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ANALYSIS OF THE FACTORS AFFECTING THE SIZE OF PUBLIC HEALTHCARE EXPENDITURE IN NIGERIA

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ABSTRACT

Despite the Abuja Declaration of 2001, where the African Union heads of state pledged to allocate at least 15% of annual budgeted expenditure to the health sector, none of these countries including Nigeria has been able to honor that pledge. This study examines the factors influencing public healthcare expenditure in Nigeria from 1985 to 2022. Nigeria, despite having one of the largest populations in Africa and significant healthcare needs, has seen public healthcare expenditure that is insufficient to meet growing demands. This is particularly concerning given Nigeria's low life expectancy, high maternal and child mortality rates, and poor ranking on the Human Development Index. Drawing on Wagner's theory of public expenditure, this research explores the impact of income growth, healthcare prices, public infrastructure development, and population healthiness (measured by life expectancy) on public healthcare expenditure. Using time series data sourced from various publications, the study employs Augmented Dickey-Fuller and Phillips-Perron tests to ensure stationarity, followed by Johansen's co-integration test. An ordinary least squares (OLS) regression model is applied to estimate the effects of these variables on public healthcare expenditure. The findings show that public healthcare expenditure had a positive relationship to each of the explanatory variables, except life expectancy at birth, which showed a negative sign. The hypotheses tested also suggest that only price of healthcare impact on public healthcare expenditure is significant at 5% level. The study advocated for policies that would improve economic activities, reduce price of healthcare, improve infrastructural development, and increase life expectancy as measures that would ensure optimal size of public healthcare expenditure in Nigeria.

Keywords: Healthcare, public, budget, national income
JEL Classification Codes: H15, H13, P12, N15

1.0 INTRODUCTION

Healthcare is a necessity and a basic human need for mankind. Unfortunately, for most developing countries, the prospects of achieving even a minimal level of adequacy in health services and health remains a mirage, while healthcare needs are increasing, government expenditure on health in many developing countries, Nigeria inclusive, appears to be on

the decline. The burden of disease which is greatest in Africa relative to any other continent in the world is further worsened by poverty. The case of Nigeria is even more worrisome. The country is home to some 200 million people, the vast majority of whom live in abject squalor and dehumanizing poverty, in view of the fact of an evident and ever-increasing inequality in income distribution.

There is increasing empirical evidence that health is of high importance for economic growth and development. Literature on economic growth has clearly showed the role of health in influencing economic performance, at least at the micro level. It is suggested that, all things being equal, healthier workers are more likely to be able to work longer, be generally more productive than their relatively less healthy counterparts, thus able to secure higher earnings than sick workers. Babatunde (2012) posits that poor health infrastructure, illness and disease shorten the working life of people thereby reducing their life time earnings.

The foregoing notwithstanding, there are arguments in the extant literature that Africa has the lowest health expenditure. Government expenditure on health in sub-Saharan Africa has severally been described as being inadequate, insufficient, inequitable and unsustainable (Bokhari et al, 2006). This is despite the Abuja Declaration of 2001, where the African union heads of state pledged to allocate at least 15% of annual expenditure to health. Rising poverty levels, increasing scale of health problems, the impact of economic policies on structural adjustment and the recent Covid-19 pandemic have been identified as major contributory factors to the funding gaps between the healthcare needs and resources. This has resulted to the poor performance of Nigeria on the human development index (HDI), where it was rated 163 out of 191 countries (UNDP, 2022).

The consequences of inadequate health expenditure, which evidence suggests to be more severe among the disadvantaged groups especially women and children are further worsened by their disproportionately limited access to services, thus furthermore, reducing the benefit of already scarce resources these groups mostly needed. Latest figures from UNICEF (2022) showed a maternal mortality rate of 576 per 100,000 live births, the fourth highest on earth, and child mortality of 128 per 1,000 births. Furthermore, an average Nigerian is not expected to live beyond his or her 55th birthday. According to World Bank (2022) report, the average life expectancy of Nigerians was 55 years. This report ranked Nigeria 198th out of 202 countries studied. According to the human development report (2020), Nigeria's health condition is poor. One inhibiting factor is poor capital investment. This has been attested to by the poor health outcomes evidenced by high maternal and child mortality rates, and very low performance in human development index (HDI). This is despite what appears to be availability and accessibility to healthcare facilities. According to a survey report of the

Federal Ministry of Health (2021), Nigeria has about 39,440 healthcare facilities of which 85% are primary, 14.6% are secondary and 0.4% is tertiary. Of this number, 38% are owned by the private sector, which accounts for 60% of healthcare services in the country. The report also indicates that private out-of-pocket (OOP) expenditure on healthcare in Nigeria accounts for more than 60% of the estimated $10 per capita health expenditure. This indeed limits access to quality healthcare delivery in Nigeria.

