Government Health Expenditure and Health Outcomes in Nigeria

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Abstract
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. Therefore, this study is set out to investigate the impact government health expenditure on infant mortality, maternal mortality, and life expectancy in Nigeria; using data from World Development Indicator, (2021) and World Health Organization Global Health Estimates Data (2020), the study avails the 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. Therefore, 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. Environmental pollution should also be curtailed to ensure healthy population and increase in life expectancy of the populace.

Keywords: *Public health expenditures, Health Outcomes*

JEL Classifications: *H51, I15*

Introduction

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. Studies have established that improvement in health care is an important prerequisite for enhancing human capital development. Siddiqui, Afridi and Haq (1995) observed that improvement in the health status of a nation creates an outward shift in the labour supply curve; thus increased productivity of labour with a resultant increase in investment in other forms of human capital. 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, 2007). 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).

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). According to Omeruan et.al (2009), 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). 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 life expectancy at birth and infant mortality rates as health outcomes. This study deviates from existing studies by considering life expectancy at birth, infant mortality rate, and maternal mortality rate as health outcomes. It is a conventional wisdom that most developing countries are smarting with poor health outcomes in spite of huge investments in the sector by governments, development partners and other global stakeholders. This poor health outcomes is a problem of great concern to this study, little is known about the magnitude and dimension of mis-match existing between health spending and health outcomes particularly in many developing countries including Nigeria. This current study is an attempt to provide empirical evidence-based relationship between Government Health Expenditure and Health outcome in the case of Nigeria using recent published data from two compatriot organizations, the World Bank and the World Health Organization.

The rest of the paper is organized into four sections. Section two covers review of literature while section three contains the methodology. Section four is pre-occupied with results and discussion of results, and section five concludes the study.

Literature Review

Studies are replete with works on the relationship between public expenditure and health outcome, Tatjana *et al.* (2018) examine the link between government expenditures and health outcomes in Ghana, to establish whether government intervention in the health sector improves outcomes. The study covers 1980-2014 and employs ordinary-least squares (OLS) and two-stage-least squares (2SLS) estimators to determine the impacts of government expenditures on health

outcomes in Ghana. The study found a significant improvement on life expectancy with increase in government health expenditure. Adewunmi et al. (2018) adopted the ordinary-least squares (OLS) methodological approach to examine health expenditure and health outcomes in Nigeria, with emphasis on both public health expenditure and private health expenditure. The authors concluded that government health expenditure has a positive effect on neonatal mortality rate, child mortality rate and infant mortality rate while private health expenditure has a negative effect on neonatal mortality rate, child mortality rate and infant mortality rate. Similarly, Mohammed et al. (2018), using the panel fixed and random effects model analysed the nexus between health care expenditure and health outcome in the SARC-ASEAN region and found that total health expenditure, public health expenditure and private health expenditure significantly reduced infant mortality rates. Also, Richardson et al (2017) concluded established a long-run relationship between public health expenditure and health outcome in Nigeria.

Ahmed and Hasan (2016) analysed the effect of public health expenditure and governance on health outcomes in Malaysia using data from 1984-2009. The bounds test results indicate a stable, long-run relationship between health outcomes, level of income, public health spending, corruption and government stability. The results also reveal that public health expenditure and corruption affect long and short-run health outcomes. To improve the quality of life in the country, the study emphasized the importance of health programmes while reducing or eliminating the corruption rate in the country. Abbas (2010) described health as one of the basic capabilities that generates economic freedom. This was empirically tested by estimating the role of different macroeconomic and policy relevant factors affecting public health spending and health status in Pakistan over time and attempted to see the likely impact of health-related variables like health status and per-capita calorie availability on economic development using health demand function and health production function. Contrary to the estimates obtained for most of the industrialized countries, income elasticity of public health expenditures was less than unity while the short-run elasticity was negative. The co-integration and Granger-causality analyse show that per-capita health expenditure is negatively related to infant mortality rate and positively related to female life expectancy.

