Review

Healthcare Expenditure and Development Indices of Health in Nigeria: A Time Series Econometric Approach

[1]Kelechi Chijindu Nnamdi, [1]Franklin Nnaemeka Ngwu
[1]Lagos Business School, Pan-Atlantic University, Lagos -Nigeria

Corresponding author: ***Kelechi C. Nnamdi:*** *Lagos Business School, Pan-Atlantic University, Lagos -Nigeria. donkc2004@yahoo.com; +234-8038258059*
Received 26 January 2025, Reviewed 10 March 2025, Accepted for publication 11 March 2025

Abstract

Background: This study analyses the relationship between healthcare expenditure and development indices of health in Nigeria, such as life expectancy, infant mortality, and maternal mortality. Although healthcare expenditure has improved following the Millennium Development Goals, Nigeria continues to lag in converting this investment into significant improvements in healthcare outcomes. This motivates the study of the performance of various expenditure structures.
Method: The study utilises annual time series data from reputable organisations such as the Central Bank of Nigeria and the World Health Organisation. The Least Squares (LS) and Autoregressive Distributed Lag (ARDL) cointegration approaches estimate short-run and long-run relationships between health expenditure and health indicators.
Findings: The findings reveal that public health expenditure is positively related to life expectancy and negatively related to infant and maternal mortality, though the latter relationships are not always statistically significant. Private health expenditure is positively associated with life expectancy and negatively with mortality. Foreign health assistance and health expenditure per capita show weak associations with life expectancy and mortality rates. Out-of-pocket spending is negatively correlated with life expectancy and positively with infant and maternal mortality. Population growth is strongly linked to increased life expectancy and reduced mortality rates.
Conclusion: The study discovers that private health spending is a more significant determinant of increasing Nigeria's health outcomes over public spending, and out-of-pocket spending is a reverse determinant. Such conclusions suggest the necessity of greater public-private collaboration and reduction in out-of-pocket dependence to achieve improved development measures of health in Nigeria.
Keywords: Good health and well-being, Reduced Inequalities, Life expectancy

How to cite this article:

Nnamdi KC, Ngwu FN. Healthcare Expenditure and Development Indices of Health in Nigeria: A Time Series Econometric Approach. The Nigerian Health Journal 2025; 25(1):31 – 48. https://doi.org/10.71637/tnhj.v25i1.954

Introduction

Since the introduction of Millenium Development Goals (MDGs) in the year 2000 and the associated increase in healthcare expenditure, it was expected that healthcare status of Nigeria would improve. Record shows that between 1980 and 1989, in Nigeria, public health allocation was averaged ₦283.209 while life expectancy averaged 45.8 years; 1990 and 1999, health sector's allocation increased to an average of ₦6,126.61 with a registered life expectancy averaged at 45.6 years; and 2000 and 2010 witnessed a substantial increase with an average of ₦95,330.42, life expectancy improved marginally to an average 58.6 years. (53) observed that considerable improvement in life expectancy; and significant decrease in infant mortality has not been registered, hence Nigeria's health policy target to attain life expectancy of at least 70years has not been attained.

Also, the level of private sector participation in healthcare has been another feature in the ongoing debate about healthcare funding and development.
Existing literature displays some conflicting views on the relationship between government expenditure on healthcare and economic development. Some of the conclusions drawn are based on the experience of developed countries as well as developed and developing countries.

Nigeria is struggling to clout the level of development that bothers on healthcare. Improvement in healthcare could be regarded as one of the necessary conditions to achieving a significant level of development. Nigeria's life expectancy is one of the lowest in the world, with an attendant abnormal mortality rate. Nigeria's economic development is anomalous due to the continued structural problems, including high rates of poverty, income inequality, low investment in health, and weak institutional settings that constrain sustainable development and equitable health outcomes.

The focal question to ask is the extent to which changes in both public and private health care expenditure has influenced development indices of life expectancy, infant and maternal mortality of Nigerians. Another principal question is: what is the causal relationship between health indices and health sector expenditures in Nigeria?

The motivation for the study stems from the need to understand why Nigeria's increased healthcare expenditure since the Millennium Development Goals has not yielded substantial improvements in life expectancy, infant mortality, and maternal mortality, aiming to inform policy for better health outcomes. It adds value by providing a detailed analysis of various expenditure types (public, private, out-of-pocket, external aid to healthcare) and their differential impacts, while filling gaps in the literature through its focus on Nigeria-specific dynamics. Prior studies generalised their findings across developing countries or focused on public expenditure alone, but this study is thorough to accommodate for other components of healthcare expenditure.

Literature Review

This literature review highlights the critical role of health care investment and health expenditure by the public and private sector in promoting economic growth and improving health outcomes in various regions with respect to regional variations. For instance, (36) explored the effects of health care investment on economic growth in China. They used spatial panel data analysis to examine the direct and indirect economic effects of health expenditure during 2012- 2018. The results showed that health care investment positively promotes economic growth within provinces and in neighboring provinces. Thus, their findings validate the notion that investing in health care is crucial for achieving high-quality development and economic advancement. To examine the impact of health expenditure on development, (27), investigated the impact of public healthcare expenditure on economic development in South Africa between 1996 and 2016. Their findings indicated a positive relationship between public health expenditure and the Human Development Index (HDI).

Essentially from the literature, health investment may lead to increased income for health workers and improved working conditions, contributing to better health outcomes and economic development. (17) tried to show the link between public health expenditures and health outcomes in Asian economies from 2000 to 2018. Their results revealed that immunisation, GDP per capita, trade openness, and utilisation of basic water service facilities significantly improve under-five and infant mortality rates in the selected Asian economies. However, ecological footprint increases under-five and infant deaths by damaging the environment. In Sub-Saharan Africa economies, (52) conducted a study on 38 Sub-Saharan African countries between 2000 and 2016 to assess the effect of health expenditure on economic growth. They used the linear dynamic generalised method of moments instrumental variable (GMM-IV) on panel data. The findings revealed that health expenditure significantly improves economic growth in the region, and both public and private health

Print ISSN: 0189-9287 Online ISSN: 2992-345X

expenditures contribute to this positive relationship. Using causality analysis, (48) investigated the causal relationship between health expenditure and economic growth in 36 OECD countries from 2000 to 2016. Panel cointegration and causality tests were applied, revealing no cointegration relationship between health expenditures and economic growth. However, they found a causal relationship from economic growth to health expenditures, indicating that economic growth stimulates health expenditure in the short term.