In light of the foregoing, this study investigates the factors that influence public healthcare expenditures in Nigeria. It is specifically aimed at assessing the impact of income growth on public healthcare expenditure; analyzing the impact price of healthcare have on public healthcare expenditure; exploring the impact of infrastructural development (electricity consumption) on public healthcare expenditure; and examining the impact of degree of healthiness of the population (life expectancy) on public healthcare expenditure in Nigeria. The study would be an addition to the empirical literature by introducing a combination of variables which includes income growth, price of healthcare, infrastructural development, and life expectancy as the independent variables, using the method of ordinary least squares (OLS) to estimate the impacts of these variables on public healthcare expenditure in Nigeria.

2. REVIEW OF EMPIRICAL LITERATURE

A number of empirical studies have been conducted to determine the factors that impacts on public healthcare expenditure. The empirical literature review was done chronologically as follows:

A study by Fasoranti (2015) examined the determinants of government health expenditure in Nigeria between 1970 and 2012. The focus was on the determinant and the direction of causality between government health expenditure and the specified independent variables. Data collected from secondary sources were analyzed with the aid of descriptive statistics and the ordinary least square multiplier regression. Other tests employed were the Augmented Dickey-Fuller (ADF) unit root test, Johansen co-integration test and the pair-wise Granger causality test. The study found that all variables were stationary at level, and that long-run relationship existed between government health expenditure and the determinants. Furthermore, all the variables were positively related to government health expenditure except total population of age 14 and younger. The study found that literacy rate, share of health expenditures in the total government expenditures and consumer price index were significant factors in government health expenditures within the study period. On the other hand, per capita GDP, total population of age 65 and above, total population of age 14 and younger and life expectancy rate were found to be insignificant. The causality test showed the existence of uni-directional and bi-directional causality for some variables while for some others, there was no causality. The income elasticity was found to be

inelastic, showing that health is a necessity. The study recommended higher budgetary allocation to health services and higher premium to be placed on the health needs of the population aged 14 and younger. This study was conducted with variables and method different from the ones in our study.

Gunel (2018) analyzed the effects of youth population aged less than 15, life expectancy at birth and doctors providing direct care to patients on the health expenditure in Turkey during 1978 to 2013 period. Augmented dickey fuller and Phillips-Perron tests were employed to check whether the variables were stationary or not. Johansen co-integration test and VECM approach were employed to investigate the long-run dynamics and short-run relationship between health expenditure (HE) and youth population aged less than 15 (POPI5), life expectancy at birth (LIFEX), and doctors providing direct care to patients (DOCTORS). According to results, a unit increase in the POPI5 led to a 1.99 unit decrease in the HE in the long-run. A unit increase in the LIFEX led to a 0.37 unit increase in the HE in the long-run. A unit increase in the DOCTORS led to a 5.39 unit decrease in the HE in the long-run. The coefficient of error correction model, indicating the speed of adjustment to restore equilibrium in the dynamic model and how quickly variables converge to equilibrium, was equal to (-0.160506), which implies that more than 16 percent of disequilibrium in the previous year corrected in the current year. The study advocated for more engagement of health personnel, especially doctors, for more reduction in health expenditure in Turkey. The study differs in scope and variables to our study.

Raecissi et al (2018) investigated the determinants of healthcare expenditure in different healthcare systems. They studied 25 countries with different types of healthcare systems, including national health insurance, traditional sickness insurance, national health services, and mixed systems. Health expenditure per capita was estimated as a function of healthcare price, out-of-pocket health expenditure income, and other exogenous factors. A random-effect model was selected instead of a fixed-effects model based on the Hausman test to assess the effect of different factors on health expenditure using panel data. The result showed that income and healthcare price had the greatest impacts on health expenditures in countries with mixed healthcare system respectively. Among the variables, mortality and life expectancy had the greatest impacts on health expenditure in all types of the healthcare system. The out-of-pocket health expenditure had the most and least impacts on health expenditure in countries with mixed healthcare systems and countries with national health insurance systems, respectively. The study recommended identification of factors that mostly affect healthcare expenditure as critical for policy makers, for better future planning. The study differs in method with the present study.

Barkat et al (2019) examined the determinants of healthcare spending for 18 Arab world

countries for the period 1995 to 2015 by using recently developed panel co-integration techniques. They conducted the same estimation for 3 sub-samples, namely high-income, upper-middle, and lower middle income countries to reduce the heterogeneity among them. The empirical findings demonstrated that healthcare expenditure and its determinants were non-stationary, and revealed the existence of a long-run relationship among variables. The estimation which was done with pooled mean group (PMG) and common correlated effects (CCE) is not the only driver of health expenditure in the Arab world countries in the long- run. Other variables such as medical progress and ageing population are also playing an important role in the increase of healthcare expenditure with major policy implications for the region in the long-run. The results support that healthcare expenditure is a necessity good for the three income groups. Furthermore, the pair-wise Dumitrescu-Hurlin panel causality test showed evidence of a bidirectional causal relationship between healthcare expenditure and income for the full sample, as well as for the group income. This implies that increasing healthcare expenditure leads to a higher labour efficiency, economic growth, and a better quality of life. This study recommended that the improvement of health condition in the Arab countries should be a priority in their development policies. The study is different from our study in scope, variables and method.