Boachie and Ramu (2015) examined the relationship between public health expenditure and health status in Ghana, employing standard OLS and Newey - White estimation techniques. After controlling for real-per-capita income, literacy

level and female participation in the labour market, the study found evidence that the declining infant mortality rate in Ghana was explained by public-health spending among other factors. Thus, they concluded that public healthcare expenditure is associated with improvement in health status through reduction in infant mortality. Barenberg, Basu and Soylu (2015) study the impact of public health expenditure on the infant mortality rate, after controlling for other relevant explanatory co-variables like per-capita income, female literacy, and urbanization. The study found that public expenditure on healthcare dampens infant mortality rate. The baseline specification shows that an increase in public health expenditure by 1% of state-level GDP leads to a decrease in the infant mortality rate by about 8%. The study also finds that female literacy and urbanization also reduce infant mortality rate. Anyanwu and Erhijakpor (2007) study health expenditures and health outcomes in Africa provided econometric evidence linking African countries' per-capita incomes as well as public health expenditures and per-capita income to infant mortality and under-five mortality with data from 47 African countries. Health expenditures were found to have a significant effect on infant mortality and under-five mortality. The results suggest that for African countries, total health expenditures are an important contributor to health outcomes. In addition, infant and under-five mortality were found to be positively related to health outcomes for Sub-Saharan Africa. The reverse is true for North-Africa where ethno-linguistic fractionalization and HIV prevalence positively affect health outcomes while higher numbers of physicians and female literacy reduce these health outcomes.

Akinci et al. (2015) on the impact of healthcare expenditures on selected health outcomes for 19 countries in the Middle-East and North-Africa region with panel data for 1990-2010 estimated the impact of government and private healthcare expenditures on infant, under-five and maternal mortality rates. The results show that, government and private spending on healthcare significantly improve infant, under-five, and maternal mortality in the region. In specific terms, a percentage increase in per capita government expenditure reduces the infant mortality rate by 8.6-9.5%, under-five mortality by 10.3-12 %, under-five deaths and maternal mortality by 26.0-26.3%. In the same vein, a percentage increase in the log per capita private expenditures reduces the infant mortality rate by 7.2-8.1%, under-five mortality rate by 9.5-9.8% and the maternal mortality rate by 25.8-25.9%. Matthew *et al.* (2015) did a study on government spending on health and its effect

on health outcomes in Nigeria from 1979 and 2012. The study made use of the Johansen Co-integration and the Vector Error Correction Model (VECM) estimation techniques to determine the long-run relationship between public spending on health outcomes in Nigeria. Also, Novignon *et al.* (2012) carried out a study on the effects of public and private healthcare expenditure on health status in 44 Sub-Saharan Africa countries, using panel data from 1995-2010. Fixed and random effects panel data regression models were used to determine the effects of healthcare expenditure on population health status. The results show that healthcare expenditure significantly influences health status through improving life expectancy, reducing death and infant mortality rates. Both public and private healthcare spending showed strong positive association with health status even though public healthcare spending had relatively higher impact. Therefore, the existing literature on the effects of health spending on health outcomes remains inconclusive.

Methodology

This study adopts the Grossman's (1972) model of health production to examine the effect of government health spending on health outcomes in Nigeria. Grossman (1972) posits that utility derived from the production and consumption of health is affected by healthcare expenditure and other commodities consumed by individuals. The health production function from the Grossman (1972) model can be specified as:

$$H = f(x) \quad (1)$$

Where H is a measure of vector of individual health output and X is a vector of individual inputs to the health production function. The elements of the X vector include government health expenditure *(GHE)* urbanization *(URB),* CO2 emission *(CO2)* and macroeconomic uncertainty *(MUN).* The elements of the H vector which represents the health outcome are life expectancy rate *(LER),* infant mortality rate *(IMR)* and maternal mortality rate *(MMR).* Grossman's (1972) theoretical health production function model was designed for analysis of health production at micro level. However, this study would analyse this production function at macro level. To switch from micro to macro analysis, without losing the theoretical framework the X vector were re-grouped into sub-sectoral vectors of economic (E), social (S) and environmental (ENV) factors as:

