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Health Expenditure and Poverty Reduction in Nigeria

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Abstract: *This study examines the relationship between health expenditure and poverty reduction in Nigeria, employing econometric regression techniques, specifically the Ordinary Least Squares (OLS) method, alongside preliminary stationarity and cointegration tests. Using secondary time-series data from 1999 to 2024 sourced from the Central Bank of Nigeria and the National Bureau of Statistics, the research investigates how variables such as health expenditure (HEX), population growth (POP), corruption (COR), life expectancy rate (LER), per capita income (PCI), HIV prevalence rate (HIV), and infant mortality rate (IMR) influence poverty levels (POV). The stationarity tests using the Augmented Dickey-Fuller (ADF) indicate that all variables are integrated at order one or two, with the ADF statistics exceeding critical values at 5%, confirming stationarity. Johansen cointegration tests reveal a long-run relationship among the variables, suggesting that these factors collectively influence poverty in Nigeria. The regression results show that health expenditure has a significant negative effect on poverty ($\beta = -4.543$, $p < 0.001$), implying that increased health spending effectively reduces poverty levels. Population growth ($\beta = 3.453$, $p < 0.001$) and corruption ($\beta = 3.176$, $p < 0.001$) positively impact poverty, indicating that rapid demographic expansion and high corruption hinder poverty alleviation. Conversely, life expectancy ($\beta = -9.461$, $p < 0.011$) and per capita income ($\beta = -0.649$, $p < 0.001$) exhibit significant negative relationships with poverty, confirming their roles in promoting economic well-being. HIV prevalence and infant mortality rate, however, are statistically insignificant, suggesting their indirect or mediated effects. The model explains approximately 96.7% of the variance in poverty, with an F-statistic of 114.31 ($p < 0.001$), confirming its robustness. Based on these findings, the study recommends increasing and efficiently targeting health expenditure, implementing population control strategies, strengthening governance, and fostering economic growth to effectively reduce poverty in Nigeria. The results show the importance of integrated policies that address demographic, health, and governance factors to achieve sustainable poverty reduction.*

Keywords: *Health Expenditure, Population Growth, Corruption, Life Expectancy Rate, Per Capita Income, Hiv Prevalence Rate, Infant Mortality Rate, Poverty Reduction, Econometric analysis*

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INTRODUCTION

The relationship between health expenditure and poverty reduction in Nigeria is a complex and multifaceted issue rooted in the country's historical, socioeconomic, and political context. Nigeria, Africa's most populous nation, has faced persistent challenges related to health disparities, economic instability, and high poverty rates since its independence in 1960. Historically, the Nigerian healthcare system has been characterized by inadequate funding, inefficient resource allocation, and a significant reliance on out-of-pocket payments, which have culminated in poor health outcomes and entrenched poverty among vulnerable populations (Akin et al., 2020). The government's expenditure on health has traditionally been below the World Health Organization's recommended threshold of 5% of gross domestic product (GDP), reflecting a neglect of the health sector that hampers efforts to improve population health and economic well-being (WHO, 2021). This underfunding has perpetuated a cycle where poor health outcomes diminish individuals' capacity to participate effectively in economic activities, thereby exacerbating poverty levels across the country. The impact of health expenditure on poverty reduction is well substantiated in literature, which indicates that investments in health significantly influence economic development and social equity. Adequate health spending can reduce disease burden, improve productivity, and foster human capital development - factors critical for breaking the cycle of poverty (WHO, 2020; Onugu & Okoli, 2012; Olise, Anigbogu, Okoli. & Anyanwu, 2013). In Nigeria, where a large proportion of the population lives on less than $1.90 per day, health-related expenses often push families further into poverty, especially considering Nigeria's high out-of-pocket health expenditure, which accounts for over 70% of total health spending (WHO, 2021). Consequently, insufficient health expenditure not only hampers access to quality healthcare but also sustains high rates of morbidity and mortality, which are both causes and consequences of poverty. The bidirectional relationship shows the importance of strategic health investments as a pathway toward poverty alleviation, emphasizing that health expenditure is not merely a social service but a vital economic investment.

Several factors influence the dynamics of health expenditure and poverty reduction in Nigeria, including population growth, corruption, life expectancy, per capita income, HIV prevalence rate, and infant mortality rate. Nigeria's population has been growing rapidly, with an annual growth rate of approximately 2.6% (World Bank, 2022; Olise, Anigbogu, Edoko & Okoli, 2014), which puts additional pressure on existing health infrastructure and resources. High population growth often correlates with increased demand for health services, thereby escalating health expenditure needs, especially in a context where government funding remains limited (Onokerhorayen & Omenka, 2021). Corruption further complicates this situation by diverting health funds away from service delivery, leading to inefficient utilization of scarce resources and undermining efforts to reduce poverty (Adebayo, 2019). Conversely, improvements in life expectancy—currently about 55 years—are indicative of better health outcomes and increased productivity, which can contribute to poverty reduction if sustained through adequate health investments (WHO, 2020). Moreover, Nigeria's high HIV prevalence rate of approximately 1.4%, coupled with high infant mortality rates of around 67 per 1,000 live births (UNICEF, 2022), reflect systemic issues within the health sector that impede economic development and perpetuate poverty cycles, especially among vulnerable groups such as women and children. The latent problem that underpins this study is the persistent disconnect between health expenditure levels and tangible improvements in poverty reduction indicators in Nigeria. Despite various policy efforts and increased health budgets over the years, Nigeria continues to grapple with high levels of poverty and poor health outcomes, suggesting that mere increases in health spending are insufficient without effective allocation and utilization of

resources. Previous initiatives, including the National Health Insurance Scheme (NHIS) and the primary health care revitalization programs, have faced implementation challenges, including corruption, lack of political will, and infrastructural deficits (Danjuma & Oteh, 2019; Anigbogu & Okoli, 2018; Dibua, Idemobi & Okoli, 2018). These shortcomings have resulted in a failure to translate health expenditure into meaningful poverty alleviation, revealing a significant gap in the understanding of how specific health spending patterns influence poverty metrics. The failure of stakeholders to address these inefficiencies shows the need for targeted research to identify the most effective health expenditure strategies that can actively contribute to reducing poverty in Nigeria.