Micah et al (2019) examined the trends and drivers of government health spending in sub-Saharan Africa from 1995 to 2015. The variables used in the study are national income, general government spending, development assistance for health, government tax revenue, perception of corruption In the public sector, time trend and population structure. Panel data were used on domestic government health spending in 46 countries in sub-Saharan Africa from 1995 to 2015, sourced from the institute for health metrics and evaluation. A regression model was used to examine the factors associated with government health spending, and Shapley decomposition was used to attribute the contributions of factors to the explained variance in government health spending. The findings showed that good governance, national income and the share of it that is government spending were positively associated with government health spending. The results from the decomposition, however, showed that individual country characteristics made up the highest percentage of the explained variation in government health spending across sub-Saharan African countries. The study recommended an understanding of a country's socio-political context as key to stimulating domestic government health spending. This study differs in scope variables and method to our study.

An empirical analysis of relationship between per capita health expenditure and economic growth based on Vector Autoregressive Model (VAR) in Mongolia was carried out by Bayarbet and Li (2020). The study was aimed at examining the dynamic correlation between per

capital health expenditure (PCHE) and economic growth in Mongolia, using the data from the period of 1993 to 2018. A vector Autoregressive (VAR) model was established between per capita gross domestic product (PCDP) and PCHE. Variance decomposition as well as impulse response function was used to analyze the dynamic relationship among variables. The results revealed that correlation was found between PHCE and PGDP with obvious one-way Granger causality. Moreover, the result showed that economic development had positive impact on PCHE growth for 1-3 (short term) years in Mongolia. However, the response of the two variables was gradually eradicated in the long-term by impulse response function. The contribution rate of PGDP on PCHE increased from 0% to 18.14% by six periods. The study recommended that Mongolian policymakers should not only increase the budget for health, but should also oversee the budget spending, increase the public health expenditure, and improve private health insurance system, which leads to the upgraded national health and can reduce personal health burden. The study differs from ours in scope, method and variables.

Ideh, Nenbee and Vite (2020) analyzed 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), co-integration, and Autoregressive Distributed Lag (ARDL) were used to estimate the model. The result showed that the coefficient of capital health expenditure in the long-run had a positive and significant sign, while recurrent health expenditure was negative, for development, though insignificant in effect. Development responded positively to population growth variation in the short run too. The study recommended that the Nigerian government should allocate more funds for capital healthcare expenditure to increase the pace of economic development. The study variables and method are different from our study.

Imandojemu et al (2020) investigated the relationship between health expenditure and economic growth in Nigeria from 1985 to 2019. Annual time series data were collected from central bank of Nigeria (CBN) statistical bulletin and the world development indicator (WDI). Stationarity, long run relationship, equation estimation and causality were determined using the Augmented Dickey Fuller (ADF), Johansen co-integration, Parsimonious Error Correction Mechanism (ECM) and pair-wise Granger causality test respectively. The result showed that a long-run relationship exist among the variables, while the ECM showed that in event of a disequilibrium, the system would restore itself to equilibrium at an adjustment speed of approximately 85.5 percent. The result uncovered that current and past percentage of health expenditure in total expenditure (PHETE), government final

consumption expenditure (GFCE), and labor force participation (LABF) all had direct impact on national growth (real GDP per capita), while current and past number of infant deaths (NUFD) had inverse relationship with national growth. The result further showed that there exist a unidirectional causality running from NUFD to RGDPPC; from GFCE to RGDPPC; from LABF to RGDPPC; from NUFD to PHETE; from LABF to PHETE; from NUFD to GFCE; and from NUFD to LABF. It was recommended that the federal government through the ministry of health should endeavour to encourage private-public partnership in the building of quality health infrastructure such as hospital with state of the art facilities in localities where standard healthcare centres are not accessible to working citizens.

Ndaguba and Hlotywa (2021) explored the impact of public healthcare expenditure on economic development in South Africa between 1996 and 2016. The variables of the study are Human Development Index (HDI), Public Health Expenditure (PHE), inflation (INF), population growth (POPG), and Unemployment (UNMP). The auto regressive distributed lag model, error correction model and time series data were adopted in analysing this impact. The findings demonstrated a positive relationship between PHE and HDI in South Africa. In addition, the relationship between CPI and economic development was insignificant; however, CPI mediates population growth. More so, mediating variables like inflation, unemployment and economic development had a negative relationship. The study recommended increased funding to the health sector for improved human development index in South Africa. The study is different from ours in scope, variables and method.

