critical value at levels is -2.964 and at 1st difference is -2.966. Constant is included in both the Augmented Dickey-Fuller and Philips–Perron unit root test models estimated.

Source: Author's Computation

The Augmented Dickey-Fuller test has a 5 per cent critical value that is higher than the test statistics of the variables respectively. Thus, at levels, the null hypothesis that there is a unit root is accepted. The variables were differenced once and, the test was conducted at 1st difference. The test statistics of the variables at 1st difference are higher than the 5 per cent critical value. Therefore, the null hypothesis of the presence of unit root is rejected. This means that the variables are stationary at 1st difference. They are integrated of order 1. This is also confirmed by the Philips–Perron test. None of the variables is stationary at the level. But at 1st difference, all the variables became stationary.

Impact of Health Expenditure on Under-Five Mortality

We begin with the cointegration test. The Johansen test for cointegration was employed and the test result is reported in Table 2 below.

Table 2. Result of Johansen test for cointegration

Maximum Rank	Eigenvalue	Trace Statistics	5% critical value
0	-	86.5927	59.46
1	0.6123	51.5382	39.89
2	0.5272	23.8220*	24.31
3	0.3378	8.5723	12.53
4	0.1212	3.7920	3.84
5	0.0974	-	-

Source: Author's computation

The variables have two cointegrating equations. Therefore, the null hypothesis of no cointegration is rejected at the 5 per cent level. This also

means that the variables have a long-run relationship. The impact of government health expenditure on under-five child mortality was estimated using the OLS technique. The result is reported in Table 3.

Table 3. Estimates of the impact of government health expenditure on under-five child mortality

CM	Coefficients	Standard Errors	t-stat	P-value
GFCF	1.7519	0.2110	8.30	0.000
RCEXP	-0.5100	0.1815	-2.81	0.000
CEXP	-0.6802	0.4147	-1.64	0.111
GHEXP	-0.2016	0.1440	-1.40	0.169
Constant	103.8768	9.4659	10.97	0.000
R-Squared		0.7042		
Adj. R-Squared		0.6694		
F (3, 34)		20.23 (p = 0.0000)		
Durbin-Watson d-statistic (5, 39)		2.3847		
Breusch-Godfrey LM chi2		2.203 (0.2601)		

Source: Author's computation

An increase in government health expenditure leads to a 0.20% insignificant decrease in under-five child mortality. The insignificant impact of government health expenditure on under-five child mortality means that government health expenditure does not significantly reduce child mortality. The negative coefficient, however, showed prospects that if health expenditure is appropriately allocated and judiciously utilized, it can significantly reduce under-five child mortality.

Gross fixed capital formation has a positive and significant impact on under-five child mortality. In specific terms, an increase in the Gross fixed capital formation results in a 1.75% significant increase in under-five child mortality. This means that domestic investment increases child mortality. This also means that investments are not meanly on health, therefore, resulting in deterioration of the health sector and child mortality.

Government recurrent expenditure has a negative and significant impact on under-five child mortality. Specifically, an increase in government recurrent expenditure leads to a 0.51% decrease in under-five mortality. This implies that government recurrent expenditure significantly reduces under-five child mortality.

Government capital expenditure has a negative and insignificant impact on under-five mortality. An increase in government capital expenditure brings about a 0.68% insignificant decrease in under-five mortality. This implies that government capital expenditure does not significantly reduce under-five child mortality. It could be possible that capital expenditures are not efficiently allocated and/or not sufficient to develop medical facilities that will reduce child mortality.

The R^2 coefficient is 0.7042. This means that the independent variables explain about 70.42 per cent change in under-five child mortality in Nigeria. The F-value is 20.23 with a p-value of 0.0000. This means that the independent variables have a joint significant effect on under-five mortality. The Durbin-Watson d-statistic is 2.3847, which is approximately 2. Therefore, the null hypothesis of no autocorrelation is accepted. Similarly, the insignificant Breusch-Godfrey LM Chi-square Statistics of 2.203 (p = 0.2601) means that the independent variables are not serially correlated.