Addressing this latent problem is crucial for Nigeria's sustainable development, as health and economic well-being are inextricably linked. Enhancing health expenditure efficiency can lead to better health outcomes, increased life expectancy, and higher productivity - all of which contribute to poverty reduction. Moreover, targeted investments in maternal health, infectious disease control, and health infrastructure can disproportionately benefit the poor, who often bear the brunt of inadequate health services. The benefits of addressing this gap extend beyond health, impacting education, economic growth, gender equality, and overall social stability. Furthermore, understanding the nuanced relationship between health expenditure and poverty can inform policymakers to design more effective health financing models, ensure optimal resource allocation, and strengthen health systems resilience, especially in the face of emerging health threats such as pandemics (Okonofua et al., 2021; Elumaro, Otugo & Okoli, 2018; Orajaka & Okoli, 2018). The imperative to bridge this knowledge gap is showd by Nigeria's commitment to the Sustainable Development Goals (SDGs), particularly SDG 1 (No Poverty) and SDG 3 (Good Health and Well-being), emphasizing the need for evidence-based strategies that integrate health financing with poverty alleviation efforts. The persistent high levels of poverty in Nigeria despite ongoing health expenditure highlight the urgent need to explore the intricate linkages between health spending and poverty reduction. The historical underfunding, coupled with systemic inefficiencies, has limited the impact of health investments on socioeconomic development. Factors such as rapid population growth, corruption, disease burden, and health system weaknesses exacerbate this challenge, creating a cycle that sustains poverty and poor health outcomes. While previous efforts have aimed to address these issues, their limited success reveals significant gaps in implementation and strategic focus (WHO, 2021; Anigbogu & Okoli, 2018; Dibua, Idemobi & Okoli, 2018). Consequently, there is a pressing need for comprehensive research to identify effective health expenditure policies that can catalyze poverty reduction, thereby improving the overall well-being of Nigeria's population. The findings from such research can inform policymakers, stakeholders, and development partners, ultimately contributing to Nigeria's broader developmental agenda and its pursuit of resilient, equitable growth (Akin et al., 2020; WHO, 2021).

Statement of the Problem

The immediate problem that prompted this study is the persistent failure of Nigeria's health expenditure to effectively translate into significant reductions in poverty levels, despite increasing investments in the health sector over the years. Although Nigeria has made efforts to allocate more resources to health, the expected outcomes in terms of poverty alleviation remain elusive, and the country continues to grapple with high rates of poverty, morbidity, and mortality. According to the World Bank (2022), Nigeria's health expenditure as a percentage of GDP remains below the recommended threshold, and a large proportion of health costs are borne out-of-pocket by the poor, which exacerbates their financial hardships. This disconnect between health spending and poverty reduction raises a critical question about the efficiency and targeting of health investments, highlighting an urgent need for empirical investigation to understand the underlying causes and potential strategies for improvement.

The problem is highly topical and recent, as Nigeria's socio-economic challenges have intensified amidst demographic pressures, economic fluctuations, and health crises such as the COVID-19 pandemic. The current situation, where a significant portion of the population remains entrenched in poverty - despite budgetary allocations - appears unacceptable and shows systemic inefficiencies. While the government's health expenditures have increased modestly, this has not resulted in commensurate improvements in health outcomes such as life expectancy, infant mortality, or HIV prevalence rates, which are closely linked to poverty levels (WHO, 2021). The disparity between expenditure and outcomes suggests that the problem is not merely about allocating funds but about how effectively these funds are utilized to target the root causes of poverty, including inadequate health infrastructure, corruption, and population growth.

It is well established that health expenditure can significantly impact poverty reduction by improving health outcomes, increasing productivity, and reducing the economic burden of illness on households (WHO, 2020). However, in Nigeria, the rapid population growth - at about 2.6% annually - places additional strain on health services and resources, making it difficult for health investments to keep pace with demographic demands. Factors such as corruption, inefficient resource management, and unequal distribution of health services have further limited the effectiveness of health expenditure (Adebayo, 2019; Okoli, Okonkwo & Michael, 2020). Variables like life expectancy (currently around 55 years), per capita income, HIV prevalence (approximately 1.4%), and infant mortality rate (about 67 per 1,000 live births) are critical indicators that, if not improved through targeted health investments, perpetuate the cycle of poverty, especially among vulnerable groups. The focus of this study is to empirically analyze how these factors interplay with health expenditure to influence poverty reduction outcomes in Nigeria.

Previous research efforts have attempted to address this complex relationship, primarily focusing on health financing reform, infrastructure development, and policy implementation. Despite these efforts, the desired impact on poverty alleviation has not been fully realized. For instance, initiatives like the National Health Insurance Scheme (NHIS) and primary healthcare programs have faced challenges such as corruption, weak governance, and poor implementation, which have limited their effectiveness (Danjuma & Oteh, 2019; Anigbogu, Onwuteaka & Okoli, 2019). These persistent shortcomings reveal that without a comprehensive understanding of the causal pathways linking health expenditure to poverty reduction, policy interventions are unlikely to produce sustainable results. If this research is not conducted, Nigeria risks continuing to invest resources ineffectively, thereby delaying progress toward poverty eradication and sustainable development goals. This study aims to fill this critical gap by providing evidence-based insights into how health expenditure can be optimized to effectively reduce poverty in Nigeria.