The determinant of public healthcare investment: co-integration and causality evidence from Pakistan was investigated by Saleem et al. (2022). The study empirically investigated the co-integration and causal relationship between healthcare expenditures (HCE), income, healthcare infrastructure (HCI), and healthcare services (HCS) in Pakistan from 1974 to 2017. Lee-Strazicieh and Clemente-Montanes-Reyes structural break unit root tests were employed in addition to standard unit root testing. The Bayer-Hank, Gregory-Hansen, and Hatmei-j co-integration tests consistently showed that HCE, income, HCI, and HCS are co-integrated. The short-run Granger causality inferences showed unidirectional causalities from HCE to HCL and HCS, from income to HCE, whereas bidirectional causality was observed between HCI and income, and between HCI and HCS. Similarly, long-run causality results showed unidirectional causality from income to HCE, from HCE, income, and HCS to HCI, and bidirectional causality between HCS and HCE. The study recommended that the government should play an obligatory role in healthcare financing, and must pay special attention to the equitable distribution of healthcare facilities, infrastructure, and services across Pakistan. The

study differs in scope, variables, and method to ours.

3. METHODS

3.1 Theoretical Framework and Model Specification

This study finds its basis on Wagner's theory of public expenditure, which states that public expenditure increases as national income rises. It predicts that the development of an industrial economy will be accompanied by an increased share of public expenditure in gross national product. Wagner's law suggests that welfare states evolve from free-market capitalism because the population votes for ever-increasing social services as income grows (Peacock & Scott, 2000). The important idea supporting this relationship is the fact that increases in public spending are an inevitable consequence of economic growth. This means that the share amount of public spending rises with an increase in the rate of output growth. Public health expenditure refers to the expenditure of federal, state, and local government in the health sector. It constitutes a significant part of government social spending and hence, government expenditure. The multiplier effect of increased public health expenditure may lead to an increase in total expenditures and aggregate demands. Wagner contended that government expenditure rise at a faster rate than the output of the economy. Firstly, demands for services such as health and education grow faster than the percentile income, which implies that citizens have an income elasticity of demand on these kinds of services that is greater than one. Secondly, to maintain an environment beneficial for economic progress, the state must increase its efforts and consequently its expenses in the sectors of law, protection and administration. Lastly, market failures such as monopolies, which might be the result of the need for high capital investment, cause expensive government interventions (Peacock & Scott, 2000).

This makes income growth a vital factor in determining public healthcare expenditure. The theory on the factor that influences public health expenditure continues to expand beyond income growth. Some of the factors that influence public expenditure on healthcare as suggested by theory include: the price of healthcare, the level of public infrastructural development, the tempo of economic activity in the economy, and the healthiness of the country's population. Theory suggests that public investment in healthcare would tend to be high when the price of healthcare is high and possibly rising. The government, with a view of dampening the high prices of healthcare services would respond by increasing public investment expenditure on healthcare facilities and services.

In addition to the foregoing, theory suggests that public investment expenditure on healthcare services should respond favourably to the level of activities in the economy. The theoretical proposition here is that a high and possibly rising level of economic activity is indicative of prosperity in business climate and conditions, which will tend to impact beneficially on all

sectors of the economy, the health sector inclusive. Prosperous business conditions will serve to increase the capacity of the government to increase investment in critical sectors of the economy, which includes the health sector. As such, the public health expenditure is expected to increase with increase in income growth.

Theory suggests too that the degree of healthiness of the country's population should be a critical factor influencing public investment expenditure on healthcare services. The reasoning here is that public investment expenditure on healthcare will tend to decline when the degree of healthiness of the country's population manifest by way of high and possibly rising life expectancy at birth.

It can be argued that the overall level of public infrastructural development is also a critical factor in accounting for public expenditure on healthcare. It is expected that public expenditure on healthcare would tend to decline with a high and appreciable level of public infrastructure development such as electricity consumption.

Deriving from the foregoing analysis, we specify a multivariate model to be tested in this study in a functional form as:

$$PHEXP = (GTRIY, PRHLC, PSTRD, L \quad (3.1)$$

In a form suitable for empirical testing, we specify equation 3.1 as:

$$PHEXP = \beta_0 + \beta_1 \text{gtriy} + \beta_2 \text{prhlc} + \beta_3 \text{pstrd} + \beta_4 \text{lxpct} + u \quad (3.2)$$

Where:

Phexp is public health expenditure,

Gtriy is the growth rate of income,

Prhlc is the price of healthcare,

Pstrd is the level of public infrastructural development, and

Lxpct is life expectancy, proxy for the degree of healthiness.