Impact of Child Mortality on Economic Growth

The cointegration test was carried out to show the existence of a long-run relationship between the variables in the equation for objective two. The Johansen test for cointegration was employed and the test result is reported in Table 4 below.

Table 4. Result of Johansen test for cointegration

Maximum Rank	Eigenvalue	Trace Statistics	5% critical value
0	-	78.6268	59.46
1	0.62155	42.6752	39.89
2	0.39832	23.8781*	24.31
3	0.31643	9.8026	12.53
4	0.15753	3.4602	3.84
5	0.08928	-	-

Source: Author's computation

The result showed two significant trace statistics. It means that the variables have two cointegrating equations. Therefore, the null hypothesis of no cointegration is rejected at the 5 per cent level. This as well means that the variables have a long-run relationship. The impact of child mortality on economic growth was estimated using the OLS technique. The result is reported in Table 5 below.

Table 5. Estimates of the impact of child mortality on economic growth

RGDP	Coefficients	Standard Errors	t-stat	P-value
CM	-0.1172	0.0238	-4.93	0.000
AGEXP	5.5100	6.3000	0.87	0.388
GFCF	0.3532	0.0496	7.12	0.000
INF	-0.0963	0.0331	-2.91	0.006
Constant	-2.7454	2.6771	-1.03	0.312
R-Squared		0.6849		
Adj. R-Squared		0.6479		
F (4, 34)		18.48 (p = 0.0000)		
Durbin-Watson d-statistic (5, 39)		1.5171		
Breusch-Godfrey LM chi2		2.184 (0.1395)		

Source: Author's computation

Child mortality has an inverse relationship with economic growth. An increase in child mortality leads to a 0.12% significant decrease in economic growth. This means that reduction in child mortality promotes economic growth. Reduction in child mortality will increase labour force growth and human capital increase, which is good for economic growth.

Gross fixed capital formation has a positive and significant impact on economic growth. An increase in the gross fixed capital formation results in a 0.35% significant increase in economic growth. Meaning that domestic investment significantly promotes economic growth.

There is a positive impact of government aggregate expenditure on economic growth. Specifically, an increase in government aggregate expenditure leads to a 5.51% insignificant increase in economic growth. This implies that government aggregate expenditure does not significantly reduce economic growth. However, with the positive coefficient, it means that there is the prospect of enhancing economic growth.

For inflation, the study showed a negative coefficient of -0.0963 with a significant t-value of -2.91. In order words, inflation has a statistically significant impact on economic growth. An increase in inflation leads to a 0.10% significant decrease in economic growth.

The R^2 coefficient is 0.6849. This means that the independent variables explain about a 68.49% change in economic growth in Nigeria. The F-value is 18.48 with a p-value of 0.0000. Therefore, the null hypothesis that the independent variables have no joint significant impact on the dependent variable is rejected. The Durbin-Watson d-statistic is 1.5171, which is approximately 2. Therefore, the null hypothesis of no autocorrelation is

accepted. Similarly, the insignificant Breusch-Godfrey LM Chi-square Statistics of 2.184 (p = 0.0000) means that the independent variables are not serially correlated.

5. Discussion

Public health spending, child mortality and economic growth in Nigeria have been examined. Based on the findings, it is concluded that government health expenditure does not significantly reduce under-five child mortality. Government capital expenditure has a negative and insignificant impact on under-five mortality, while government recurrent expenditure has a negative and significant impact on under-five mortality. Gross fixed capital formation has a positive and significant impact on under-five child mortality. Government aggregate expenditure and health and recurrent expenditure has positive and insignificant impact on economic growth. But child mortality, government capital expenditure and domestic investment have a positive and significant impact on economic growth. Also, high inflation is detrimental to the economy. Policymakers should pay closer attention to the health sector by increasing its yearly budgetary allocation to the sector. We recommend 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 but rather on implementing a public finance system that is good enough to extend and possibly link particular expenditure and revenue decisions and ensure appropriate usage of the allocated fund as transparently as possible. Provision of 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.

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