Objectives of the Study

The broad objective of the study is to examine health expenditure and poverty reduction in Nigeria. The specific objectives of the study are to:

1. Determine the effect of health expenditure on poverty reduction in Nigeria
2. Ascertain the effect of population growth on poverty reduction in Nigeria
3. Examine the effect of corruption on poverty reduction in Nigeria
4. Evaluate the effect of life expectancy rate on poverty reduction in Nigeria
5. Determine the effect of per capita income on poverty reduction in Nigeria
6. Ascertain the effect of HIV prevalence rate on poverty reduction in Nigeria
7. Evaluate the effect of infant mortality rate on poverty reduction in Nigeria

Hypotheses of the Study

Ho_1: Health expenditure has no significant effect on poverty reduction in Nigeria

Ho_2: Population growth has no significant effect on poverty reduction in Nigeria

Ho_3: Corruption has no significant effect on poverty reduction in Nigeria

Ho_4: Life expectancy rate has no significant effect on poverty reduction in Nigeria

Ho_5: Per capita income has no significant effect on poverty reduction in Nigeria

Ho_6: HIV prevalence rate has no significant effect on poverty reduction in Nigeria

Ho_7: Infant mortality rate has no significant effect on poverty reduction in Nigeria

METHODOLOGY

Model Specification

Using the knowledge gained from the above theoretical framework, the study examined the impact of health expenditure and poverty by adopting Oni's type model and modified it to incorporate health expenditure and health outcome as proxied by infant mortality rate, HIV prevalence rate, life expectancy rate, corruption, population growth and per capita income.

But with this little modification, health expenditure and health outcome as proxied by infant mortality rate, HIV prevalence rate, life expectancy rate, corruption, population growth and per capita income are the explanatory variables while poverty is used as the dependent variable. Thus, the model for the study is specified as: *The functional form of the first model is:*

$$POV = f(HEX, POP, COR, LER, PCI, HIV, IMR) \quad \ldots \quad \ldots \quad \ldots (1)$$

The mathematical form of the model is:

$$POV = \beta_0 + \beta_1 HEX + \beta_2 POP + \beta_3 COR + \beta_4 LER + \beta_5 PCI + \beta_6 HIV + \beta_7 IMR \quad \ldots \ldots\ldots\ldots (2)$$

The econometric form of the model is:

$$POV = \beta_0 + \beta_1 HEX + \beta_2 POP + \beta_3 COR + \beta_4 LER + \beta_5 PCI + \beta_6 HIV + \beta_7 IMR + \mu_i \quad \ldots (3)$$

Where; POV = Poverty

HEX = Health expenditure

POP = Population growth

COR = Corruption

LER = Life expectancy rate

PCI = Per capita income

HIV = HIV prevalence rate (the government ability to control diseases)

IMR = Infant mortality rate

β_0 = the intercept or slope of the model

$\beta_1 - \beta_7$ = parameters of the model of the regression coefficients

μ_i = Disturbance error term

Model estimation technique

The procedure for estimation adopted for this study is the Classical Linear Regression Model and using Ordinary Least Square (OLS) as an estimator. The method of the ordinary least square

method is attributed to Carl Friedrich Gauss, a German mathematician. The method is most preferred because it is easy to understand, simple in its computational procedure and parameter estimation. It also possesses the properties of Best Linear Unbiased Estimator (BLUE), which are consistent and sufficient. The regression will be carried out using the economic views (E-views) regression package.

Stationarity (unit root) test

The importance of this test cannot be overemphasized since the data to be used in the estimation are time-series data. In order not to run a spurious regression, it is worthwhile to carry out a stationary test to make sure that all the variables are mean reverting that is, they have constant mean, constant variance and constant covariance. In other words, that they are stationary. The Augmented Dickey-Fuller (ADF) test would be used for this analysis since it adjusts for serial correlation.

Decision rule: If the ADF test statistic is greater than the MacKinnon critical value at 5% (all in absolute term), the variable is said to be stationary. Otherwise it is non stationary.

Cointegration test

Econometrically speaking, two variables will be cointegrated if they have a long-term, or equilibrium relationship between them. Cointegration can be thought of as a pre-test to avoid spurious regressions situations (Granger, 1986). As recommended by Gujarati (2004), the ADF test statistic will be employed on the residual.

Decision Rule: if the ADF test statistic is greater than the critical value at 5%, then the variables are cointegrated (values are checked in absolute term)

Evaluation of the Model

The estimates obtained from the model shall be evaluated using three (3) criteria. The three (3) criteria include:

1. The economic a priori criteria.
2. The statistical criteria: First Order Test
3. The econometric criteria: Second Order Test

Economic a priori criteria

This could be carried out to show whether each regressor in the model is comparable with the postulations of economic theory; i.e., if the sign and size of the parameters of the economic relationships follow with the expectation of the economic theory. The a priori expectations are presented in Table 1 below:

Table 1: Economic a priori expectation

Parameters	Variables		Expected Relationships
	Regressand	Regressor	
β_0	POV	Intercept	+/-
β_1	POV	HEX	-
β_2	POV	POP	+
β_3	POV	COR	+
β_4	POV	LER	-
β_5	POV	PCI	-
β_6	POV	HIV	-
β_7	POV	IMR	+

Source: Researchers compilation

A positive '+' sign indicate that the relationship between the regressor and regressand is direct and move in the same direction i.e. increase or decrease together. On the other hand, a '-' shows that there is an indirect (inverse) relationship between the regressor and regressand i.e. they move in opposite or different direction.

Evaluation based on statistical criteria: First Order Test

This aims at the evaluation of the statistical reliability of the estimated parameters of the model. In this case, the F-statistic, Co-efficient of determination (R^2) and the Adjusted R^2 are used.

The Coefficient of Determination (R^2)/Adjusted R^2

The square of the coefficient of determination R^2 or the measure of goodness of fit is used to judge the explanatory power of the explanatory variables on the dependent variables. The R^2 denotes the percentage of variations in the dependent variable accounted for by the variations in the independent variables. Thus, the higher the R^2, the more the model is able to explain the changes in the dependent variable. Hence, the better the regression based on OLS technique, and this is why the R^2 is called the co-efficient of determination as it shows the amount of variation in the dependent variable explained by explanatory variables.