The presumptive sign of the coefficients as suggested by theory are:

$$\beta_0 > 0, \beta_1 > 0, \beta_2 > 0, \beta_3 < 0, \beta_4 < 0$$

3.2 Estimation Technique

The time series data for this study was tested for time series properties on the variables in the specification. This entailed testing the data for unit root in order to ensure consistency in subsequent regression estimates. In doing this we employed the Augmented Dickey-Fuller (ADF) and the Phillips-Perron tests in testing the null hypothesis of non-stationarity of the series. When stationarity was confirmed, we proceeded to test the variables in the specification for co-integration, using Johansen's co-integration test. Finally, we estimated an ordinary least squares (OLS) regression of public health expenditure on the arguments in the specification.

3.3 Data Sources and Measurements

The data for this study were obtained from several secondary sources, including publications of the World Health Organization, Central Bank of Nigeria's Annual Report and statistical Bulletin, as well as, publications of the National Bureau of Statistics. The data covered the period from 1985 to 2022.

Public healthcare expenditure is measured by the amount budgeted for healthcare expenditure by the Federal government.

Income growth is measured by individual per capital income.

Price of healthcare is measured by the cost of individual's medical expenses.

Infrastructural development is measured by electricity consumption.

Life Expectancy is measured by the expected lifespan of an individual from birth.

4. RESULTS' PRESENTATION AND ANALYSES

4.1 Summary of Descriptive Statistics

Table 1 presents the summary of the descriptive statistics i.e., the measures of central tendency which explains the extent of distribution of values of a variable around the mean, and measures of dispersion, which measures the tendency of values of a variable to scatter away from the mean. The measures include the Skewness and Kurtosis.

Table 1: Descriptive Statistics

	PHEXP	GTRIY	PRHLC	PSTRD	LXPCT
Mean	2.790583	4.234356	63.71539	112.1548	48.90308
Median	3.173936	4.230061	65.04916	104.6610	47.24200
Maximum	5.053609	15.32916	77.26952	156.7972	55.22100
Minimum	0.876209	-2.035119	41.46286	74.49062	45.84300
Std. Dev.	1.145782	3.861423	10.24174	27.09716	3.351277
Skewness	-0.151984	0.458945	-0.375798	0.159510	0.631783
Kurtosis	1.996025	3.397211	1.847673	1.530363	1.835557
Jarque-Bera	1.696391	1.542128	2.917996	3.486642	4.551815
Probability	0.428187	0.462521	0.232469	0.174938	0.102704
Sum	103.2516	156.6712	2357.469	4149.729	1809.414
Sum Sq. Dev.	47.26139	536.7811	3776.159	26433.23	404.3181
Observations	37	37	37	37	37

Source: Researchers' Computation using E-Views 10

Table 1 presents the descriptive statistics of the linear regression model variables of public health expenditure (PHEXP), growth rate of income (GTRIY), price of healthcare (PRHLC), level of public infrastructural development (PSTRD), and life expectancy (LXPCT). From the presented evidence in Table 1, the mean for the variables ranges from 2.79 to 112.15, that is, the mean/average values for public health expenditure to the independent variables. The range for the variables is the difference between the maximum and the minimum. For example, the range for public health expenditure is 4.17 while the range for growth rate of income is 17.37. The skewness statistics showed that public health expenditure (PHEXP) and price of healthcare (PRHLC) are negatively skewed while growth rate of income (GTRIY), level of public infrastructural development (PSTRD), and life expectancy are positively skewed. From the skewness results also, it can be concluded that there are no outliers in the distribution. The kurtosis statistics showed that the values of the data range from 1.53 to 3.40 suggesting that the

variables/data are normally distributed (mesokurtic). Finally, the Jargue-Bera statistic values of 1.54 to 4.55 agreed with skewness and kurtosis statistics that the variables/data used are normally distributed.

4.2 Correlation Matrix

The correlation matrix is carried out in support of the descriptive statistic results. The correlation matrix plays an important role in multi-variance analysis of this type of study since it captures the degree of relationship between the modelled variables.

Table 2: Correlation Matrix

Correlation	PHEXP	GTRIY	PRHLC	PSTRD	LXPCT
PHEXP	1.000000				
GTRIY	0.240181	1.000000			
PRHLC	0.848109	0.137144	1.000000		
PSTRD	0.588243	0.022696	0.706672	1.000000	
LXPCT	0.556431	-0.121635	0.718839	0.698979	1.000000

Note: Variables previously defined
Source: Researchers' Computation using E-Views 10

Each cell in the table shows the correlation between two specific variables. For example, the correlation between public health expenditure (PHEXP) and growth rate of income (GTRIY) is 0.24, which indicates that GTRIY is weakly related to PHEXP. Empirically, it implies that an increase in public health expenditure (PHEXP) will only lead to a 24 percent increase in growth rate of income (GTRIY). Interestingly, public health expenditure (PHEXP) is highly correlated with the price of healthcare (PRHLC) with a correlation value of 0.85. This implies that the cost or price of healthcare in Nigeria is highly associated with the government's health expenditure. A decrease in public health expenditure will lead to a decrease in the number of health facilities across the country leading to few well equipped private hospitals attending to high numbers of patients. Furthermore, both the level of public infrastructural development (PSTRD) and life expectancy (LXPCT) are positively associated with public health expenditure (PHEXP) with correlation values of 0.59 and 0.56 respectively. The correlation coefficients along the diagonal of Table 2 are all equal to 1 because each variable is perfectly correlated with itself.