Furthermore, (23) viewed medical expenditure as an enhancement factor for human capital and studied its impact on economic development using panel data of 26 OECD countries from 1980 to 2008. They found that total medical expenditure and public health expenditure positively affected economic development, while the cost of forming a health care system had a negative impact. National Health Service and National Health Insurance groups also showed positive effects on economic progress, depending on the type of expenditure. In another dimension, (19) examined the relationship between health expenditures and economic growth in MENA countries from 2000 to 2015 using panel data analysis. Their findings revealed that health expenditure in these countries had a negative effect on economic growth. However, economic growth positively affected life expectancy at birth and infant mortality rate. (25) investigated the relationship between public health expenditure and social economic development in prefecture-level cities in Shandong Province. They found that public health expenditure per capita and coverage of medical insurance significantly promoted social economic development. However, an increase in the number of health institutions did not necessarily promote economic development, and proper planning and resource allocation were essential for effective health spending. Again, in Sub-Saharan Africa,

(1) examined the relationship between health care expenditure and economic growth in Sub-Saharan Africa from 1995 to 2014. They used the system General Method of Moments (GMM) technique and found a positive and statistically significant relationship between health expenditure and economic growth in the region. Foreign direct investment, gross domestic savings, and the active population were also key determinants of economic growth. Stressing the importance of healthcare expenditure category to the government, (2) emphasised the significance of health expenditures for governments and investigated the relationship between health expenditures and economic development in four countries - Pakistan, China, India, and Bangladesh. Their panel regression analysis showed insignificant results, highlighting the need for increased focus on health expenditure as a key indicator of economic growth and development. Additionally, (39) compared the impact of health expenditure between countries in the CEMAC sub-region and five other African countries that achieved the Abuja Declaration target. Their results showed a positive and significant effect of health expenditure on economic growth in both samples. Put differently, a unit change in health expenditure could potentially increase GDP per capita in the respective countries, emphasising the importance of achieving the Abuja target. Besides, (9) examined the relationship between income and health expenditures in emerging market economies in Europe, the Middle East, Africa, and Asia from 1995 to 2013.

The study found a two-way causality between income and healthcare expenditures in some countries, indicating that increases in income levels stimulate healthcare expenditures in these economies. In a similar study in India, (54) studied the impact of per capita health expenditure on infant and child mortality in India using lagged multiple regression models for urban and rural sectors. The study highlighted that health expenditure taken alone does not have a significant impact on health parameters. However, the inclusion of factors like mother's education and per capita income increased the effectiveness of health expenditure in improving health outcomes.

In a similar study by (41), healthcare expenditure (public, private & total) and health outcome (life expectancy at birth, crude mortality rate & infant mortality rate) nexus was examined with evidence from the SAARC-ASEAN region for the period 1995 to 2014. Based on the application of fixed and random effect model estimation; they showed that total healthcare expenditure, public health expenditure and private health expenditure has significantly reduced the level of crude and infant mortality. However, they showed that, private healthcare expenditure is relatively more significant than health expenditure from the public sector. Therefore, it was recommended from their finding that, public spending on healthcare should be appropriately and efficiently be utilised.
In Cameroon, (28) examined healthcare expenditure and life expectancy on annual time series data for the period 1980 to 2014 with the use of OLS regression technique and the Toda Yamamoto causality test. In addition, they showed evidence that private health expenditure has a positive and significant impact on life expectancy, whereas, public health expenditure has no significant

Print ISSN: 0189-9287 Online ISSN: 2992-345X

impact on life expectancy in Cameroon. More so, evidence from the Toda Yamamoto test shows a bidirectional causality between private health expenditure and life expectancy. While a unidirectional causality was found to flow from life expectancy to public health expenditure.

(42) examined the effects of health expenditure on health outcomes on middle or high-income level countries using a panel data approach and the k-mean method for the period 2000 to 2015. Results from their estimation showed that public health expenditure had a significant influence on health indicators (life expectancy and infant mortality); whereas private health expenditure revealed no significant effect on health outcomes (life expectancy and infant mortality).

(29) studied the impact of health expenditures on health outcomes (life expectancy, infant mortality and maternal mortality) in 46 sub-Saharan Africa countries for the period 2000 to 2015. Findings from his study showed that per capita GDP, physician per 1000 population, population aged above 65years, and infant mortality rate are the most significant determinants of health expenditure in SSA.

(33), carried out research titled life expectancy, public health spending and economic growth in Nigeria using a Vector Autoregressive (VAR) model. Their broad objective is to empirically analyse the relationship existing among life expectancy, public health spending and economic growth in Nigeria. A Vector Autoregressive (VAR) method was employed in analysing the data in a sample period of 1977 to 2008. Their results revealed that there is no bidirectional causality between life expectancy and public health spending in Nigeria. Their study also revealed that there is no bidirectional causality between life expectancy and economic growth in Nigeria over the years.

(31) in a paper titled health expenditures and life expectancy around the World using a quantile regression approach. They sought to evaluate the heterogeneity in country health expenditure effects throughout the life expectancy distribution applying quantile regression to an assembled dataset of 177 countries. They found significant heterogeneities in expenditures effects on life expectancy that are completely masked by ordinary least squares (OLS) technique, which underestimates (overestimates) the expenditure returns for countries ranking at low (high) life-expectancy quantiles.

(24) in a paper titled government health expenditure and public health outcomes: A comparative study among 17 countries and implications for US Health Care reform. Their broad objective was to empirically analysed the relationship between public health expenditure and national health outcomes among developed countries. They considered a sample of 17 OECD countries between 1973 and 2000. They employed the Linear Mixed Model (LMM) technique to analyse the data. A statistically significant relationship was found between government health expenditure and infant mortality rate, and a positive relationship between government health expenditure and life expectancy at birth.

(21) in a paper titled the relationship between Life expectancy at birth and health expenditures estimated by a cross-country and time-series analysis, their paper was set to analyse the relationship between the dynamics of the inputs and the outputs of health care systems. They sampled 175 countries over 16 years- 1995-2010. They used a panel data analysis to estimate life expectancy by a function of health expenditures. Their results show a significant relationship between health expenditures and life expectancy.

(4) in a paper titled the influence of health care spending on life expectancy, with a broad objective to examine the relationship between health care expenditures and life expectancy, they used a causality framework. Their results showed that increases in health care spending have contributed somewhat to the growth in life expectancy in Western countries

(51) in a paper titled public health expenditure and health Outcome in Nigeria, the impact of governance. The broad objective of their paper was set to investigate how the effectiveness of public health expenditure is affected by governance in Nigeria. They used both the Ordinary Least Squares and the Two-Stage Least Squares method. Their result showed that public health expenditure has negative effect on infant mortality and under-5 mortalities when the governance indicators are included. (30) showed the effects of public and private health care expenditure on health status in sub-Saharan Africa: new evidence from panel data analysis. Their broad aim was set to determine the effects of health care expenditure on health outcomes. They used panel data from 1995 to 2010 covering 44 countries in SSA, based on a Fixed and random effects regression models. Their results show that health care expenditure significantly influences health status through improving life expectancy at birth, reducing death and infant mortality rates. Also, public

Print ISSN: 0189-9287 Online ISSN: 2992-345X

and private health care spending showed strong positive association with health status

(3) in a paper titled health expenditures and health outcomes in Africa, with a broad objective to examine African countries' per capita total as well as government health expenditures and per capita income to infant mortality and under-five mortality. They used econometric method to analyse data from 47 African countries between 1999 and 2004. Their result showed that Health expenditures have a statistically significant effect on infant mortality and under-five mortality

(32) in an article titled the effect of health expenditure on child health in sub- Saharan Africa: governance perspective. Their main objective was to examine the effects of corruption and how corruption levels influence effectiveness of health expenditure on under-five mortality. They used a linear dynamic panel model; their results show that public health expenditure relative to private health expenditure led to fall in under-five mortality rates in SSA

(11) in a paper titled influence of health care expenditures, GDP, employment and globalisation on cardiovascular disease mortality: potential implications for the current recession. He used the Time-series analytical technique, on a sample period of 1979 to 2006. His result shows that health expenditures, labor force participation, and GDP per capita, tend to decrease cardiovascular disease mortality. He also found that employment rates are negatively related to cardiovascular mortality over 1979-2006.