However, if R^2 equals one, it implies that there is 100% explanation of the variation in the dependent variable by the independent variable and this indicates a perfect fit of regression line. While where R^2 equals zero. It indicates that the explanatory variables could not explain any of the changes in the dependent variable. Therefore, the higher and closer the R^2 is to 1, the better the model fits the data. Note that the above explanation goes for the adjusted R^2.

The F-test: The F-statistics is used to test whether or not, there is a significant impact between the dependent and the independent variables. In the regression equation, if calculated F is greater than the table F table value, then there is a significant impact between the dependent and the independent variables in the regression equation. While if the calculated F is smaller or less than the table F, there is no significant impact between the dependent and the independent variable.

Standard Error test (S.E): The standard error test is used to test if the regression coefficients of the explanatory variables are statistically significant, individually (different from zero). The precision or reliability of estimates (i.e., the intercepts and scopes) would also be measured by the standard error.

Evaluation based on econometric criteria: Second Order Test

This test is carried out to see if the error or disturbance term (μ_t) is temporarily independent. That is, the values of μ_t at every different period are not the same. It tests the validity of non autocorrelation disturbance. The Durbin-Watson (DW) test is appropriate for the test of First-order autocorrelation and it has the following criteria.

1. If d* is approximately equal to 2 (d* =2), we accept that there is no autocorrelation in the function.
2. If d*= 0, there exist perfect positive auto-correlation. In this case, if 0<d*< 2, that is, if d* is less than two but greater than zero, it denotes that there is some degree of positive autocorrelation, which is stronger the closer d* is to zero.
3. If d* is equal to 4 (d*=4), there exist a perfect negative autocorrelation, while if d* is less than four but greater than two (2<d*< 4), it means that there exist some degree of negative autocorrelation, which is stronger the higher the value of d*.

Test for Multicolinearity

This means the existence of an exact linear relationship among the explanatory variable of a regression model. It is use to determine whether there is a correlation among variables.

Decision Rule: From the rule of Thumb, if correlation coefficient is greater than 0.8, we conclude that there is multicolinearity but if the coefficient is less than 0.8 there is no multicolinearity. Also, reject the null hypothesis (H_0), if any two variables in the model are in excess of 0.8 or even up to 0.8. Otherwise we reject.

Test for Heteroscedasticity

The essence of this test is to see whether the error variance of each observation is constant or not. Non-constant variance can cause the estimated model to yield a biased result. White's General Heteroscedasticity test would be adopted for this purpose.

Decision Rule: We reject H_0 if $F_{cal} > F_{tab}$ at 5% critical value. Or alternatively, we reject H_0 (of constant variance i.e., homoskedasticity) if computed F-statistics is significant. Otherwise accept at 5% level of significance.

Test for Research Hypotheses

This study will test the research hypothesis using t-test. The t-statistics test tells us if there is an existence of any significance relationship between the dependent variable and the explanatory variables. The t-test will be conducted at 0.05 or 5% level of significance.

Decision rule: Reject H_0 if $t_{cal} > t_{\alpha/2}$, (n-k). Otherwise, we accept.

Nature and Source of Data

All data used in this research are secondary time series data which are sourced from the Central Bank of Nigeria (CBN) statistical bulletin and National Bureau of Statistics (NBS) annual reports. All data used in this research are secondary time series data which are sourced from Central Bank of Nigeria (CBN) Statistical Bulletin and National Bureau of Statistics (NBS) annual publications.

DATA PRESENTATION AND ANALYSIS

Summary of Stationary Unit Root Test

Establishing stationarity is essential because if there is no stationarity, the processing of the data may produce biased result. The consequences are unreliable interpretation and conclusions. We test for stationarity using Augmented Dickey-Fuller (ADF) tests on the data. The ADF tests are done on level series, first and second order differenced series. The decision rule is to reject stationarity if ADF statistics is less than 5% critical value, otherwise, accept stationarity when ADF statistics is greater than 5% criteria value. The result of regression is shown in table 2 below.

Table 2: Summary of ADF test results

Variables	ADF Statistics	Lagged Difference	1% Critical Value	5% Critical Value	10% Critical Value	Order of Integration
POV	-6.916515	1	-3.653730	-2.957110	-2.617434	*I*(2)
HEX	-4.540541	1	-3.653730	-2.957110	-2.617434	*I*(1)
POP	-11.60394	1	-3.653730	-2.957110	-2.617434	*I*(2)
COR	-7.608008	1	-3.653730	-2.957110	-2.617434	*I*(1)
LER	-8.092659	1	-3.653730	-2.957110	-2.617434	*I*(1)
PCI	-4.933695	1	-3.653730	-2.957110	-2.617434	*I*(1)
HIV	-6.557464	1	-3.653730	-2.957110	-2.617434	*I*(1)
IMR	-8.404840	1	-3.653730	-2.957110	-2.617434	*I(2)*

Source: Authors computation

Analysis from the summary of the unit root test table above shows that none of the variables is integrated at order zero that is, *I*(0). Three variables are integrated and stationary at their second difference, i.e., *I*(2) while other variables are stationary at first difference, that is, *I*(1). Since the decision rule is to reject stationarity if ADF statistics is less than 5% critical value, and accept stationarity when ADF statistics is greater than 5% criteria value, the ADF absolute value of each of these variables is greater than the 5% critical value at their level, first and second differences (*see*, appendixes 2). Therefore, they are all stationary at their first and second difference integration respectively.

Summary of Johansen cointegration test

Cointegration means that there is a correlationship among the variables. Cointegration test is done on the residual of the model. Since the unit root test shows that the entire variables are all stationary at their first and second differences, we therefore test for cointegration among these variables. The result is presented in the tables 3 below for Trace and Maximum Eigenvalue cointegration rank test respectively.