4.3 Augmented Dickey Fuller, Phillips-Perron Unit Root Tests and Co-integration Results

The unit root test is carried out to find out if the variables are stationary or not over time. The essence of stationarity is for the mean and the variance of the data to be fairly constant to help the predictability of the model. Table 3 shows the unit root test for all the time series data using the Augmented Dickey Fuller (ADF) and Phillip Perron test.

Table 3: ADF and PP Unit Root Tests

Variables	5% CI	ADF Stat	Order of Integration	5% CI	PP	Order of Integration
PHEXP	-2.9484	-7.5310	I(I)	-2.9484	-7.6167	I(I)
GTRIY	-2.9458	-4.0489	I(0)	-2.9458	-4.1317	I(0)
PRHLC	-.2.9484	-6.6340	I(I)	-2.9484	-8.9020	I(I)
PSTRD	-2.9484	-7.2404	I(I)	-2.9484	-7.2245	I(1)
LXPCT	-1.6109	-2.0584	I(1)	-1.9503	3.1663	I(0)

Source: Authors' Computation using E-Views 10.

Table 3 shows that the variables were not stationary at levels. Then, all variables were differenced, and were found to be stationary at the 5% significance level. Since all the variables were stationary at different order of integration, it indicates the need for further treatment and analysis hence the need for co-integration test using F-Bounds test to check for existence of long or short run relationship of the equation. Table 4 presents the co-integration test results.

Table 4: F-Bounds Test

F-Bounds Test			Null Hypothesis: No levels relationship	
Test Statistic	Value	Signif.	I(0)	I(1)
			Asymptotic: n=1000	
F-statistic	8.197898	10%	2.2	3.09
K	4	5%	2.56	3.49
		2.5%	2.88	3.87
		1%	3.29	4.37
Actual Sample Size	33		Finite Sample: n=35	
		10%	2.46	3.46
		5%	2.947	4.088
		1%	4.093	5.532
			Finite Sample: n=30	
		10%	2.525	3.56
		5%	3.058	4.223
		1%	4.28	5.84

Source: Authors' Computation using E-Views 10.

The F-Bound test indicated the existence of long-run relationship among the selected variables of this study as the F-Statistic value of 8.19 was greater than both lower and upper bound values of 2.56 and 3.49 at 5% critical value. We therefore reject null hypothesis of no co-integration and conclude that there exists a long-run relationship among the dependent and independent variables. Given this outcome, the OLS regression technique was used to estimate the multivariate model. Table 5 presents the OLS result.

Table 5: Ordinary Least Squares Regression Result

Variable	Coefficient	Std. Error	t-Statistic	Prob.
GTRIY	0.009170	0.028029	0.327172	0.7457
PRHLC	0.130573	0.018139	7.198467	0.0000
PSTRD	0.000352	0.008578	0.041021	0.9675
LXPCT	-0.137783	0.077459	-1.778780	0.0848
C	1.130761	2.694281	0.419689	0.6775
R-squared	0.777947	Mean dependent var		2.790583
Adjusted R-squared	0.750190	S.D. dependent var		1.145782
S.E. of regression	0.572673	Akaike info criterion		1.848084
Sum squared resid	10.49453	Schwarz criterion		2.065775
Log likelihood	-29.18955	Hannan-Quinn criter.		1.924830
F-statistic	28.02744	Durbin-Watson stat		0.939301
Prob(F-statistic)	0.000000			

Source: Authors' Computation using E-Views 10.

The OLS result shows that all the explanatory variables except infrastructural development conformed to the apriori expectations of the model. The coefficient of determination (R^2) is 0.7779. This implies that the mix of regressors – growth rate of income (GTRIY), price of healthcare (PRHLC), public infrastructural development (PSTRD), and life expectancy (LXPCT) - in our model explained approximately 78% of the variations in the dependent variable. It therefore means that the other determinants of public health expenditure (PHEXP) not captured in the model explained 22% of the variations in public healthcare expenditure in Nigeria. The F-statistics is 28.02, which is greater than F_{tab}(2.69). Hence, we reject the null hypothesis and conclude that the model is significant because all the independent variables have influence on public health expenditure in Nigeria. However, the Durbin-Watson (DW) statistic is less than 2, which indicates positive autocorrelation in the residuals of the model. To address this issue of autocorrelation, this study employed the Newey-West standard errors.