$$H = f(E, S, ENV) \quad (2)$$

In equation (2), E is government health expenditure *(GEH),* S is Urbanization *(URB)* and (*ENV)* is CO2 emission which captures environmental factor. Grossman (1972) emphasized that benefits of good health are greater for high wage workers so they demand higher optimal health stock, thus government expenditure on health should increase to reduce the cost of health inputs, thereby increasing optimal capital stock and finally increasing health outcome. Uncertainty in the macroeconomic environment was identified as a very important factor which influences the allocation of resources to the health sector. However, this justifies the inclusion of macroeconomic uncertainty *(MUN)* as one of the important variables used in the study. Sibhatu et al. (2019) also justified the need to examine the effect of environmental factors on the health outcome in his study on nexus between good governance, public health expenditures, urbanization and child under-nutrition in Ethiopia. Therefore, equation (2) can be explicitly stated as:

$$H = \beta_0 + \beta_1 GDP_t + \beta_2 GHE_t + \beta_3 URB_t + \beta_4 CO2_t + \beta_5 MUN_t + \varepsilon_t - - - -(3)$$

In equation (2), *H* is outcome which is proxy by life expectancy *(LER),* infant mortality *(IMR)* and maternal mortality *(MMR)* in the study. Others variables are income *(GDP),* government health expenditures *(GHE),* urbanization *(URB)* and macroeconomic uncertainty *(MUN).*

Data and Estimation Technique

The first analysis involves testing the stationarity of the individual variables under consideration. This is done using the Augmented Dickey-Fuller (ADF) unit root test. The tests are conducted with and without a deterministic trend (t) for each of the variables. The equation for the unit root test is thus:

$$\nabla Y_t = \alpha + \beta_t + \gamma Y_{t-1} + \delta \nabla Y_{t-1} + \cdots + \delta_{\rho-1} \nabla Y_{t-\rho+1} + \varepsilon_t \ - - - -(4)$$

Where $\boldsymbol{\alpha}$ is a constant, $\boldsymbol{\beta_t}$ the coefficient on a time trend and $\boldsymbol{\rho}$ $\boldsymbol{\rho}$ the lag order of the autoregressive process. By including lags of the order *p* the ADF formulation allows for higher-order autoregressive processes. This means that the lag length *p* has to be determined when conducting the test. The unit root test is then carried out under the null hypothesis $\boldsymbol{\gamma = 0}$ against the alternative hypothesis of $\boldsymbol{\gamma < 0.}$ If variables are found to be non-stationary at level, I(0), the variables are differenced

such that it would be stationary at first difference, I(1). If all variables are established to be stationary at first difference only, then error correction model (ECM estimates will be carried out. However, if the variables are of I(0) and I(1), the estimation technique will be Auto Regressive Distributed Lag Estimator (ARDL).

The co-integration test is done to test for a long-run relationship. The absence of co-integration suggests the absence of a long-run relationship between health outcomes and government health expenditure. A residual based test is used to establish a long-run relationship thus:

$$Z_t = Y_t - \theta X_t \quad (5)$$

Where θ is the co-integrating coefficient. This technique is necessitated due to the order of integration of the variables which are found to be I(0) and I(1). The ARDL model is a dynamic specification which includes lagged values of the dependent and explanatory variables as well as contemporaneous values of explanatory variables to estimate both long-run and short-run relations among several variables of interest. The error correction model (ECM) comes with a difference operator for the dependent variable, and the lag length is p-1 lag for the dependent variable and q-1 lag for the independent variable. This is because once the ARDL model is differenced, a lag will be lost. By applying ARDL technique, the unbiased long run estimates is obtained. The data for the study covers 1981 to 2019 and obtained from different sources. Table 1 and Table 2 show the measurement of data and description of data used in the study.

Table 1: Measurement of Data

Variables	Description	Source
LER	Life Expectancy Rate.	WDI, 2021
IMR	Infant mortality rate for Nigeria per 1000 people	WDI, 2021
MMR	Maternal Mortality rate	WHO Global health Estimate (GHS), 2020
MUN	Macroeconomic uncertainty proxy by changes in inflation rate	WDI, 2021
GHE	Government health expenditure proxied by government expenditure in the health sector.	CBN Statistical bulletin, 2019
ENF	Environmental factor proxied by CO2 emission.	WDI, 2021
GDP	GDP at constant US dollars.	WDI, 2021
URB	Urban population as a percentage of the total population	WDI, 2021