(34) in a paper titled the impact of health expenditure on the elderly in Nigeria. Their research broad objective was to investigate the effect of the burden of health care expenditure on the elderly adults aged 65 years and above using a growth factor model method. Their result shows that per capita health expenditure of the elderly is higher than the per capita health expenditure of other age group in Nigeria. They also found that for the 5 years considered those in the age group 65 years and above spend the larger share of health expenditure.

(10) in a paper titled reducing malaria in Nigeria: a public health expenditure conundrum. His paper seeks to determine the relationship between deaths from malaria and public health and non-health expenditure in Nigeria. He used the Filmer and Pritchet model on a sample period of 1975 to 2001. He found a negative relationship between deaths from malaria, public health expenditure, per capita income and non- public health expenditure, but a positive relationship between deaths from malaria and political instability.

(40) in a paper titled comparison of the effects of public and private health expenditures on the health status: a panel data analysis in eastern Mediterranean countries. Their study aimed to compare the effects of public and private expenditures on health in Eastern Mediterranean Region. They used panel data of eastern Mediterranean countries between 1995 and 2010. Their results showed that the public health expenditures had a strong negative relationship with infant mortality rate. They also showed that the relationship for public health expenditures was significant

Methodology

The Ordinary Least Squares (OLS) method is employed in estimating the specified equations, while the EViews 11 as a computing platform in the analysis. The study utilised annual time series secondary data (1980 – 2023). All the data set are obtained from the Central Bank of Nigeria (CBN), National Bureau of Statistics, United Nations Development Programme (UNDP), World Health Organisation (WHO) and World Development Indicators.

In line with (30); (49) and (21), health expenditure consists of public health expenditure, private health expenditure, out-of-pocket expenditure and external aid. Therefore, the composite nested multiple equation model specification is:

. LE= ∂0 + ∂1GHE + ∂2PHE + ∂3OPH + ∂4ERH + ∂5THE + ∂6HEPC + ∂7POP + μ1 (3.1) IM= ß0 + ß1GHE + ß2PHE + ß3OPH + ß4ERH + ß5THE + ß6HEPC + ß7POP + μ2 (3.2) MM= λ0 + λ1GHE + λ2PHE + λ3OPH + λ4ERH + λ5THE + λ6HEPC + λ7POP + μ3 (3.3)
Where:

LE=Life Expectancy (Proxy for development index of health)
IM=Infant Mortality Rate (Proxy for development index of health)
MM=Maternal Mortality Rate (Proxy for development index of health)
ERH=External resources for health (% of total expenditure on health)
OPH=Out-of-pocket health expenditure (% of total expenditure on health)
PHE=Health expenditure, private (% of GDP)
GHE=Health expenditure, public (% of government expenditure)

Print ISSN: 0189-9287 Online ISSN: 2992-345X

THE= Health expenditure, total (% of GDP)
HEPC= Health expenditure per capita (current US$)
POP= Population growth (annual %)
μi= error term (μ is a pure white noise term)
α0= Intercept
α, ∂, ß and λ = estimation parameters

The Durbin- Watson (DW) statistic for autocorrelation test is defined as;

$$Dw = \frac{\Sigma (\mu t - \mu t\text{-}1)^2}{\Sigma \mu^2}$$

The Unit Root Test Equation

The Augmented Dickey- Fuller (ADF) test is employed in estimating the following regression which is based on the assumption that μt is white noise i.e. serially uncorrelated.

$$\Delta LEt = \Omega 1 + \Omega 2t + \alpha LEt\text{-}1 + \varrho 1 \Sigma \Delta LEt\text{-}1 + \mu t1 \quad (3.4)$$

$$\Delta MMt = \beta 1 + \beta 2t + \eta MMt\text{-}1 + \text{ƶ}1 \Sigma \Delta MMt\text{-}1 + \mu t2 \quad (3.5)$$

$$\Delta IMt = \Omega 1 + \Omega 2t + \alpha IMt\text{-}1 + \varrho 1 \Sigma \Delta IMt\text{-}1 + \mu t1 \quad (3.6)$$

$$\Delta GHEt = \phi 1 + \phi 2t + \text{Ƭ}GHEt\text{-}1 + \text{Ꮃ}1 \Sigma \Delta GHEt\text{-}1 + \mu t3 \quad (3.7)$$

$$\Delta PHEt = \text{л}1 + \text{л}2t + \delta PHEt\text{-}1 + \lambda 1 \Sigma \Delta PHEt\text{-}1 + \mu t4 \quad (3.8)$$

$$\Delta OPHt = \alpha 1 + \alpha 2t + \tau OPHt\text{-}1 + \text{ƨ}1 \Sigma \Delta OPHt\text{-}1 + \mu t4 \quad (3.9)$$

$$\Delta ERHt = \Theta 1 + \Theta 2t + \text{и}ERHt\text{-}1 + \text{ʌ}1 \Sigma \Delta ERHt\text{-}1 + \mu t4 \quad (3.10)$$

$$\Delta THEt = \text{₸}1 + \text{₸}2t + \prod THEt\text{-}1 + €1 \Sigma \Delta THEt\text{-}1 + \mu t4 \quad (3.11)$$

$$\Delta HEPCt = ₩1 + ₩2t + ₡\delta HEPCt\text{-}1 + \infty 1 \Sigma \Delta HEPCt\text{-}1 + \mu t4 \quad (3.12)$$

$$\Delta POPt = \text{Ғ}1 + \text{Ғ}2t + \sharp POPt\text{-}1 + \text{ѡ}1 \Sigma \Delta POPt\text{-}1 + \mu t4 \quad (3.13)$$

The number of appropriate lagged terms to include is determined empirically, based on the Akaike Information Criterion (AIC) and Schwartz Information Criterion (SIC).

Table 1. Short Run-Estimated Result showing the effects of healthcare expenditure on development components on healthcare in Nigeria

Variable	***LE***		***IM***	***MM***	
C	-18.37997	(-2.301148)	816.1111 (6.404266)	139.8779 (6.862642)	
ERH	0.010030 (0.688669)		-0.205884 (-0.781001)	-0.039573	(-0.938538)
OPH	-0.074929	(-0.888618)	5.162989 (3.895802)*	0.749375 (3.535225)*	
PHE	2.643287 (1.107226)		-158.9634 (-4.346406)*	-23.38964	(-3.998332)*
GHE	0.006332 (0.246063)		-0.753402 (-1.629504)	-0.103333	(-1.397304)
THE	-2.015909	(-1.245586)	107.6987 (4.356129)*	16.07483 (4.064985)*	
HEPC	0.004609 (0.912211)		-0.008545 (-0.111914)	-0.011914	(-0.975608)
POP	27.90563 (17.83385)*		-375.6033 (-13.94826)*	-54.72583	(-12.70589)*
R-squared	0.994631		0.991042	0.989803	
F-statistic	264.6443		173.8577	152.5419	
Durbin-Watson stat	1.343546		2.072613	1.957284	

***Source**: Eviews 11 Computation*
******indicates significance at 5%*

Public Health Expenditure as a Percentage of Total Government Expenditure (GHE)

Life expectancy is the most common indicator of health conditions in a country.[46,43,20] The result reveals that an

Print ISSN: 0189-9287 Online ISSN: 2992-345X

expansion in government expenditure on the healthcare sector, tends to improve human welfare and wellness. It also showed the expected sign on infant mortality and maternal mortality. Specifically, infant mortality tends to reduce by 0.75 following an increase in government expenditure to the healthcare sector, equally, maternal mortality tends to reduce by 0.10. However, the extent of government expenditure commitment to healthcare is not yet adequate to influence development indices of health, to a significant extent. Contrary to (50), we found that growth in out-of-pocket health expenditure seems faster than public healthcare expenditure

Private Health Expenditure as a Percentage of GDP

It was also found that private health expenditure has a strong negative relationship with infant mortality. Similarly, the result shows that a proportionate rise in the percentage of private health expenditure to GDP, will bring about a reduction in maternal mortality to about 23.38. Comparatively, healthcare expenditures made by the private sector showed a strong influence in preventing mortality rates, as against government level of expenditure commitment. These findings conform to apriori. Although scholars in literature like (26) found that maternal mortality rate had no relationship with health expenditure in African countries

Out-of-pocket Health Expenditure as a Percentage of Total Expenditure on Health

This is an aspect of healthcare expenditure that refers to the payments made by the patients at the point of receiving services. It includes payments for doctor's consultation fees, medication, laboratory tests and hospital bills.

