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Public Healthcare Expenditure, Population Growth and Economic Development in Nigeria

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ABSTRACT: *This paper analyses the effect of health expenditure on economic development in Nigeria using yearly data from 1980 to 2019 on capital health, recurrent health expenditure, and population growth, sourced from the World Development Indicators, Central Bank of Nigeria (CBN) Statistical Bulletin, and the United Nation Development Report. Ordinary Least Squares (OLS), cointegration, and autoregressive distributed lag (ARDL) were used to estimate the model. The coefficient of capital health expenditure in the long run has a positive and significant sign, while recurrent health expenditure is negative for development, though insignificant in effect. Development responds positively to population growth variation in the short run too. The paper recommends that the Nigerian Government allocate more funds for capital healthcare expenditure to increase the pace of economic development.*

KEYWORDS*:* human development, public healthcare expenditure and population growth.

INTRODUCTION

Public spending on healthcare is a core indicator of socio-economic development, and an important component of ensuring equitable access to healthcare resources. The Millennium Development Goals entailed increased health spending for countries worldwide, but despite continually increasing health spending (e.g., from the 2006 figure of NGN 221.8 billion to NGN 313.7 billion in 2009), economic development remains sluggish. Furthermore, Nigerian health indices have worsened, despite the extensive efforts of the Federal Government to improve the health system. Nigeria's 2019 average life expectancy of 54.7 years is the lowest in West Africa, while the infant mortality rate of 59 per 1000 live births is the fourth highest, following Sierra Leone (77), Mali (63), and Benin (59) (UNICEF, 2019; United Nations, 2019). These poor outcomes are reflected in government officials seeking treatment in hospitals outside Nigeria, and the national public

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health system remains moribund due to an absence of political will and organizational capability rather than resource constraints *per se*.

Nevertheless, health spending is considered very low. Funds voted for capital health goods in recent years have been massive, including NGN 22.68 billion, NGN 28.65 billion, NGN 55.61 billion, and NGN 71.11 billion in 2015-2018 (respectively). About NGN 100 million was pencilled to purchase kitchen utensils and food in the 2017 budget, and NGN 850 million of the NGN 42 billion State House budget was voted for cooking utensils. Dr. Ehanire, of the Ministry of Health, said Nigerians spend USD 1 billion per year seeking treatment outside Nigeria (Nan, 2016). Low health spending signals that the Nigerian government sees the sector as unworthy of its investment, and a strain on lean resources. This raises concerns like whether capital health spending can support economic development; whether a link can be fostered between recurrent health spending and development in Nigeria; and whether population growth slows or quickens development in Nigeria.

This study seeks to answer to these questions, extending on the findings of previous studies, which mainly focused on the effect of health expenditure on economic growth, while few focused on economic development, using per capita income and infant mortalities as proxy of economic development (Babalola, 2015; Okeke, Mbonu, & Ndubuisi, 2018; Strittmatter & Sunde, 2011). Infant mortality is seen as a sluggish variable that does not respond quickly to adjustments in economic policies. In lieu of this, this study adopted the Human Development Index (HDI), as it incorporates economic and social indicators, with improvement in the index translating into reduction of economic and social anomalies.

REVIEW OF RELATED LITERATURE

Theoretical Studies

Wagner’s Theory of Public Expenditure (Wagner’s law) is one of the best known theories on public spending impacts in national economies, developed by Adolph Wagner (1835-1917), who posited that the public sector proportion of gross domestic product would continue to increase due to increased economic growth and complexity requiring expanded state regulation, urbanization entailing increased municipal costs, and public sector goods having “high income elasticity of demand” (Black, Hashimzade, & Myles, 2009). These observations concern the role of the state in industrialized modern economies, which have increased public expenditure as real income per capita rises due to normal economic growth. Wagner hypothesized that state expenditure outstrips output due to administrative and protectionist actions, state social activities, and welfare functions (Wagner, 1893).

Aside the Wagner’s theory, Grossman’s (1972) model of public spending studies health demand and medical care. The formalization of demand for health comes specifically from the conceptualization of health as a personalized capital good, dwindling with time, but its creation

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comes from investing in it. According to this model, the health demand function interacts with its production function to determine medical care demand. As a durable capital good, health is inherited but declines over time; investing in health via medical care and other healthcare resources thus incurs an immediate increase in health, which subsequently naturally deteriorates over time (without further investment). In a utility function, health is included directly as a good from which people derive pleasure, and indirectly as investment, making health available specially for tradeable, non-tradeable ventures. Health becomes good produced and consume by individual, with each knowing how to allocate his/her income and time. The time an individual can spend in economic, or leisure activity is the payoff of that investment (Atuahene, Yusheng, and Bentum-Micah, 2020).