Source: *Authors' compilation*

Table 2 shows the descriptive statistics for infant mortality rate *(IMR),* gross domestic product *(GDP),* maternal mortality rate *(MMR),* carbon dioxide emission *(CO2),* consumer price index *(CPI) for* macroeconomic uncertainty, urban population *(URB),* infant mortality rate *(IMR),* government health expenditure *(GHE)* and life expectancy rate at birth *(LER)* for Nigeria from 1981-2019. According to Table 2, the maximum value of infant mortality rate *(IMR)* per 1000 live births was 125.7. The minimum value of infant mortality rate was 64.6 per 1000 live births. The mean value was 105.3 while the standard deviation was 21.4 per 1000 live births. The average value of *GDP* was about ₦229b. The maximum value for *GDP* was ₦464b while the minimum value was ₦108b. The average value for *MMR was 1,250.8 per* 100,000 births. The maximum value of *MMR* was 22,732 while the minimum value was 5,007. The average value for CO2 emission *(CO2)* was between about 70,467.01kt. The maximum value for *CO2* was 106,068kt while the minimum value was 35,199.53kt. The average value of consumer price index *(CPI) for MUN* was approximately 51.2%. The maximum value was 214.2% and the minimum value was 0.49%.

Table 2: Descriptive Statistics of the variables Used

	Obs	Mean	Std D	Max	Min
IMR	38	105.31	21.39	125.7	64.60
GDP	38	2.29	1.20	4.64	1.80
MMR	38	1250.8	50090	22734	5007
CO2	38	70467.0	24500.5	106068	35199.5
MUN (CPI)	38	51.19	58.71	214.23	0.49
URB	38	4658049	2273487	9452499	1711264
LER	38	45.29	6.42	52.6	32.9
GHE	38	5.91	8.30	2.58	2.58

Source: *Authors' computation*

Results and Discussion

Table 3 shows the unit root test results using the augmented dickey fuller (ADF) test and the Phillips-Perron (PP) test for the variables employed in this study. The ADF test indicates that all variables are stationary at first difference and *MUN* was stationary both at level and at first difference. Thus, there was absence of unit root at first difference and *MUN* is stationary both at level and at first difference. On the other hand, the Phillips-Perron test show that *GHE, MUN, MMR, GDP* and *CO2* are stationary at first difference while *IMR, LER, URB* are stationary both at first difference and at level.

Table 3: Augmented Dickey Fuller (ADF) and Phillips-Perron (PP) Test Results

Variables	Augmented Dickey Fuller (ADF)		Phillips-Perron (PP)		Order of Integration
	Level	1st Difference	Level	1st Difference	
PHE	0.5807	0.0000	0.7955	0.0001	**I(1)**
MUN	0.0150	0.0001	0.0734	0.0000	**I(0)**
IMR	0.1286	0.0016	1.0000	0.8484	**I(1)**
LER	0.1317	0.0023	1.0000	0.8570	**I(1)**
MMR	0.2747	0.0000	0.2682	0.0000	**I(1)**
GDP	0.9645	0.0074	0.9951	0.0074	**I(1)**
URB	0.9037	0.0000	0.3673	0.3461	**I(1)**
CO2	0.6898	0.0001	0.6782	0.0001	**I(1)**

Source: *Authors' computation*

Table 4 illustrates the trace test and the maximum Eigenvalue test statistic of the Johansen co-integration test for the variables used in this study. The Trace test and the Maximum Eigenvalue test statistic indicate the presence of at least five co-integrating equations because the probability values of each co-integrating equation was less than 5%. Since there is at least one co-integrating equation, the co-integration tests confirm the existence of a long-run relationship between the variables used in this study.

Table 4: Co-Integration Tests

Unrestricted Co-integration Rank Test (Trace)					Unrestricted Co-integration Rank Test (Maximum Eigenvalue)			
Hypothesized No. of CE(s)	**Eigen value**	**Trace Statistic**	**0.05 Critical Value**	**Prob**	**Eigen value**	**Max-Eigen Statistic**	**0.05 Critical Value**	**Prob**
None *	0.99	495.9685	197.3709	0.00	0.99	153.0063	58.43354	0.00
At most 1 *	0.94	342.9623	159.5297	0.00	0.94	88.81878	52.36261	0.00
At most 2 *	0.91	254.1435	125.6154	0.00	0.91	75.74707	46.23142	0.00
At most 3 *	0.87	178.3964	95.75366	0.00	0.87	65.12319	40.07757	0.00
At most 4 *	0.72	113.2732	69.81889	0.00	0.72	40.22678	33.87687	0.01
At most 5 *	0.61	73.04644	47.85613	0.00	0.61	29.95136	27.58434	0.02
At most 6 *					0.49	21.28397	21.13162	0.05
At most 7 *					0.42	17.30209	14.2646	0.02