Against apriori, our result reveals that an increase in out-of-pocket expenditure brought unfavourable health outcomes for Nigeria.

In the literature, (13) affirmed that Out-of-pocket financing of healthcare can cause considerable financial hardship to families. As many households must devote a large share of their resources for medical treatment expenses which is appalling. In addition, some studies show evidence that heavy reliance on out-of- pocket spending in healthcare financing results in high levels of medical impoverishment.[47,5,6,45,44]

External Resources for Health as a Percentage of total expenditure on Health

Foreign aid for healthcare has continued to play an important role in Nigeria. Operationally, foreign aid is defined by (16) as a grant or gift of convertible currency, the recipient country does not pay interest or make any repayment. It is interesting to note that external resources on health appeared with the expected sign. External resources on healthcare represents an important source of financing healthcare in most countries in sub-Saharan Africa (SSA), where it supplements public expenditure. From our short run result, external resource on healthcare contributed positively to life expectancy to about 0.01 years. We also found a negative relationship between external resources on healthcare and infant mortality with a coefficient of 0.205884. This implies that an increase in foreign aid to healthcare delivery in Nigeria, tends to reduce the level of infant maternity by 0.20. In the same vein, the short run result showed that a negative association exists between external resources on healthcare and maternal mortality with a negative coefficient of 0.039573. These findings conform to *a priori* and demonstrate that foreign donor is vital for healthcare improvement in developing countries, particularly for Nigeria, taking into consideration the extent of external sector's commitment to healthcare in Nigeria, however, our result suggest that the level of improvement in health is not satisfactory.

Total Health Expenditure as a Percentage of GDP

The result of this research reveals that total health expenditure as a percentage of GDP and life expectancy are negatively correlated, also total health expenditure as a percentage of GDP is positively correlated with infant mortality and maternal mortality rates. This finding conforms to (7). Total health expenditure as a percentage of GDP had an out of the blue sign on the selected indices of development, this however suggest that total health expenditure as a ratio of GDP is not enough to incite the desired influence on healthcare indices, (7) attributed it to poor distributional pattern of health expenditure as it does not reflect a better living condition for the poor. Though, (50) in a World Health Report noted that higher health expenditure does not necessarily lead to better health outcomes, as a minimum level of resources are needed for a health system to fulfil its essential functions adequately.

Per Capita Health Expenditure

A real-world question for policymakers is to know how much of healthcare expenditure is spread out per individual in a geographical space. The results provided evidence that increase in per capita healthcare expenditure was associated with increase in life expectancy at birth and reduction in maternal death and infant mortality rates.

Print ISSN: 0189-9287 Online ISSN: 2992-345X

The findings imply that there is need for governments to increase amounts allocated to health care service delivery with respect to Nigeria's teeming population.

Population Growth

We also considered the influence of demographic factor (population growth) in economic development. Population growth was included in our health expenditure regression as a check variable. The policy question referred here is, does population growth raise mortality rates of infants and the motherly.

The coefficient showed a positive and significant relationship between population growth and life expectancy. Contrary to (14), we found a negative and significant relationship between population growth and infant mortality rate. This implies that, c*eteris paribus,* a percentage growth in Nigeria's population will bring about a reduction in the number of newborns dying under a year of age. Also, in line with *a priori,* the short run result reveals a negative relationship between population growth and maternal mortality. This suggests that population growth is associated with a sturdy reduction in maternal mortality. Relatively speaking, the result reveals that population growth has a stronger influence on reducing infants' death rate than maternal deaths rate in Nigeria.

Test for Autocorrelation/Serial Correlation

Essentially, we employed the Durbin-Watson (DW) test for autocorrelation, it is based on the assumption underlying the Ordinary Least Squares (OLS), that the error term (μ) is assumed to be uncorrelated. It is clear that there we cannot decide whether to accept the null hypothesis of no positive autocorrelation in the Life Expectancy regression, which implies that the residuals are uncorrelated. The Durbin Watson value for Infant mortality and Maternal mortality also lies in the zone of indecision.

Test for Perfect Multicollinearity

Table 2: Test for Multicollinearity

	ERH	OPH	PHE	GHE	THE	HEPC	POP
ERH	1.000000						
OPH	-0.277139	1.000000					
PHE	-0.216182	0.135498	1.000000				
GHE	-0.339646	-0.414842	0.573897	1.000000			
THE	-0.147846	-0.231431	0.928801	0.744188	1.000000		
HEPC	-0.313587	-0.036227	0.453478	0.719218	0.499979	1.000000	
POP	-0.166167	-0.348731	0.448171	0.780024	0.587255	0.826603	1.000000

Source: Author's Computation Using EViews 8 Software

This concept is associated with (15).[18] The result from multicollinearity test confirms the absence of perfect correlated explanatory variables

Print ISSN: 0189-9287 Online ISSN: 2992-345X

Test for Model Stability

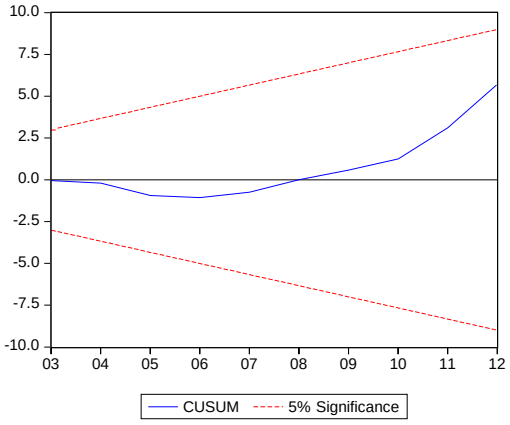


Figure 4.1a: Model Stability Test For Life Expectancy Model

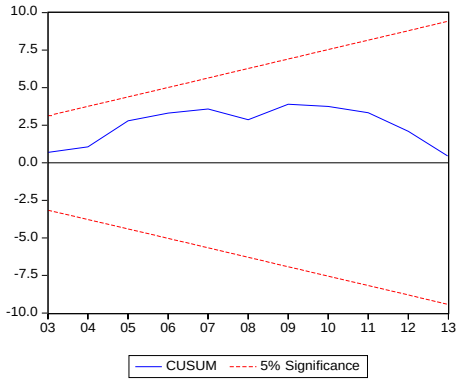


Figure 4.1b: Model Stability Test For Infant Mortality Model

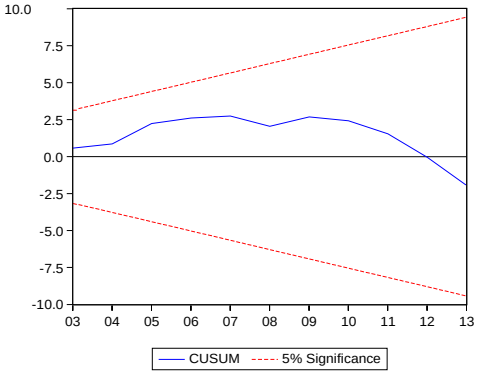


Figure 4.1c: Model Stability Test For Maternal Mortality Model

The Nigerian Health Journal, Volume 25, Issue 1
Published by The Nigerian Medical Association, Rivers State Branch.