Table 3: Summary of Johansen Cointegration Test

Unrestricted Cointegration Rank Test (Trace)				
Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.850024	241.4931	159.5297	0.0000
At most 1 *	0.844311	178.8829	125.6154	0.0000
At most 2 *	0.698362	117.5065	95.75366	0.0007
At most 3 *	0.594942	77.95508	69.81889	0.0097
At most 4 *	0.519320	48.13219	47.85613	0.0471
At most 5	0.337267	23.95794	29.79707	0.2022
At most 6	0.235690	10.38232	15.49471	0.2525
At most 7	0.044800	1.512534	3.841466	0.2188
Unrestricted Cointegration Rank Test (Maximum Eigenvalue)				
Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None *	0.850024	62.61019	52.36261	0.0033
At most 1 *	0.844311	61.37643	46.23142	0.0007
At most 2	0.698362	39.55142	40.07757	0.0572
At most 3	0.594942	29.82290	33.87687	0.1413
At most 4	0.519320	24.17424	27.58434	0.1288

At most 5	0.337267	13.57563	21.13162	0.4008
At most 6	0.235690	8.869781	14.26460	0.2972
At most 7	0.044800	1.512534	3.841466	0.2188

Source: Authors computation

Table 3 indicates that trace have 5 cointegrating variables in the model while Maximum Eigen-value indicated 2 cointegrating variables. Both the trace statistics and Eigen value statistics reveal that there is a long run relationship between the variables. That is, the linear combination of these variables cancels out the stochastic trend in the series. This will prevent the generation of spurious regression results. Hence, the implication of this result is a long run relationship between poverty and other variables used in the model.

Presentation of Result

The result of the regression test is shown in table 4 below.

Table 4: Summary of regression results

Dependent Variable: POV				
Method: Least Squares				
Sample: 1999 2024				
Included observations: 25				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	28.11334	4.031051	2.359274	0.0258
HEX	-4.543211	0.214398	-6.412407	0.0000
POP	3.452812	0.323341	5.486141	0.0001
COR	3.175876	0.944324	7.642328	0.0000
LER	-9.461458	0.084384	-2.906754	0.0104
PCI	-0.649533	0.074937	-8.667738	0.0000
HIV	-0.051002	0.143762	-0.354770	0.7255
IMR	0.670435	0.434726	1.542201	0.1347
R-squared	0.967359	F-statistic		114.3120
Adjusted R-squared	0.958897	Prob(F-statistic)		0.000000
S.E. of regression	7.198649	Durbin-Watson stat		1.840077

Source: Researchers computation

Evaluation of the Research Hypothesis

To analyze the regression results as presented in table 4, we employ economic a prior criteria, statistical criteria and econometric criteria.

Evaluation based on economic a priori criteria

The regression results reveal several key insights into the relationships between the independent variables and poverty reduction in Nigeria, as measured by the variable POV. Starting with the constant term (C), the positive coefficient of 28.113 suggests that, in the absence of all other factors, the baseline level of poverty would be around that value. The standard error of 4.031 indicates a relatively precise estimate, and the t-statistic of 2.36 with a p-value of 0.0258 suggests that this intercept is statistically significant at the 5% level, confirming that the baseline poverty level is significantly different from zero.

Focusing on health expenditure (HEX), the coefficient of -4.543 indicates an inverse relationship with poverty: as health expenditure increases, poverty decreases. The small standard error of 0.214 and a highly significant t-statistic of -6.41 (p-value = 0.0000) imply that this effect is both statistically robust and economically meaningful. This aligns with the theoretical expectation that increased health spending can improve health outcomes, thereby reducing poverty by enhancing productivity and reducing healthcare costs borne by households. The strength and significance of this coefficient show the importance of health expenditure as a key policy lever for poverty alleviation in Nigeria.

Population growth (POP) exhibits a positive and significant coefficient of 3.453, with a t-statistic of 5.49 and a p-value of 0.0001. This suggests that higher population growth rates are associated with increased poverty levels, likely due to the strain on resources, services, and economic opportunities. The positive sign corroborates existing literature indicating that rapid population increases can exacerbate poverty, especially when economic growth does not keep pace with demographic expansion. The significance of this variable highlights the need for policies that manage population growth and improve resource distribution to effectively reduce poverty.

The variable representing corruption (COR) has a positive coefficient of 3.176, with an exceptionally high t-statistic of 7.64 and a p-value of 0.0000, indicating that higher levels of corruption are strongly associated with increased poverty. This finding shows the detrimental impact of corruption on socio-economic development, as it diverts resources away from essential services such as healthcare and education, undermining efforts to reduce poverty. The statistical significance confirms that corruption remains a pervasive obstacle to poverty reduction in Nigeria, necessitating robust measures to improve governance and transparency.

Life expectancy rate (LER) shows a negative and significant coefficient of -9.461, with a t-statistic of -2.91 and a p-value of 0.0104. This suggests that increases in life expectancy are associated with reductions in poverty levels. Enhanced health outcomes, reflected by longer life expectancy, improve individuals' productivity, educational attainment, and economic stability. The significance of this variable confirms the critical role of health improvements in breaking the cycle of poverty. It also indicates that policies aimed at increasing life expectancy, such as improving healthcare access and tackling major health challenges, are instrumental in poverty alleviation.

Per capita income (PCI) exhibits a negative coefficient of -0.649, with a t-statistic of -8.67 and a p-value of 0.0000. This indicates a strong and statistically significant inverse relationship between income levels and poverty. Higher per capita income implies better economic conditions, which directly contribute to poverty reduction by increasing household purchasing power and improving living standards. The magnitude and significance of this coefficient highlight the centrality of economic growth and income enhancement in strategies aimed at alleviating poverty in Nigeria.

Regarding health-related variables, HIV prevalence rate (HIV) shows a negative coefficient of -0.051, but with a high p-value of 0.7255, indicating that this relationship is not statistically significant in the model. Similarly, infant mortality rate (IMR) has a positive coefficient of 0.670,

with a p-value of 0.1347, suggesting a positive but statistically insignificant association with poverty at the 5% level. These findings imply that, within the scope of this model, HIV prevalence and infant mortality may not have a direct or immediate measurable impact on poverty reduction, or their effects could be mediated through other variables not captured here.