4.4 Newey-West Standard Errors

These standard errors adjust for potential autocorrelation and heteroskedasticity in the residuals of the regression model. The adjusted standard errors account for potential serial correlation and non-constant variance in the errors, which can otherwise lead to biased and inconsistent standard errors (Smith & McAleer, 1994). The Wald test assesses the joint significance of a set of coefficients in the regression model with the null hypothesis that the coefficients are equal to zero. A p-value less than 5% (0.05) indicates the rejection of null hypothesis at 5% significance level. In other words, there is strong evidence to suggest that the set of coefficients being tested are jointly

significant. Newey-west standard error model is depicted as follows:

Dependent Variable: PHEXP

HAC standard errors & covariance (Bartlett kernel, Newey-West fixed bandwidth = 4.0000)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	1.130761	3.887438	0.290876	0.7730
GTRIY	0.009170	0.022560	0.406494	0.6871
PRHLC	0.130573	0.020548	6.354499	0.0000
PSTRD	0.000352	0.012117	0.029040	0.9770
LXPCT	-0.137783	0.119110	-1.156772	0.2559

R-squared	0.777947	Mean dependent var	2.790583
Adjusted R-squared	0.750190	S.D. dependent var	1.145782
S.E. of regression	0.572673	Akaike info criterion	1.848084
Sum squared resid	10.49453	Schwarz criterion	2.065775
Log likelihood	-29.18955	Hannan-Quinn criter.	1.924830
F-statistic	28.02744	Durbin-Watson stat	0.939301
Prob(F-statistic)	0.000000	Wald F-statistic	28.92342
Prob(Wald F-statistic)	0.000000		

Source: Authors' Computation using E-Views 10

Given the possible present of autocorrelation and heteroscedasticity in the previous model, Newey-West standard error technique was used as a means of adjusting the errors to be robust for heteroscedasticity and autocorrelation. From the result above, it was observed that Wald F-statistic is highly significant as the value is less than 5%. This implies that the standard error inference is robust to autocorrelation and heteroskedasticity. The p-value of the Wald test being less than 5% indicates that the variables included in the model are jointly significant. This suggests that they collectively have a significant impact on the dependent variable (Keifer et al, 2000). Given the significant result from the Wald test, it confidently indicates that the model's predictors such as growth rate of income (GTRIY), price of healthcare (PRHLC), level of public infrastructural development (PSTRD), and life expectancy (LXPCT) are important for explaining the variation in the dependent variable, public health expenditure (PHEXP). The adjustments for autocorrelation and heteroskedasticity further strengthen the validity of these results, ensuring that the standard errors used for hypothesis testing are accurate and reliable (Kaufman, 2013).

Table 7: Summary of t-test

Variables	t-calculated	t-tabulated	Conclusion
GTRIY	0.3271	1.96	Insignificant
PRHLC	7.1984	1.96	Significant
PSTRD	0.0410	1.96	Insignificant
LXPCT	-1.7787	1.96	Insignificant

Source: Author's computation

From the results obtained in the t-test, we observed that income growth has a t-value of 0.3271 which is less than the tabulated value of 1.96. Therefore, it is insignificant. This implies that for the period under study, 1985 -2022, income growth had no significant impact on public healthcare expenditure in Nigeria. Therefore, we accept the null hypothesis and reject the alternative hypothesis, and conclude that income growth has no significant effect on public healthcare expenditure in Nigeria. On the other hand, the calculated t-value of 7.1984 for the price of healthcare is greater than 1.96. This implies that PRHLC has significant impact on public healthcare expenditure in Nigeria. Thus, we reject the null hypothesis that price of healthcare has no significant impact on public healthcare expenditure in Nigeria for the period under study. We also observed from the results that infrastructural development has a t-value of 0.0410 which is less than 1.96. We accept the null hypothesis, which implies that infrastructural development had no significant impact on public healthcare expenditure in Nigeria for the period under study. Furthermore, life expectancy has a t-value of -1.7787 which is less than 1.96. This shows that for the period under study, life expectancy had no significant impact on public healthcare expenditure. We therefore accept the null hypothesis.

4.5 Discussion of Findings

This study was undertaken to analyse the factors affecting the size of healthcare expenditure in Nigeria from 1985 to 2022. The specific objectives of the study are to assess the impact of income growth on public healthcare expenditure in Nigeria, analyse the impact price of healthcare have on public healthcare expenditure in Nigeria, explore how infrastructural development impact on public healthcare expenditure in Nigeria, and examine the impact of life expectancy at birth on public healthcare expenditure in Nigeria. The study adopted ordinary least squares technique to check for empirical evidence. The results showed that income growth had a positive but insignificant impact on public healthcare expenditure in Nigeria. This result aligns with that of Thoa *et al* (2013), who found a positive impact of income growth on public healthcare spending in rural Vietnam. The results also showed a positive and significant impact of price of healthcare on public healthcare expenditure in Nigeria. This outcome agrees with the findings of Ideh et al (2020), who argued that price of healthcare accounts for

changes in public healthcare expenditure in Nigeria due to the fact that the federal and state governments in Nigeria traditionally set a portion of their annual budget for the public health sector based on cost of healthcare provision.