Print ISSN: 0189-9287 Online ISSN: 2992-345X

Test for Model Stability

Print ISSN: 0189-9287 Online ISSN: 2992-345X

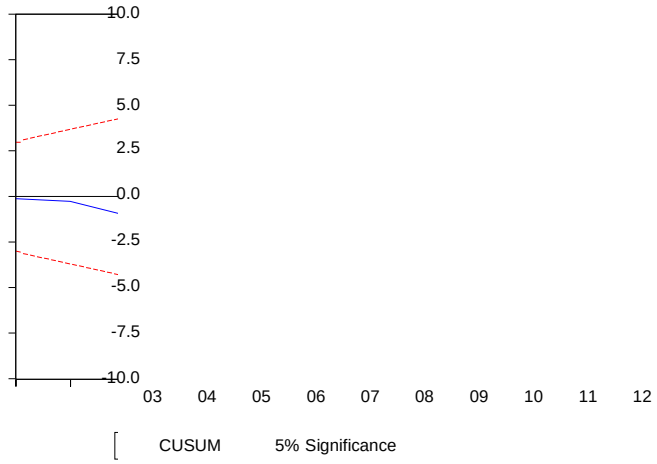


Figure 1a: Model Stability Test for Life Expectancy Model

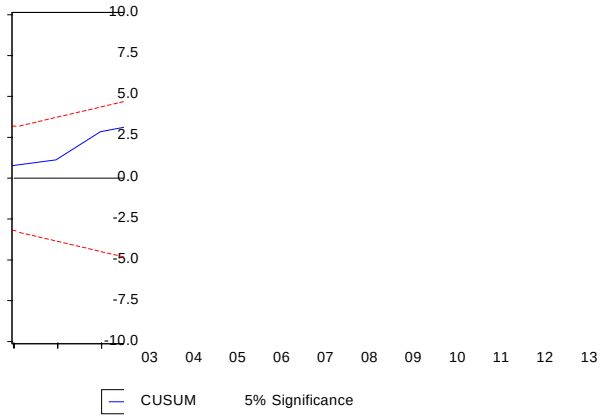
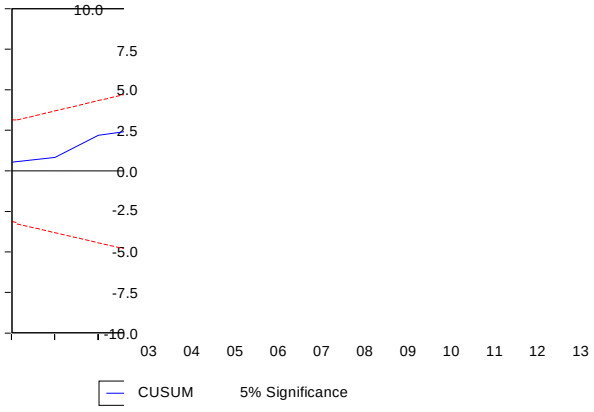


Figure 1b: Model Stability Test for Infant Mortality Model



The CUSUM tests is used in this study to test for parameter stability, our graph shows that the plots of the residuals remain within the 5% critical bounds, therefore, we can accept that

Print ISSN: 0189-9287 Online ISSN: 2992-345X

the parameters of the model are stable

Test for Residual Normality

The Jarque-Bera (JB) test of normality is adopted purely to verify whether the residuals are normally distributed. It is conducted under the null hypothesis that the residuals are not normally distributed. From illustration below, the computed ϱ value of the JB statistic (0.360412, 0.406604 and 0.399465) under the normality assumption, we therefore reject the hypothesis that the error terms are not normally distributed. The diagram below shows that the residuals from the regression seem to be symmetrically distributed.

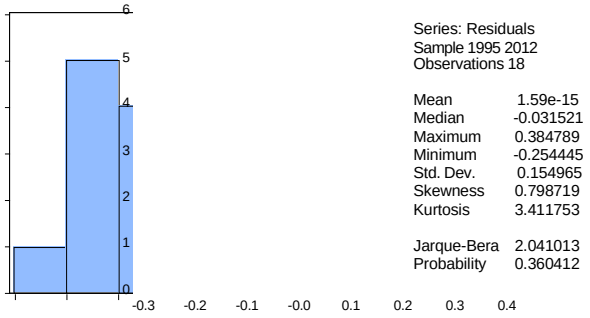


Figure 2a: Histogram Normality Test for Life Expectancy Model
***Source**: Author's Computation*

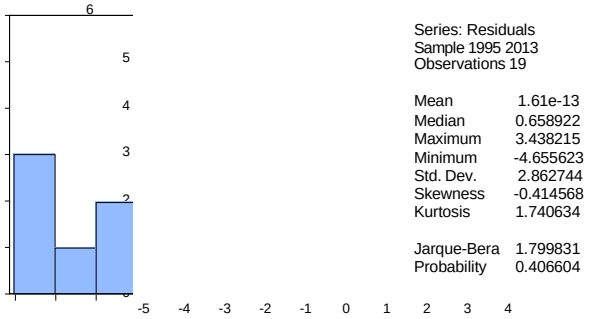


Figure 2b: Histogram Normality Test for Infant Mortality Model
***Source**: Author's Computation*

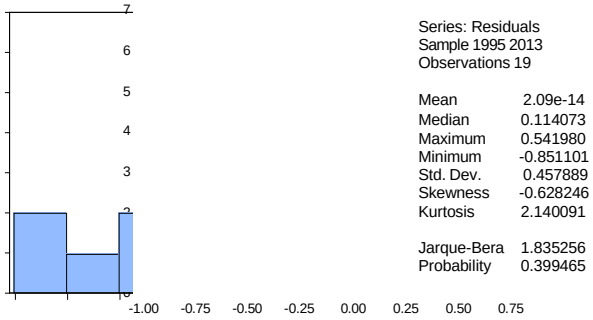


Figure 2c: Histogram Normality Test for Maternal Mortality Model
***Source**: Author's Computation*

Print ISSN: 0189-9287 Online ISSN: 2992-345X

Table 3: Test for Heteroscedasticity

Heteroscedasticity Test for Life Expectancy model			
F-statistic	1.273686	Probability	0.3518
Obs*R-squared	8.484148	Probability	0.2918
Heteroscedasticity Test for Infant Mortality model			
F-statistic	0.376822	Probability	0.8975
Obs*R-squared	3.674896	Probability	0.8164
Heteroscedasticity Test for Maternal Mortality model			
F-statistic	0.897192	Probability	0.5407
Obs*R-squared	6.905335	Probability	0.4388

Source: *Author's Computation*

This test is conducted using White's test, which involves either an auxiliary regression with no cross-terms or with cross terms. It also follows the chi-square or F-distribution, from the table shown below, since the ρrobability of F-value 0.3518, 0.8975 and 0.5407 for Life expectancy, infant mortality and maternal mortality equations respectively is not significant, we therefore conclude that there is homoscedasticity, that is to say, the variances are equal.