These arguments were later reformed in the works of the neoclassical growth theorists. The neoclassical growth model of Solow (1956) gave birth to new thinking about economic growth. Solow's (1956) opinion was that labour force and capital do not define a country's economic size or potentiality, rather technological changes can explain why output varies, hence he included technological variation in his model. His position is one where labour (L), technology (A), capital (K) together cause dynamism in output. According to his model, states with sufficient labour and capital levels can produce more output with technological progress (Todaro & Smith, 2011).

Empirical Literature

There is a growing divide in economic literature regarding the actual impactful effect of public health spending on national economic development over the last five decades, with studies presenting inconclusive outcomes. For instance, Ye and Zhang (2018) studied 15 OECD countries and 5 developing countries using Granger causality testing and showed that unidirectional causality runs from economic growth to health expenditure in Portugal, India, Ireland, and Korea. They reported bidirectional causality in the OECD countries.

Atuahene, Yusheng, and Bentum-Micah (2020) estimated a dynamic panel model using GMM method from 1960 to 2019 and found that economic growth had a significant negative impact on health expenditure in China and India, and increasing CO2 emissions were found to influence health expenditure positively.

Ali and Ogeto (2020) investigated the effect of health expenditure on economic growth from 2000 to 2016 in 38 Sub-Saharan African countries. They used Generalized Method of Moments Instrumental Variable (GMM-IV) on panel data to find that both public and private health expenditure significantly improve economic growth in the region. However, Eggoh, Houeninvo, and Sossou (2015) also used GMM technique to estimate a dynamic model, and they found that health expenditure affected economic growth negatively in 49 African countries during the period 1996 to 2010. Conversely, they found that human capital stimulated growth in the studied countries.

Piabuo and Tieguhong (2017) used ordinary least square (OLS), fully modified OLS, and dynamic OLS to demonstrate that health expenditure has a positive and significant effect on economic growth in the Economic and Monetary Community of Central Africa (CEMAC) sub-region. Hlafa, Sibanda, and Hompashe (2019) used seemingly unrelated regression (SUR) model and least squares dummy variable (LSDV) to show that the influence of health spending on health outcomes is significant, but varies across the provinces of South Africa.

Using the fully modified ordinary least squares (FMOLS) technique, Boachie et al. (2014) found real gross domestic product (GDP), crude birth rate and life expectancy to be determinants of public health expenditure in Ghana. Adewunmi, Acca and Afolayan (2018) examined the impact of government health expenditure on health outcomes in Nigeria. The result shows that government health expenditure per capita have positive relationship with neonatal mortality rate, child mortality rate and infant mortality rate in Nigeria. Private health expenditure, number of physicians, and life expectancy show a negative relationship with neonatal, infant, and child mortality rates in Nigeria.

David (2018) empirically examined public health expenditure and infant mortality in Nigeria using Autoregressive Distributed Lag (ARDL) bound testing approach to cointegration and granger causality technique to analyse relevant data from 1980 to 2016. The results reveals bi-directional causal relationship between government expenditure and infant mortality. The results indicate negative relationship between government health expenditure, private health expenditure, external health resource and immunization, and infant mortality, in both the long and short run. Ogunjimi and Adebayo (2018) used Toda-Yamamoto causality method on annual data from 1981 to 2017 to demonstrate a unidirectional causality running from health expenditure to infant mortality; a unidirectional causal relationship running from health expenditure and real GDP to life expectancy and maternal mortality; and a unidirectional causal relationship running from real GDP to health expenditure. Onisanwa (2014) disclosed a bidirectional relationship between health expenditure and gross domestic product in Nigeria.

Babalola (2015) investigated the impact of fiscal policy on economic development in Nigeria for the period from 1981 to 2013, using the duo techniques of cointegration and vector error correction model (VECM). In the long and short run, the study agreed with Matthew and Adegboye (2014), reporting that government recurrent expenditure and government investment exert significant positive influence on real capita per income. Capital expenditure was observed to have positive influence only the short run.

Okeke, Mbonu, and Ndubuisi (2018) examined the effect of tax revenue on economic development in Nigeria from 1994 to 2016 using the cointegration technique, the vector error correction model, and the Granger approach. A long-run relationship between the variables was confirmed using the Johansen cointegration test: the estimated results show that tax revenue influences economic development significantly.