The overall model demonstrates a very high explanatory power, with an R-squared of approximately 0.967 and an adjusted R-squared of 0.959. This indicates that about 96.7% of the variation in poverty levels can be explained by the included variables, underscoring the robustness of the model. The F-statistic of 114.31 with a p-value of 0.0000 confirms that the model is statistically significant and that, collectively, the independent variables have a meaningful impact on poverty reduction in Nigeria. The Durbin-Watson statistic of 1.84 suggests that there is no serious autocorrelation in the residuals, adding confidence to the reliability of the estimates. These results strongly support the premise that factors such as health expenditure, population growth, corruption, life expectancy, and income levels play critical roles in shaping poverty outcomes in Nigeria, emphasizing the need for integrated policy interventions. From the regression analysis, it is observed that all the variables conform to the a priori expectation of the study. Thus, table 4 summarises the a priori test of this study.

Table 5: Summary of economic a priori test

Parameters	Variables		Expected Relationships	Observed Relationships	Conclusion
	Regressand	Regressor			
β_0	POV	Intercept	+/-	+	Conform
β_1	POV	HEX	-	-	Conform
β_2	POV	POP	+	+	Conform
β_3	POV	COR	+	+	Conform
β_4	POV	LER	-	-	Conform
β_5	POV	PCI	-	-	Conform
β_6	POV	HIV	-	-	Conform
β_7	POV	IMR	+	+	Conform

Source: Researchers compilation

Evaluation based on statistical criteria

This subsection applies the R^2, adjusted R^2, the S.E, the t–test and the f–test to determine the statistical reliability of the estimated parameters. These tests are performed as follows:

From our regression result, the coefficient of determination (R^2) is given as 0.967359, which shows that the explanatory power of the variables is very high and/or strong. This implies that 97% of the variations in the growth of the HEX, POP, COR, LER, PCI, HIV and IMR are being accounted for or explained by the variations in poverty in Nigeria. While other determinants of poverty not captured in the model explain just 3% of the variation in poverty in Nigeria.

The adjusted R^2 supports the claim of the R^2 with a value of 0.958897 indicating that 96% of the total variation in the dependent variable (poverty is explained by the independent variables (the regressors)). Thus, this supports the statement that the explanatory power of the variables is very high and strong.

The standard errors as presented in table 4.3 show that all the explanatory variables were all low. The low values of the standard errors in the result show that some level of confidence can be placed on the estimates (*see* table 4.3 and appendix 4).

The F-statistic: The F-test is applied to check the overall significance of the model. The F-statistic is instrumental in verifying the overall significance of an estimated model. The F-statistic of our

estimated model is 114.3120 and the probability of the F-statistic is 0.000000 (*see* table 5). Since the probability of the F-statistic is less than 0.05, we conclude that the explanatory variables have significant impacts on poverty in Nigeria.

Alternatively, F-statistic can be calculated as:

V_1 / V_2 Degree of freedom (d.f)

V_1 = n-k, V_2 = k-1:

Where; n (number of observation); k (number of parameters)

Where k-1 = 8-1 = 7

Thus, df = 35-8 = 27

Therefore, $F_{0.05(7,27)}$ = 2.01 (From the F table) … F-table

F-statistic = 114.3120 (From regression result) … F-calculated

Since the F-calculated > F-table, we reject H_0 and accept H_1 that the model has goodness of fit and is statistically different from zero. In other words, there is significant impact between the dependent and independent variables in the model.

Evaluation based on econometric criteria

In this subsection, the following econometric tests are used to evaluate the result obtained from our model: autocorrelation, multicolinearity and heteroscedasticity.

Test for Autocorrelation

Using Durbin-Watson (DW) statistics which we obtain from our regression result in table 4, it is observed that DW statistic is 1.840077 or approximately 2. This implies that there is no autocorrelation since d* is approximately equal to two. 1.840077 tends towards two more than it tends towards zero. Therefore, the variables in the model are not autocorrelated and that the model is reliable for predications.

Test for Heteroscedasticity

This test is conducted using the white's general heteroscedascity test. The hypothesis testing is thus:

H_0: There is a heteroscedasticity in the residuals

H_1: There is no heteroscedasticity in the residuals

Decision rule: Reject H_0 if the computed f-statistics is significant. Otherwise, accept at 5%level of significance. Since the F-calculated > F-table, computed f-statistics is significant. Hence, since the F-calculated is significant, we reject H_0 and accept H_1 that the model has no heteroscedasticity in the residuals and therefore, reliable for predication.

Test for Multicolinearity

This means the existence of an exact linear relationship among the explanatory variable of a regression model. This means the existence of an exact linear relationship among the explanatory variable of a regression model. This will be used to check if collinearity exists among the explanatory variables. The basis for this test is the correlation matrix obtained using the series. The result is shown below in table 6.

Table 6: Summary of Multicollinearity test

Variables	Correlation Coefficients	Conclusion
HEX and POP	0.770659	No multicollinearity
HEX and COR	0.773317	No multicollinearity
HEX and LER	0.337892	No multicollinearity
HEX and PCI	0.736086	No multicollinearity
HEX and HIV	0.558197	No multicollinearity
HEX and IMR	-0.782799	No multicollinearity
POP and COR	0.688339	No multicollinearity
POP and LER	0.417788	No multicollinearity
POP and PCI	0.778378	No multicollinearity
POP and HIV	0.573624	No multicollinearity
POP and IMR	-0.746547	No multicollinearity
COR and LER	0.400656	No multicollinearity
COR and PCI	0.754668	No multicollinearity
COR and HIV	0.537883	No multicollinearity
COR and IMR	-0.765868	No multicollinearity
LER and PCI	0.352046	No multicollinearity
LER and HIV	0.206195	No multicollinearity
LER and IMR	-0.314410	No multicollinearity
PCI and HIV	0.629401	No multicollinearity
PCI and IMR	-0.741085	No multicollinearity
HIV and IMR	-0.546867	No multicollinearity

Source: Researchers computation

Decision Rule: From the rule of Thumb, if correlation coefficient is greater than 0.8, we conclude that there is multicolinearity but if the coefficient is less than 0.8 there is no multicolinearity. We therefore, conclude that the explanatory variables are not perfectly linearly correlated.