Unit Root Stationarity Test (1980-2023)

Table 4: Augmented Dickey- Fuller (ADF) Unit Root Test of Stationarity Results

Test	Variables	Levels		Differences		Order of Integration
		t- statistic	Critical	t- statistic	Critical	
ADF	**GHE**			-5.034226	-3.886751	I(1)
	PHE			-7.325725	-3.886751	I(1)
	OPH			-5.163557	-3.886751	I(1)
	ERH			-4.268915	-3.886751	I(1)
	THE			-6.326509	-3.886751	I(1)
	HEPC			-3.777827	-2.708094	I(1)
	POP			-7.449184	-2.639210	I(1)
	LE			-4.629073	-3.670170	I(1)
	IM	3.834067	-3.639407			I(0)
	MM	-3.341429	-2.674290			I(0)

Note: ** Implies significance at 1%*

Source: Author's Computation based on data from Central Bank of Nigeria Publications, UNESCO

The summarised result presented in table 4 above shows that at various levels of significance (1%, 5% and 10%), all the variables were stationary, specifically, only IM and MM are integrated of order zero, I(0), whereas GHE, PHE, OPH, ERH, THE, HEPC, POP and LE are integrated of order one, I(1). Hence, all the variables in this study are stationary.
ARDL Bounds Tests for Cointegration

Table 5: Bounds Test for Cointegration Analysis

Critical value	Lower Bound Value	Upper Bound Value
1%	3.418	4.694
5%	2.752	3.883
10%	2.410	3.492

Source: *(38)*

Table 6: ARDL Results for Cointegration Analysis

Wald Test:

	Test Statistic	Value	df	Probability
LE EQUATION	F-statistic	11.60866	(7, 1)	0.1817

Print ISSN: 0189-9287 Online ISSN: 2992-345X

	Chi-square	11.60866	7	0.0007
IM EQUATION	F-statistic	11.08429	(8, 1)	0.2284
	Chi-square	88.67433	8	0.0000
MM EQUATION	F-statistic	20.43942	(7, 1)	0.1687
	Chi-square	143.0760	7	0.0000

Source: *Author's Computation Using EViews Software*

The ARDL Bounds approach of testing for cointegration was developed by (37) is also adopted in this study because it can be used with a mixture of variables that are integrated of order zero and order one, in addition, this approach involves a single equation set-up.

According to (37), the asymptotic distribution of the F-statistic is non- standard regardless of whether the regressors are I(0) or I(1), and provide two adjusted critical values that establish lower and upper bounds of significance.

Decision Rule/ Criterion: If the F-statistic exceeds the upper critical value, we can conclude that a long-run relationship exists. If the F-statistic falls below the lower critical value, we cannot reject the null hypothesis of no cointegration. The value of the F-statistic that lies within the bounds makes the test inconclusive.

Given a computed F-Value of 45.45131, 11.08429 and 20.43942 for LE, IM and MM equations, the results of the bounds co-integration test therefore establish that the null hypothesis against its alternative is rejected at the various significance level. The computed *F*-statistic of 45.45131, 11.08429 and 20.43942 are greater than the lower and upper critical bound values at 1%, 5% and 10% respectively, thus indicating the existence of a steady-state long-run relationship among the variables. This suggest that the various forms of expenditure on healthcare have a long run relationship with economic development indices of health in Nigeria.

Meanwhile, population growth (POP) unexpectedly enhances health outcomes, possibly reflecting increased demand or economies of scale, challenging (14). These results suggest that Nigeria's healthcare financing requires a shift away from out-of-pocket reliance and toward more equitable and efficient systems.

The ARDL bounds test confirms a long-run relationship between expenditure and health indices, validating the value of sustained investment, yet the varying effectiveness of funding types, points to systemic inefficiencies. External aid (ERH) and per capita expenditure (HEPC) show potential but lack significance, possibly due to misalignment or insufficient scale. These findings advocate for public-private collaboration, reduced out-of-pocket burdens via expanded insurance, and optimized resource distribution, providing lessons for Nigeria and similar contexts pursuing Sustainable Development Goal 3 (good health and well-being).

Discussion

The findings reveal the nexus between expenditure in health and outcomes in health in Nigeria, as private

Expenditure on health (PHE) turns out to be a robust driver of rising life expectancy and fall in infant and maternal mortality and public expenditure in health (GHE) which has positive, though statistically minor, effects. This aligns with (41), where private spending was more effective in the SAARC-ASEAN region, but against (27), where public spending significantly enhanced South Africa's Human Development Index. Nigeria's comparatively restricted contribution of GHE may reflect inadequate funding—well below the Abuja Declaration target of 15%—or misallocation, as (51) have suggested, appealing for increased efficiency in the public sector to enable the national desire for a life expectancy of 70 years.

Conversely, the inverse relationship of out-of-pocket expenditure on health with life expectancy and a direct relationship with mortality rates reinforces the policy problem, agreeing with (13) and (47) regarding its economic burden. Total health expenditure (THE) as a percentage of GDP is also paradoxical, inversely related to life expectancy and directly to mortality, a result replicated by (8), who attribute it to misdistribution.

Strengths and Limitations of the Review

The review reflects several strengths, including its broad analysis of healthcare expenditure and economic development indices in Nigeria. By employing rigorous econometric techniques such as the autoregressive distributed lag (ARDL) model, along with diagnostic tests for multicollinearity, heteroscedasticity, and autocorrelation, the study ensures statistical reliability.

Print ISSN: 0189-9287 Online ISSN: 2992-345X

Also, its data-driven approach, drawn from reputable secondary sources, enhances the credibility of its findings. The policy relevance of this study finding is profound, as it reveals the implications of healthcare financing on critical health indicators such as life expectancy, infant mortality, and maternal health. Moreover, by benchmarking its results against existing literature, the review provides comparative insights that contextualise its findings within broader economic and healthcare studies.

Despite these strengths, the review is not subject to limitations. The study primarily emphasises short-run and long run estimates, which may not explicitly test causality using methods like the Granger causality approach. Also, data limitations inherent in secondary sources raise concerns about measurement inconsistencies. The absence of a regional analysis further restricts the applicability of the study, as healthcare expenditure and its impact may vary across different states in Nigeria. Moreover, the study does not fully account for institutional and governance factors that influence healthcare spending efficiency. While the findings are relevant to Nigeria, their generalisability to other developing economies remains limited due to differences in healthcare systems and policy environments. Subsequent studies may find this limitation as a contribution to policy and academic discourse.