Ibe and Olulu-Briggs (2015) investigated the impact of public health expenditure on economic growth in Nigeria between 1981 and 2013. Their OLS results corroborated Bakare and Sanmi (2011) in determining a significant and positive long-run relationship between public health expenditure and economic growth. A unidirectional causality between economic growth proxied by GDP and all public health variables in the model was reported, contrary to the finding of Odubunmi, Saka, and Oke (2012), who reported a negative relationship between health expenditure and economic growth. Using similar method, Ilori and Ajiboye (2015) found that gross capital formation and total health expenditure positively affect the level of economic growth in Nigeria, while life expectancy rate exerts a negative statistical impact on growth.

MATERIALS AND METHODS

Data Sources

Secondary annual data for the years 1980 to 2019 was used in this analysis. It was sourced from the World Bank's World Development Indicators (WDI), CBN Bulletin, and United Nations Development Report 2019.

Model Specification

Theoretically, our model for this work is based on Solow's (1956) growth model, and it also borrows from Odubunmi, Saka, and Oke's (2012) model expressed model as:

$$RGDP = f(K, L, H, AD)$$

Where RGDP is real GDP, K is total saving, L is labour force, H is healthcare expenditure, and AD is foreign aid.

In multiplicative nature, our model is:

$$HDI = \beta_0 CHE_t^{\beta_1} RHE_t^{\beta_2} POPR_t^{\beta_3} \varepsilon^{\mu_t} \quad (1)$$

Where HDI is Human Development Index (the proxy for economic development), CHE is Capital Government Health Expenditure, RHE is Recurrent Government Health Expenditure, and POPR is Population Growth Rate.

The log linear of 3.1 is:

$$HDI_t = \beta_0 + \beta_1 lnCHE_t + \beta_2 lnRHE_t + \beta_3 lnPOPR_t + \mu_t \quad (2)$$

Where β_0 is intercept, β_1- β_3 are estimated coefficients, and μ_t is stochastic term.

We expect that β_1- $\beta_2 > 0; \beta_3 < 0$.

Equation (2) was later analysed using descriptive statistics and the framework of the autoregressive distributed lag (ARDL) model. This revealed the short- and long-run nature of connection existing among the series. We use the ARDL method, since our series were of I(0) and I(1).

The problem one encounters using economic and financial data that is unstable in level is unreliable or spurious estimates. This can be addressed by understanding how the series behaves, by using unit testing. We conducted unit root testing for our work following the augmented Dickey-Fuller (ADF) method, complimenting it using results of Phillip-Perron (PP) test, followed by cointegration test. Where two I(1) processes are merged and give an error of I(0) process, those merged series have a similar long-run trend. Expressed another way, two univariate process have equilibrium binding them if:

$$\Omega_1 y_t + \Omega_2 x_t \sim I(0) \quad (3)$$

We checked whether a similar long-term trend is visible among our series using the bound test prescription of Solow's (1956) since our series were of I(0) and I(1).

RESULTS AND DISCUSSION

Descriptive Statistics

The 40-year average human development index (HDI) was 0.474350, while recurrent health expenditure (RHE) averaged NGN 71.74834 billion. From the averages information, it is clear that average Nigerian government spending on capital health infrastructure differs markedly from its recurrent health spending. We get the highs of series from maximum figures and lows from minimum figures. Table 1 shows the peak HDI of 0.5390 and the minimum of 0.3780. For health spending, the highest amounts spent on capital and recurrent health items were NGN 103.7836 billion and NGN 388.3671 billion, respectively, while the minimum corresponding values were NGN 0.05 billion and NGN 0.041315 billion. Table 1 shows that RHE had the highest standard deviation of 102.5008. These findings indicate inconsistency in healthcare spending during the studied period. From the data in Table 1, skewness is positive for HDI (0.171701), CHE (1.377504), RHE (1.421660), and POPR (0.835442); their means and medians exceed their modes. The series are leptokurtic, with kurtosis values above 3 for HDI, (4.516712), CHEM, (3.765061), RHE, (3.993629), and POPR (4.127533). Conversely, the series capital health expenditure, recurrent health expenditure, and population growth rate are not normally distributed. Only HDI is distributed normally, having probability value for the Jarque-Bera statistics of 4.030567 is 0.133283.