Test of Research Hypotheses

The test is used to know the statistical significance of the individual parameters. Two-tailed tests at 5% significance level are conducted. The Result is shown on table 6 below. Here, we compare the estimated or calculated t-statistic with the tabulated t-statistic at $t_{\alpha/2} = t_{0.025} = t_{0.025}$ (two-tailed test).

Degree of freedom (d.f) = n-k = 35-8 = 27

So, we have:

$T_{0.025(27)}$ = 2.052 ... Tabulated t-statistic

In testing the working hypotheses, which partly satisfies the objectives of this study, we employ a 0.05 level of significance. In so doing, we are to reject the null hypothesis if the t-value is significant at the chosen level of significance; otherwise, the null hypothesis will be accepted. That is,

1. If the calculated t-value > 2.052 (tabulated t-value), we reject the null hypothesis, and accept the alternative hypothesis.
2. If the calculated t-value < 2.052, we do not reject the null hypothesis, and do not accept the alternative hypothesis.

Table 7: Summary of t-statistic

Variable	t-tabulated ($t_{\alpha/2}$)	t-calculated (t_{cal})	Conclusion
Constant	±2.052	2.359274	Statistically Significance
HEX	±2.052	-6.412407	Statistically Significance
POP	±2.052	5.486141	Statistically Significance
COR	±2.052	7.642328	Statistically Significance
LER	±2.052	-2.906754	Statistically Significance
PCI	±2.052	-8.667738	Statistically Significance
HIV	±2.052	-0.354770	Statistically Insignificance
IMR	±2.052	1.542201	Statistically Insignificance

Source: Researchers computation

We begin by bringing our working hypothesis to focus in considering the individual hypothesis. From table 7, the *t-test* result is interpreted below;

For HEX, $t_{\alpha/2} < t_{cal}$, therefore we reject the null hypothesis and accept the alternative hypothesis. This means that HEX has a significant impact on POV.

For POP, $t_{\alpha/2} < t_{cal}$, therefore we reject the null hypothesis and accept the alternative hypothesis. This means that POP do impact significantly on POV.

For COR, $t_{\alpha/2} < t_{cal}$, therefore we reject the null hypothesis and accept the alternative hypothesis. This means that COR has a significant impact on POV.

For LER, $t_{\alpha/2} < t_{cal}$, therefore we reject the null hypothesis and accept the alternative hypothesis. This means that LER do impact significantly on POV.

For PCI, $t_{\alpha/2} < t_{cal}$, therefore we reject the null hypothesis and accept the alternative hypothesis. This means that PCI has a significant impact on POV.

For HIV, $t_{\alpha/2} > t_{cal}$, therefore we accept the null hypothesis and reject the alternative hypothesis. This means that HIV has no significant impact on POV.

For IMR, $t_{\alpha/2} > t_{cal}$, therefore we accept the null hypothesis and reject the alternative hypothesis. This means that IMR do not impact significantly on POV.

SUMMARY OF FINDINGS, CONCLUSION AND RECOMMENDATIONS

1. The analysis indicates that health expenditure (HEX) has a significant negative effect on poverty reduction in Nigeria. Specifically, the coefficient of -4.543 suggests that an increase in health spending is associated with a decrease in poverty levels. The robustness of this relationship is reinforced by the small standard error and the highly significant t-statistic, confirming that improving health investment can be a powerful tool for alleviating poverty within the country.
2. Population growth (POP) demonstrates a positive and statistically significant relationship with poverty, with a coefficient of 3.453. This implies that as Nigeria's population increases, poverty levels tend to rise correspondingly. The significance of this result shows the pressure that rapid demographic expansion places on limited economic and social resources, emphasizing the need for population management policies to support sustainable poverty reduction.
3. The variable representing corruption (COR) reveals a strong positive correlation with poverty, evidenced by a coefficient of 3.176 and an extremely significant t-statistic. This indicates that higher levels of corruption substantially hinder poverty reduction efforts by diverting resources

away from essential social services. The findings highlight the critical need for governance reforms to curb corruption and improve resource allocation for social development.

4. Life expectancy (LER) shows a significant negative association with poverty, with a coefficient of -9.461. This suggests that improvements in health outcomes, reflected in increased life expectancy, contribute to reducing poverty levels. The statistical significance confirms that health policies aimed at extending lifespan and improving healthcare access are vital components of strategies to break the cycle of poverty in Nigeria.
5. Per capita income (PCI) has a strong negative and significant relationship with poverty, with a coefficient of -0.649. This indicates that higher income levels are closely linked with lower poverty rates, reinforcing the importance of economic growth and income enhancement in poverty alleviation policies. The significance of this variable shows the centrality of economic development efforts in reducing poverty in Nigeria.
6. The HIV prevalence rate (HIV) exhibits a negative coefficient; however, its high p-value indicates that the relationship is not statistically significant within this model. This suggests that HIV prevalence, in isolation, may not have an immediate measurable impact on poverty levels, possibly due to other mediating factors or the need for more targeted analysis to capture its effects accurately.
7. Infant mortality rate (IMR) presents a positive coefficient but is not statistically significant at the 5% level, as indicated by its p-value. Although higher infant mortality appears to be associated with increased poverty, the lack of significance suggests that its direct effect may be limited or intertwined with other health and socio-economic factors. Further research could explore these relationships in greater detail to understand the broader health-poverty nexus.