Implications of the Findings

The findings are supportive of a multidimensional healthcare financing in Nigeria. Strengthening the private sector, reducing reliance on out-of-pocket expenditure, and leveraging public and external resources are fundamental actions towards increasing life expectancy as well as reducing mortality. These takeaways not only address Nigeria's health challenge but also carry meaning for other developing nations attempting to balance economic growth with health. Policymakers must move quickly to translate these observations into actionable reforms such that health expenditures are translated into tangible benefits to the welfare of Nigerians. Some of these implications are as follows:

a. Re-evaluation of Public Health Funding Strategies: The failure of public health expenditure to have a significant impact on life expectancy, infant mortality, and maternal mortality suggests that simply increasing budgetary expenditures may not be sufficient. This aligns with the need to meet Nigeria's health policy objective of a 70-year life expectancy, which remains elusive.

b. Strengthening Private Sector Involvement: The strong positive impact of private spending on health outcomes puts the private sector at the forefront of importance. The government can promote private investment in the health sector through tax exemptions, subsidies, or PPPs. This can enhance the healthcare infrastructure, service delivery, and availability of care, particularly in rural and remote areas where public facilities are inadequate.

c. Minimising the Prevalence of Out-of-Pocket Spending: The adverse implication of out-of-pocket spending on health outcomes provides a strong rationale for a universal health coverage (UHC) transition. Excessive out-of-pocket expenses are to blame for economic hardship as well as for medical impoverishment, as the literature has established.[45.47,35] Diversifying or expanding health insurance schemes, e.g., National Health Insurance Scheme (NHIS), to cover more Nigerians—especially the informal sector—might appease it and improve the health indicators.

d. Maximising the Use of External Support: While external support is in the correct direction, its marginal contribution suggests under-utilisation or misallocation. There is need to ensure that foreign assistance is aligned with national health priorities so that it complements local efforts and does not substitute them. Proper monitoring and evaluation systems could maximise the efficiency of these funds.

e. Enhancing Total Health Expenditure Inefficiencies: The converse and adverse relation between the ratio of total expenditure on health as a proportion of GDP and outcomes suggests distributional inefficiencies. Policymakers must ask themselves why greater spending does not correspond to better results, possibly analysing whether greater equitability between regions and socio-economic groups and improved healthcare delivery systems are called for.

f. Policy Integration and Long-Term Planning: The derived long-run relationship between health expenditure and health indicators by ARDL estimation implies that there is a need for ongoing investment. An integrated policy environment that incorporates public, private, and external funding sources, coupled with population-targeted strategies, can drive Nigeria towards the realisation of Sustainable Development Goals (SDGs) in the health domain (e.g., SDG 3: Good Health and Well-being).

Declarations

Authors' Contribution: KCN and FNN conceived of the presented idea. KCN developed the theory and

Print ISSN: 0189-9287 Online ISSN: 2992-345X

performed the computations. FNN verified the analytical methods.

Conflict of interest: No conflict of interests
***Funding*:** No funding is associated with this study
Acknowledgment: The author would like to thank the anonymous reviewers and the Editorial Board

Conclusion

This study is an assessment of healthcare expenditure and development indices of health in Nigeria. This work has confirmed the assertion by notable economist, such as Keynes and Baumol. Although, other variables like private sector health expenditure, out-of-pocket expenditure on health, foreign aid to the health sector, per capita health expenditure, total health expenditure and population growth were included, to determine its influence on development indices that are related to healthcare. All the variables estimated in the model of our study were found to have the desired influence on development indices, except out-of- pocket health expenditure and total health expenditure; remarkably, this study concludes that the private sector expenditure on healthcare has shown a stronger influence on development indices of health, compared with the public sector. Notably, public health expenditure showed the expected sign, but not statistically significant, which implies that more action and public policy implementation is required towards achieving a substantial level of development via healthcare expenditure strategies. Therefore, the government should incorporate the private sector as a strategy to increase healthcare funding. This measure appears to increase life expectancy, reduce the rates of infant and maternal mortality in Nigeria.

References

1. Aboubacar B, Xu D. The impact of health expenditure on economic growth in sub-Saharan Africa. Theor Econ Lett. 2017;7(3):615–22. doi:10.4236/tel.2017.73046
2. Ali MA, Ullah MI, Asghar M. Effect of health expenditure on GDP, a panel study based on Pakistan, China, India and Bangladesh. Int J Health Econ Policy. 2017;2(2):57–62. doi: 10.11648/j.hep.20170202.13
3. Anyanwu JC, Erhijakpor AEO. Health expenditures and health outcomes in Africa. Afr Dev Bank Econ Res Work Pap. 2007;(91):1–40.
4. Baal PV, Obulqasim P, Brouwer W, Nusselder W, Mackenbach J. The influence of health care spending on life expectancy. Netspar Panel Pap. 2013;(35).
5. Banda P, Masiye F, Kaonga O, Bump J, Berman P. Determining household out-of-pocket payments, incidence of catastrophic expenditures and impoverishment among patients with malaria in Zambia's path towards universal health coverage. PLoS One. 2024;19(12):e0312906.
6. Barasa EW, Maina T, Ravishankar N. Assessing the impoverishing effects, and factors associated with the incidence of catastrophic health care payments in Kenya. Int J Equity Health. 2017;16:1–14.
7. Bassey JU, Riman HB, Edu BE, Ibi EE. Poverty, health expenditure, and health status: a long-term perspective with evidence from Nigeria. 2010a. Available from: http://www.ssrn.com
8. Bassey JU, Riman HB, Edu BE. Health care expenditure in Nigeria: does the level of government spending really matter? 2010b. Available from: http://www.ssrn.com
9. Bedir S. Healthcare expenditure and economic growth in developing countries. Adv Econ Bus. 2016;4(2):76–86. doi:10.13189/aeb.2016.040202
10. Bello RA. Reducing malaria in Nigeria: a public health expenditure conundrum. Niger J Econ Soc Stud. 2005;47(2):175–88.
11. Brenner MH. Influence of health care expenditures, GDP, employment and globalization on cardiovascular disease mortality: potential implications for the current recession. Int J Bus Soc Sci. 2012;3(20): Special Issue.
12. Breyer F, Felder S. Life expectancy and health care expenditures: a new calculation for Germany using the costs of dying. Health Policy. 2006;75(2):178–86.
13. Chandrasiri J, Anuranga C, Wickramasinghe R, Rannan-Eliya RP. The impact of out-of-pocket expenditures on poverty and inequalities in use of maternal and child health services in Bangladesh: evidence from the household income and expenditure surveys 2000–2010. Asian Dev Bank RETA–6515 Country Brief. 2012.
14. Fabella MC, Fabella RV. Population growth and infant mortality. UP Sch Econ Discus Pap. 2008;(0810).
15. Frisch R. Statistic confluences analysis by means of complete regression systems. 1934.
16. Gbosi AN. International trade in theory and practice. Port Harcourt: Amethyst & Colleagues Publishers; 2011.
17. Gillani QD, Gillani SAS, Naeem MZ, Spulbar C, Coker-Farrell E, Ejaz A, et al. The nexus between sustainable economic development and government health expenditure in Asian countries based on ecological footprint consumption. Sustainability. 2021;13(12):6824. https://doi.org/10.3390/su13126824
18. Gujarati DN, Sangeetha. Basic econometrics. 4th ed. New Delhi: McGraw-Hill Companies; 2007.