Table 1: Descriptive Statistics

	HDI	CHE	RHE	POPR
Mean	0.474350	23.74792	71.74834	2.58842
Median	0.461000	7.850000	15.92843	2.58612
Maximum	0.539000	103.7836	388.3671	2.84925
Minimum	0.378000	0.050000	0.041315	2.48879
Std. Dev.	0.030694	31.98482	102.5008	0.07843
Skewness	0.171701	1.377504	1.421660	0.83544
Kurtosis	4.516712	3.765061	3.993629	4.12753
Jarque-Bera	4.030567	13.62565	15.11961	6.77197
Probability	0.133283	0.001100	0.000521	0.03384
Observations	40	40	40	40

Source: Authors' Computation (2021)

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Unit Root Test

Table 2 shows the critical values of ADF and PP test and the times we differenced the series. The Schwarz information criterion determined the lag length the ADF used. The PP test served for robustness check to verify our ADF result. The two tests have series is stationary as the null hypothesis. This hypothesis is rejected when the ADF and PP calculated values are above the 5 percent critical values (absolutely). In level, the HDI, CHE, and RHE all have unit root. We got the same outcome from applying the ADF and PP tests. POPR was stationary in level after applying both tests. We then followed this by differencing the series we discovered were non-stationary. From the figures of Table 2, the differenced series turned stationary applying the ADF test. We confirmed this using the PP test. Our verdict is that the variables are a mix of I(0) and I(1). Following this, we use bound test to check if similar trend is observed in the long term.

Table 2: Result of Unit Root Test

	Augmented Dickey-Fuller			**Phillip-Perron**			**Decision**
	Level	1ST Diff.	Critical Val. at 5%	Level	1ST Diff.	Critical Val. at 5%	
HDI_t	-2.6927	-14.4157***	-2.9411	-2.7457	-14.4157***	-2.9411	I(1)
$lnCHE_t$	-0.4379	-6.3662***	-2.9411	-0.4171	-6.3628***	-2.9411	I(1)
$lnRHE_t$	-1.4159	-10.2938***	-2.9411	-1.0045	-19.6186***	-2.9411	I(1)
$lnPOPR_t$	-6.1106***	-	-2.9604	-3.5159**	-	-2.9389	I(0)

Note:***, **, ***** denotes the rejection of null hypothesis of unit root at the 10%, 5% and 1% significance levels respectively. The lag length selection throughout this research is based on Schwarz Information Criterion (SIC).
Source: Authors' Computation (2021)

Cointegration Test Result

The determination of the long-run relationship follows the test approach of which is unstringing like Johansen and Juselius (1990), relying on f-statistics. Its null hypothesis is no level association. We reject this only when the f-statistics is above the 5 percent upper bound value. Our test is deemed inconclusive if the f-statistics sandwiches the lower and upper bound values. Table 3 shows f-statistics of 6.071806, above 4.35 (the upper bound value), thus the null hypothesis is rejected, while the alternative is affirmed. Consequently, HDI, CHE, RHE, and POPR have a common long-term trend, making them linearly combinable, with meaningful established relationship.

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Table 3: Result of Johansen Cointegration Test

Dependent Variable		F-statistics
$F_Y(Y/CE, RE, POPR)$ K = 3		6.071806***
Critical Value	I(0)	I(1)
1%	4.29	5.61
5%	3.23	4.35
10%	2.72	3.77

Note: Null hypothesis: No level relationship; *K* = number of regressors; *, **, and *** denote significance at 10%, 5%, and 1% level, respectively.
Source: Authors' Computation (2021)

Long-Run Model
Table 4 shows that CHE has a positive sign, as suggested by economic theory. This means that increasing capital health spending by one (1) percent increases HDI by 0.0102 percent. This result is satisfactory and consistent with theory, and it is confirmed by probability means its significant effect. Similarly, we see that the relationship between recurrent health expenditure and HDI is positive in the long run, also in agreement with the theoretical expectation, affirming previous studies' findings on the fostering influence of health spending (Adewunmi, Acca, & Afolayan, 2018; Ali & Ogeto, 2020; David, 2018; Ogunjimi, & Adebayo, 2018). It can be seen from Table 4 that a one (1) percent increase in health spending raises HDI by 0.0001 percent. This indicates that increasing health workers' remuneration can increase economic development. Even when recurring health spending is stimulated, it is not significant, corroborating previous studies (Adewunmi, Acca, & Afolayan, 2018; Babalola, 2015; Strittmatter & Sunde, 2011.
Population growth has a positive coefficient relative to HDI, contrary to theoretical expectations. The positive sign indicates that a one percent addition in population improves HDI by 0.5761 percent. From the figures shown in Table 4, the positive influence is significant.