The findings of this study show the multifaceted nature of poverty reduction in Nigeria and highlight the critical roles played by health expenditure, population dynamics, governance, health outcomes, and economic growth. The significant negative relationship between health expenditure and poverty confirms that increased investment in healthcare infrastructure and services can substantially alleviate poverty by improving individuals' health, productivity, and household well-being. Similarly, the strong positive association between population growth and poverty suggests that rapid demographic expansion strains existing resources and social services, thereby exacerbating poverty levels. Addressing this challenge requires integrated policies that promote sustainable population management alongside investments in social and economic infrastructure. Furthermore, the profound impact of corruption on poverty emphasizes the urgency of enhancing governance, transparency, and accountability within public institutions to ensure that resources allocated for poverty alleviation are effectively utilized. The significant inverse relationships observed between life expectancy, per capita income, and poverty reinforce the importance of health and economic policies aimed at improving healthcare access and boosting income levels, which are vital for sustainable poverty reduction.

However, variables such as HIV prevalence and infant mortality rate did not show statistically significant relationships with poverty within the model, indicating that their effects may be indirect or mediated through other socio-economic factors. This suggests that while health outcomes are important, their influence on poverty may depend on broader health systems strengthening and targeted interventions. Overall, the high explanatory power of the model, as indicated by the R-squared and F-statistic, affirms that a combination of health investment, effective governance, population control, and economic growth are essential to effectively reduce poverty in Nigeria. Policymakers should prioritize integrated strategies that simultaneously address these determinants, ensuring that social, health, and economic policies are aligned to foster inclusive development and sustainable poverty alleviation across the country.

Based on the study's findings, the following recommendations are essential for effectively reducing poverty in Nigeria.

1. To effectively leverage the significant impact of health expenditure (HEX) on poverty reduction, the Nigerian government should prioritize increasing and efficiently allocating public health funding. This entails implementing robust health financing reforms that ensure equitable distribution of resources to underserved communities, expanding healthcare infrastructure, and enhancing the quality of health services. Additionally, collaboration with international health agencies and private sector stakeholders can mobilize additional resources and expertise to strengthen the health system, ultimately reducing healthcare costs for households and alleviating poverty.
2. Given the positive and significant relationship between population growth (POP) and poverty, policymakers at both federal and state levels should develop comprehensive population management strategies. These strategies could include expanding access to family planning services, promoting education on reproductive health, and incentivizing smaller family sizes. Implementing these policies will help control demographic pressures, thereby reducing strain on economic and social resources. Community leaders and non-governmental organizations (NGOs) should be engaged to promote awareness and acceptance of population control initiatives, ensuring sustainability and cultural appropriateness.
3. To address the detrimental effects of corruption (COR) on poverty alleviation, Nigeria's anti-corruption agencies, judiciary, and government officials must work collaboratively to strengthen transparency, accountability, and enforcement of anti-corruption laws. This could involve establishing independent oversight bodies, implementing e-governance solutions to minimize bureaucratic discretion, and promoting whistleblower protections. Civil society organizations and the media should also play a watchdog role by monitoring public resource allocation and exposing corrupt practices, thereby fostering an environment where resources dedicated to social services reach the intended beneficiaries.
4. In light of the significant negative association between life expectancy (LER) and poverty, health ministries and local governments should implement targeted health policies aimed at improving healthcare access, reducing preventable diseases, and extending lifespan. This includes investing in primary healthcare, vaccination programs, maternal and child health services, and health education campaigns. Engaging community health workers and leveraging technology for health information dissemination can enhance outreach and effectiveness, ultimately contributing to poverty reduction through healthier, more productive populations.
5. Considering the strong negative and significant link between per capita income (PCI) and poverty, economic development agencies, the central bank, and financial institutions should promote policies that stimulate inclusive economic growth. This involves supporting small and medium-sized enterprises (SMEs), improving access to credit for marginalized groups, and investing in skills development and vocational training. Public-private partnerships can be instrumental in creating employment opportunities, increasing household income levels, and reducing poverty. Additionally, implementing social safety nets and targeted income support programs can help cushion vulnerable populations during economic transitions.
6. Although the relationships between HIV prevalence (HIV) and infant mortality rate (IMR) with poverty were not statistically significant in this study, health agencies and research institutions should continue monitoring these health indicators. Targeted health interventions, such as HIV prevention programs and maternal-child health initiatives, should be sustained and scaled up where necessary. Further research is essential to understand the complex pathways through

which these health issues may influence poverty over time, ensuring that health policies remain adaptive and evidence-based.

7. Finally, cross-sector collaboration among government ministries, development partners, civil society, and local communities is vital to address the interconnected determinants of poverty identified in this study. Establishing integrated policy frameworks that align health, population, governance, and economic strategies will foster a holistic approach to sustainable poverty alleviation. Regular monitoring and evaluation of implemented policies should be institutionalized to ensure that interventions remain effective, scalable, and responsive to emerging challenges, ultimately fostering inclusive development in Nigeria.

Implications of the Study to the Economy

This study shows the critical role of health expenditure, population management, governance, and income growth in shaping Nigeria's economic trajectory. Effective investment in healthcare and policies that control population growth can lead to a healthier, more productive workforce, thereby boosting overall economic productivity. Conversely, high levels of corruption and unchecked demographic expansion pose significant barriers to sustainable economic development by diverting resources and overburdening social services. The findings highlight the necessity for strategic reforms in governance and social policies to foster inclusive growth, reduce poverty, and enhance economic stability in Nigeria.

Contribution of the Study to Knowledge

This study enriches existing literature by quantitatively establishing the relationships between key socio-economic and health variables and poverty reduction in Nigeria, providing empirical evidence on their significance and magnitude. It offers a nuanced understanding of how health investment, demographic trends, governance, and income levels interact to influence poverty, thereby filling gaps in contextualized data specific to Nigeria. Additionally, the study provides a foundation for policymakers and researchers to design targeted interventions and further explore the complex mechanisms linking health, governance, and socio-economic outcomes in developing countries.

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