Infrastructural development was found to have a positive but insignificant impact on public healthcare expenditure in the period under study. This result is contrary to our a priori expectation of a negative impact. It might be reasonable to assume that the impact of electricity consumption was not felt due to the abysmal low level of electricity generation in Nigeria. Nigeria with a population of about 200million consumes less than 5000 megawatts of electricity, compared to about 40000 megawatts being consumed in South Africa with a population of about 60million people. The findings of this study, furthermore, show a negative but insignificant impact of life expectancy at birth on public healthcare expenditure in Nigeria. This result is in agreement with Nesrin et al. (2017), who found life expectancy as one of the major determinants of size of public spending on healthcare in 35 OECD countries. The authors argued that low life expectancy would put pressure on public healthcare spending, causing an increase in budgeted amount in order to remedy the situation.

This study thus concludes that increased budget allocation to the health sector needs to be done by both federal and state governments in the country to improve its current state so as to increase citizens' confidence in the public health sector in meeting their health needs.

The empirical results obtained have some useful implications for policy formulation regarding public expenditure on health in Nigeria. The empirical evidence suggests that policies that are implemented to spur growth in the economy would be beneficial to public investment on health expenditure. Also, policies that increase the price of healthcare would also lead to increase in public healthcare expenditure. In addition to the foregoing, the empirical results relating to the level of public infrastructural development calls for policy actions that are aimed at redressing the comatose state of infrastructural facilities in the economy. The findings showed that increase in infrastructural development (electricity consumption) would lead to increase in public healthcare expenditure. This is against the a priori expectation, and may be as a result of our electricity consumption being too low to make any impact. This implies that policies geared towards improvement in electricity generation may bring about a reduction in medical cost, as most of our hospitals depend on electricity generators. The empirical evidence with respect to the life expectancy at birth, a measure of the state of healthiness of the citizenry also calls for policy actions that are targeted at raising the life expectancy of the citizenry, which is mere 55 years at the time of this study.

5.0 CONCLUSION AND RECOMMENDATIONS

The problem stated in this study borders on Nigeria's poor health condition and poor capital investment in the health sector by the government. The study is generally aimed at investigating the factors that influence public health expenditure in Nigeria focusing on income growth, price of healthcare, level of infrastructural development and life expectancy at birth. This study is underpinned by the Wagner's theory of public expenditure, as the law of increasing state activity emphasizes that public expenditure increases as national income rises. The public health expenditure in Nigeria is not an exception to this law.

It was discovered in this study that income growth had a positive but insignificant impact on public healthcare expenditure in Nigeria for the period under study. It was also found that price of healthcare expenditure in Nigeria for the period under study had a positive and significant impact on public health expenditure. In addition, infrastructural development was also found to have a positive but insignificant impact on public healthcare expenditure in Nigeria during the period under study. Finally, life expectancy at birth was found to have a negative and insignificant impact on public healthcare expenditure in Nigeria for the study period. All the independent variables except infrastructural development conformed to their a priori expectations. The co-efficient of determination (R^2) showed that the mix of variables in our model explained approximately 78% of the variations in the dependent variable, leaving 22% for other determinants not included in our model.

The following recommendations have been made based on the findings of this study.

i. Improved economic activities in the economy: The federal and state governments should evolve policies such as duty waivers on capital goods, granting of credit facilities to small and medium enterprises, and tax holidays geared at creating and promoting enabling environment for investment, which would create more employment opportunities and increased economic activities.
ii. Reduction in price of healthcare: The federal government should ensure a drastic reduction in duties paid on imported medical equipment, while encouraging local production of pharmaceutical products at lower cost to ensure affordability by those in need of healthcare.
iii. Improvement on infrastructural development: Government at all levels should ensure adequate provision of primary, secondary and tertiary health facilities. Other infrastructural facilities to be improved upon include good roads, steady electricity supply, good source of water supply and other infrastructures, in order to reduce the amount spent on public healthcare.
iv. Increase in life expectancy at birth: Since it was found that an increase in life expectancy reduces government healthcare expenditure, government at all levels should enact

poverty reduction policies aimed at improving living standard in line with the sustainable development goals (SDGs) to ensure a higher standard of living and increase in life expectancy at birth.

5.1 Competing Interest

The authors declared that they have no competing interests.

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