Table 4: Caption

Variable	Coefficient	Standard Error	t-statistics	Prob.
$\boldsymbol{lnCHE_t}$	0.0102**	0.0035	2.8311	0.0087
$\boldsymbol{lnRHE_t}$	0.0001	0.0031	0.0573	0.9547
$\boldsymbol{lnPOPR_t}$	0.5761**	0.1042	5.5274	0.0000

Note: *, and ** denotes significant level at 5% and 1% respectively. Dependent variable: HDI
Source: Authors' Computation (2021)

Short-Run Model
The ARDL error correction results are shown in Table 5, indicating the dynamism of our series and the years the model takes to attain equilibrium. The r-squared value of 0.49 indicates that only 49 percent HDI variation is attributed to the three regressors CHE, RHE, and POPR. The remaining

51 percent comes from variables we omitted from the model. An instant influence on HDI is exerted by population growth. When we experience a population increase, current HDI deteriorates significantly; population growth experienced during the last three years is negative to current HDI. This depressing influence, from the table, is significant by 0.9628 percent. When we consider time, short-run values may not align or agree with long-term values of HDI. The model's ability to reconcile this and the time it takes is revealed by the error correction term. The value of ECM, being -0.4081, means it takes like three years to reconcile any short- and long-term value difference of HDI.

Table 5: Summary of ARDL Error Correction Model

Variable	Coefficient	Std. Error	t-Statistics	Prob.
$D(lnPOPR_t)$	-1.6982	0.4970	-3.4164	0.0020
$D(lnPOPR_{t-1})$	1.2704	0.8117	1.5651	0.1292
$D(lnPOPR_{t-2})$	0.0614	0.7646	0.0804	0.9365
$D(lnPOPR_{t-3})$	-0.9628	0.3986	-2.4155	0.0228
ECM_{t-1}	-0.4081	0.0785	-5.1947	0.0000
C	-0.0340	0.0070	-4.8272	0.0000
R-squared =0.49	Prob. (F-Stat) = 0.0007		Adjusted R-squared = 0.40	

Note: Dependent variable: $D(HDI_t)$
Source: Authors' Computation (2021)

Diagnostic Test Result
As shown in Table 6, our errors are independent of the next value, because the LM test result led us to rejecting the null hypothesis. To check the homoscedastic nature of errors, the Breusch-Pagan-Godfrey method was used. Homoscedastic is affirmed where it is impossible to do away with the null hypothesis. From the results presented in Table 6, the null hypothesis cannot be rejected; thus, our errors are homoscedastic. From Figures 1 and 2, both CUSUM and CUSUM of squares plot are inside the 5 percent bound, indicating the stability of the estimates and freedom from structural breaks.

Table 6: Post Estimation Results

	Test stat.	Prob.	Decision
Serial Correlation LM Test (residual not correlated)	1.0369	0.3693	Accept
Heteroscedasticity Test (residual is homoscedastic)	1.0388	0.4325	Accept

Note: Null hypothesis expressed in brackets
Source: Authors' Computation (2021)