Trace test indicates 5 co-integrating eqn(s) at the 5% level
**denotes rejection of the hypothesis at the 0.05 level*
Source: *Authors' computation*

Table 5 shows the autoregressive distributed lag results (ARDL) for infant mortality rate *(IMR),* life expectancy rate *(LER*) and maternal mortality rate *(MMR)* as health outcomes respectively. From the Table 5 income proxied by

GDP is positively related to *(LER*) but negatively related to *(IMR)* and *(MMR)*. This means that increase in incomes increase life expectancy but decrease infant mortality rate *(IMR),* and maternal mortality rate (MMR). Government health expenditure *(GHE)* is inversely related to infant mortality rate *(IMR)* and maternal mortality rate *(MMR)* but positively impacts life expectancy *(LER)*. This shows that, all things being equal, an increase in government health expenditure will reduce infant mortality rate but maternal mortality rate and increase life expectancy. *CO2* emission is inversely related to all indicators of health outcome. Hence, increase in carbon dioxide emission will adversely affects infant mortality, maternal mortality and life expectancy. Urbanization (URB) is positively related to infant mortality rate *(IMR),* life expectancy rate *(LER)* and maternal mortality rate *(MMR).* This suggests that increase in the rate of urbanisation improves *IMR, LER* and *MMR.* These results are not significant, but there must be a concomitant improvement in the health-care system with increase urbanisation for this to occur. Macroeconomic uncertainty (MUN) adversely affects infant mortality rate *(IMR),* life expectancy rate *(LER)* and maternal mortality rate *(MMR)* respectively. This means that uncertain macroeconomic environment such as high inflation which may disrupt the allocation of money to the health sector may increase maternal mortality rate maternal mortality rate (*MMR),* infant mortality rate *(IMR)* and life expectancy rate *(LER).* These results corroborate the findings of Barenberg, Basu and Soylu (2015), Ahmed and Hasan (2016) and Richardson et al (2017).

Table 5: Autoregressive Distributed Lag Estimation Results

	Dependent Variable: Log (IMR)		**Dependent Variable: Log(LER)**		**Dependent Variable: Log(MMR)**	
Variables	**Coefficient**	**Std. Error**	**Coefficient**	**Std. Error**	**Coefficient**	**Std. Error**
C	38.52885	59.81802	12.61192*	1.473491	15.70269*	2.023307
LOG(GDP)	-1.640327	3.74437	0.432369*	0.085742	-0.670964*	0.118147
LOG(GHE)	0.408325	1.027556	0.005688	0.024385	0.015341	0.031478
LOG(CO2)	-1.924536*	0.646185	-0.042601*	0.017977	-0.000899	0.042823
LOG(URB)	1.97772	9.808236	0.158964	0.227312	0.383681	0.290898
MUN (INF)	-2.207741	1.617112	-0.023027	0.045868	-0.177542	0.085368
R- squared	0.7491		R-squared	0.9813	R-squared	0.9680
Adjusted R-squared	0.7009		Adj. R-squared	0.9778	Adj. R-squared	0.9778
Durbin-Watson stat	1.9475		Durbin-W stat	1.9533	Durbin-W. stat	1.9328

Source: *Authors' computation*

Conclusion

This study examined the impact of government health expenditure on health outcomes in Nigeria using data spanning 1981-2019. Government health expenditure was found to positively impact infant mortality, maternal mortality and life expectancy. Macroeconomic uncertainty was found to adversely affect infant mortality, maternal mortality and life expectancy. Notably, the study found a long-run relationship between government health expenditure and infant mortality, maternal mortality, and life expectancy. Hence, government expenditure can be used to improve required health outcomes and ensure a more healthy population. Therefore, government should increase budgetary allocation to the health sector, ensure sustainable health financing and guarantee the prudent management of public health spending. Effective environmental regulation should also be put in place to curb the deterioration of public health due to environmental pollution.

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