Print ISSN: 0189-9287 Online ISSN: 2992-345X

19. Güven D, Şimşek T, Güven A. Sağlik yönetimi kapsaminda sağlik harcamalarinin ekonomik büyüme üzerine etkisi: MENA ülkeleri üzerine bir panel regresyon analizi. SosyoEkon. 2018;26(37):33–55. doi:10.17233/sosyoekonomi.2018.03.02
20. Huang G, Guo F, Liu L, Taksa L, Cheng Z, Tani M, et al. Changing impact of COVID-19 on life expectancy 2019–2023 and its decomposition: findings from 27 countries. SSM Popul Health. 2024; 25:101568.
21. Jaba E, Balan CB, Robu LB. The relationship between life expectancy at birth and health expenditures estimated by a cross-country and time-series analysis. Emerg Mark Queries Finance Bus. 2014;15(1):108–14.
22. Jiménez-Gamero MD, Valdora M, Rodríguez D. Testing homoscedasticity of a large number of populations. Statistical Papers. 2025 Feb;66(2):1-32.
23. Kim DY, Jung HJ, Kim BH. How does medical expenditure affect economic development? Evidence from OECD countries. Int Rev Financ Consum. 2019;4(1):39–50. doi:10.36544/irfc.2019.1-1.3
24. Kim TK, Lane SR. Government health expenditure and public health outcomes: a comparative study among 17 countries and implications for US health care reform. Am Int J Contemp Res. 2013;3(9).
25. Li L, Wu M, Wu Z. The impact of public health expenditure on economic development – evidence from prefecture-level panel data of Shandong province. Res World Econ. 2017;8(2):59. doi:10.5430/rwe.v8n2p59
26. Murthy V, Okunade A. The core determinants of health expenditure in the African context: some econometric evidence for policy. Health Policy. 2009;91(1):57–62.
27. Ndaguba EA, Hlotywa A. Public health expenditure and economic development: the case of South Africa between 1996 and 2016. Cogent Econ Financ. 2021;9(1). doi:10.1080/23322039.2021.1905932
28. Nkemgha GZ, Tékam HO, Belek A. Healthcare expenditure and life expectancy in Cameroon. J Public Health (Berl). 2020;1–9. doi:10.1007/s10389-019-01181-2
29. Nketiah-Amponsah E. The impact of health expenditures on health outcomes in sub-Saharan Africa. J Dev Soc. 2019;35(1):134–52.
30. Novignon J, Olakojo SA, Nonvignon J. The effects of public and private health care expenditure on health status in sub-Saharan Africa: new evidence from panel data analysis. Health Econ Rev. 2012;2(22). Available from: http://www.healtheconomicsreview.com/content/2/1/22
31. Obrizan M, Wehby GL. Health expenditures and life expectancy around the world: a quantile regression approach. Discussion Paper Series. Kyiv: Kyiv School of Economics and Kyiv Economics Institute; 2012.
32. Odhiambo SA, Wambugu A, Kiriti-Ng'ang'a T. Effect of health expenditure on child health in sub-Saharan Africa: governance perspective. J Econ Sustain Dev. 2015;6(8).
33. Ogungbenle S, Olawumi OR, Obasuyi FOT. Life expectancy, public health spending and economic growth in Nigeria: a vector autoregressive (VAR) model. Eur Sci J. 2013;9(19).
34. Olaniyan O, Olayiwola S, Odubunmi S. The impact of health expenditure on the elderly in Nigeria. Pak J Soc Sci. 2011;8(4):212–8.
35. Park S. Medical service utilisation and out-of-pocket spending among near-poor National Health Insurance members in South Korea. BMC Health Serv Res. 2021;21(1):886.
36. Penghui X. Direct and indirect effects of health expenditure on economic growth in China. East Mediterr Health J. 2022;28(3):204–12. https://doi.org/10.26719/emhj.22.007
37. Pesaran MH, Shin Y, Smith RJ. Bounds testing approaches to the analysis of level relationships. J Appl Econ. 2001; 16:289–326.
38. Pesaran MH, Shin Y. An autoregressive distributed lag modelling approach to cointegration analysis. In: Strom S, editor. Econometrics and economic theory in the 20th century: The Ragnar Frisch Centennial Symposium. Cambridge: Cambridge University Press; 1999.
39. Piabuo SM, Tieguhong JC. Health expenditure and economic growth—a review of the literature and an analysis between the Economic Community for Central African States (CEMAC) and selected African countries. Health Econ Rev. 2017;7(1). https://doi.org/10.1186/s13561-017-0159-1
40. Rad EH, Vahedi S, Teimourizad A, Esmaeilzadeh F, Hadian M, Pour AT. Comparison of the effects of public and private health expenditures on the health status: a panel data analysis in Eastern Mediterranean countries. Int J Health Policy Manag. 2013;1(2):163–7.
41. Rahman MM, Khanam R, Rahman M. Health care expenditure and health outcome nexus: new evidence from the SAARC-ASEAN region. Glob Health. 2018;14(113):1–11.
42. Rezapour A, Mousavi A, Lotfi F, Soleimani Movahed M, Alipour S. The effects of health expenditure on health outcomes based on the classification of public health expenditure: a panel data approach. Shiraz E-Med J. 2019;20(12):1–7.
43. Roy A. A panel data study on the effect of climate change on life expectancy. PLoS Clim. 2024;3(1):e0000339.

Print ISSN: 0189-9287 Online ISSN: 2992-345X

44. Salari P, Di Giorgio L, Ilinca S, Chuma J. The catastrophic and impoverishing effects of out-of-pocket healthcare payments in Kenya, 2018. BMJ Glob Health. 2019;4(6).
45. Sangar S, Dutt V, Thakur R. Burden of out-of-pocket health expenditure and its impoverishment impact in India: evidence from National Sample Survey. J Asian Public Policy. 2022;15(1):60–77.
46. Steel N, Bauer-Staeb CMM, Ford JA, Abbafati C, Abdalla MA, Abdelkader A, et al. Changing life expectancy in European countries 1990–2021: a subanalysis of causes and risk factors from the Global Burden of Disease Study 2021. Lancet Public Health. 2025.
47. Tadiwos YB, Kassahun MM, Mebratie AD. Catastrophic and impoverishing out-of-pocket health expenditure in Ethiopia: evidence from the Ethiopia socioeconomic survey. Health Econ Rev. 2025;15(1):15.
48. Tufaner MB, Dizge F, Emir Z. Health expenditure-economic growth relationship in OECD countries. Int Conf Eurasian Econ. 2020.
49. Xu K, Saksena P, Holly A. The determinants of health expenditure: a country-level panel data analysis. World Health Organ Working Pap Results Dev Inst (R4D). 2011. Available from: www.resultsfordevelopment.org
50. Xu K, Saksena P, Jowett M, Indikadahena C, Kutzin J, David B, et al. Exploring the thresholds of health expenditure for protection against financial risk. World Health Report (2010) Background Paper. 2010;(19).
51. Yaqub JO, Ojapinwa TV, Yussuff RO. Public health expenditure and health outcome in Nigeria: the impact of governance. Eur Sci J. 2012;8(13).
52. Yimer Ali B, Moracha Ogeto R. Healthcare expenditure and economic growth in Sub-Saharan Africa. Asian J Econ Bus Account. 2020; 1-7. http://dx.doi.org/10.9734/ajeba/2019/v13i230170
53. Sede PI, Ohemeng W. Socio-economic determinants of life expectancy in Nigeria (1980 - 2011). Health Econ Rev [Internet]. 2015;5(1):2. Available from: http://dx.doi.org/10.1186/s13561-014-0037-z
54. Sengupta K. Health Expenditure and its Impact on health Status. Proceedings of International Academic Conferences [Internet]. 2015; Available from: https://ideas.repec.org/p/sek/iacpro/2804594.html

Print ISSN: 0189-9287 Online ISSN: 2992-345X