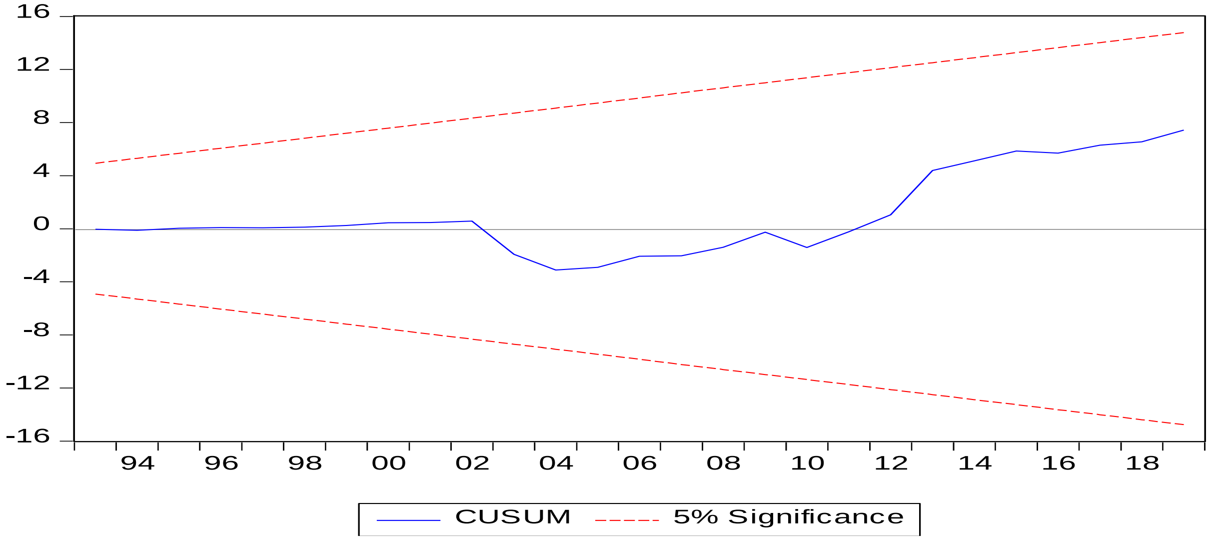

Figure 1: Plot of Cumulative Sum (CUSUM)
Figure 1:
Source: Authors' Computation (2021)

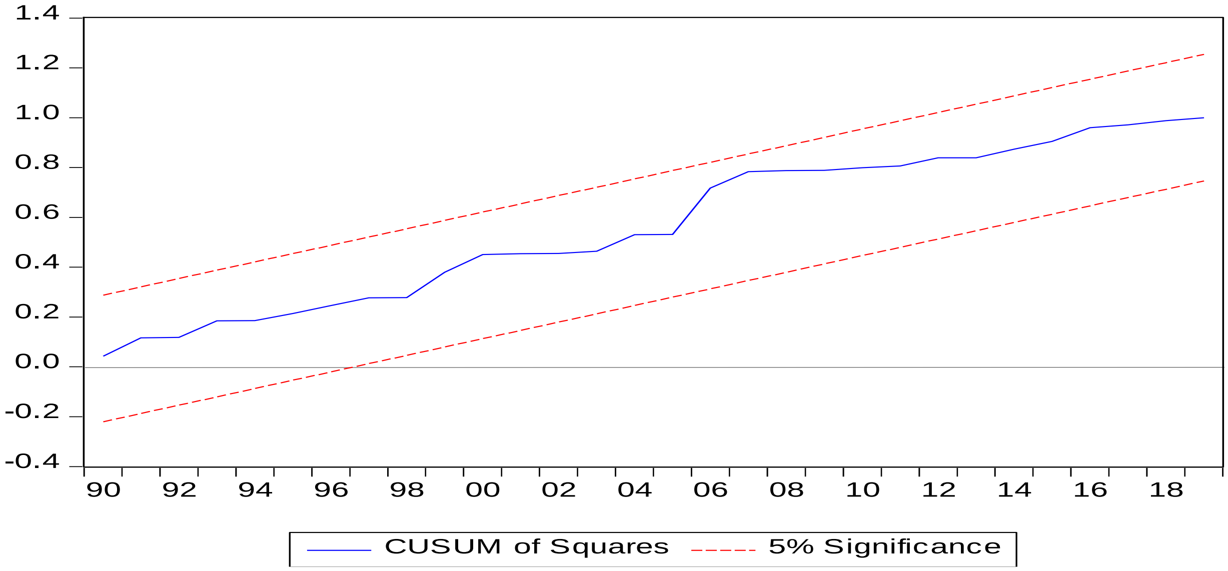

Figure 2: Plot of Cumulative Sum (CUSUM) of Squares
Source: Authors' Computation (2021)

CONCLUSION AND RECOMMENDATIONS

Reformist policies in Nigeria have sought to improve welfare, as reflected in the distinctive National Development Plans of successive regimes seeking to improve socio-economic

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development, and healthcare in particular. This examination has analysed the achievement of economic development relative to health spending and population size. The outcomes indicate that capital health spending supports economic development, and there is a significant influence of population growth on the latter. Consequently, health spending and population growth foster economic development. Based on the findings, the following recommendations are posited:

- Nigeria's fiscal authorities should vote more capital health spending for meaningful development to materialize. Huge spending on flagship infrastructure is eminent in the health sector, but health projects should be extended more to rural localities and flexible service provision networks, with a wholesale improvement in the availability of and access to required medical hardware and resources.
- Budgetary designation for capital use on health ought to be expanded to guarantee that fundamentals are available, and that health services are increasingly accessible.
- Our recommendation is to foster a moderately increasing population to guarantee energetic young Nigerians are available for production processes.

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