Journal of Economics and Sustainable Development
ISSN 2222-1700 (Paper) ISSN 2222-2855 (Online)
Vol.17, No.2, 2026

Health Expenditure, Health Outcomes and Economic Wellbeing in Nigeria: A Time Series Analysis

Ukpemeku Akponohwiroro Paris[1], Mmadu Benjamin Anabori[2], Okeke Izuchukwu Chetachukwu[2]
[1]Department of Economics, Faculty of Social Sciences, Dennis Osadebey University, Asaba, Delta State.
[2]Department of Economics , Faculty of Social Sciences, Chukwuemeka Odumegwu Ojukwu University, Igbariam, Anambra State.
Correspondents Email: okekeizuchukwuchetachukwu@gmail.com

Abstract
As Nigeria strives to improve the health and well-being of its population, understanding the relationship between fiscal policy and health outcomes becomes paramount. Fiscal policies, such as taxation, government spending, and expansionary measures, have the potential to shape healthcare accessibility, quality, and overall health outcomes. In light of the foregoing, the study explores the impact of fiscal policy on health outcomes in Nigeria between 1990 and 2021, shedding light on the dynamic interplay between economic decisions and population health. Using the Two-Stage Least Squares (2SLS) estimation, the result revealed that fiscal policy has a significant impact on longevity and have significant positive impacts on infant health. Tax has a significant negative impact on maternal health whereas health spending, general government spending and expansionary fiscal policy have a significant positive impact on maternal health. Given the significant positive impact of health spending on both longevity and infant and maternal health, we recommend the allocation of more resources towards healthcare.
Key Word: Fiscal policy, Taxation, Health outcome, longevity, infant mortality
DOI: 10.7176/JESD/17-2-03
Publication date: February 28th 2026

Background to the Study

The criticality of good health is widely acknowledged in the economic literature. Regardless of a person's social standing, health is one of the sources of happiness and contentment; it has a significant impact on a country's ability to flourish economically. Hence, while excellent health benefits the individual and raises his or her market value, it also boosts national output (Alimi, Odugbemi & Osisanwo, 2023). Health's significance and role in development are acknowledged throughout the strategic decision-making process such as the millennium development goals (goals 4, 5, and 6) and afterwards by the sustainable development goals (SDGs) (goal 3). One of the key objectives of United Nations includes promoting excellent health and well-being regardless of age to create a thriving society (Anwar, Hyder, Nor & Younis, 2023). The efforts of a competent and efficient health sector would therefore result in a prosperous society, resulting in increased life expectancy, and lower mortality rates among others (Kouton, Bétila & Lawin, 2021).

The World Health Organization (2019a) indicates that newborns and infants born in the WHO African area have a higher risk of passing away before they reach their first birthday. The infant
mortality rate in the WHO African area is more than six times higher (51 per 1,000 live births) than in the WHO European area (8 per 1,000 live births WHO, 2019a).

Analogously, according to the WHO (2019b), the average life expectancy data for the world's regions are as follows: Africa (61.2 years), Eastern Mediterranean (69.1 years), Asia (69.5 years), America (76.8 years), Europe (77.5 years), and the Western Pacific (76.9 years). To guide the economy toward economic prosperity, several macroeconomic policy alternatives (fiscal policy, monetary policy, trade policies, exchange rate policies, sector-specific policies) have to be pursued by Nigerian governments over time (Yusuf & Mohd, 2021). Fiscal policy is one of the most extensively employed economic management tools. Spending more money on healthcare can result in better health access and quality. It can help with the construction of healthcare facilities, improve access to necessary medications and equipment, and boost the number and quality of trained healthcare personnel. Secondly, behavioural incentives can be used by fiscal policy to encourage healthy habits and illness prevention. This involves levies or taxes on dangerous goods like sugary drinks, tobacco, or unhealthy foods while offering incentives or tax breaks for healthy behaviours like physical activity or routine health checks. Fiscal policy seems to offer incentives like grants and subsidies to promote spending and innovation in the healthcare sector.

The nation's fiscal deficit (a measure of the gap between fiscal revenue and spending as a share of GDP) has been negative from 1990 to 2021. For instance, in 1990, the figure was -4.5 and in 2021 it was -4.1 (CBN, 2022). With taxes making up about 7% of GDP, Nigeria's actual revenue barely covers the expense of governance, much less providing for the country's infrastructure needs (Nwokoye, Igbanugo, Ekesiobi & Dimnwobi, 2022; Yusuf & Mohd, 2021). The government's capacity to fund the budget and invest in social welfare and infrastructure necessary to encourage development outcomes has been hampered by low tax receipts and the continuous drop in crude oil prices (Ogar, Eyo, & Arikpo 2019). As a result, the economy is encumbered with large public debt and debt servicing expenses that devour the majority of the actual revenue collected, leaving only a small amount to build desperately required infrastructure to promote development outcomes (Yusuf & Mohd, 2021). To ensure Nigeria's economy's long- term growth, which has one of the lowest tax-to-GDP ratios in the world and can hardly pay the cost of governance, it is necessary to mobilize more domestic revenue. The budgetary space for the government to invest in crucial infrastructure that supports private investment and economic advancement in Nigeria is becoming more constrained due to rising public debt and debt service costs (Babalola & Onikosi-Alliyu 2020). In light of this, this study uncovered the impact of fiscal policy on health outcomes in Nigeria.

1.2. Statement of the Problem

A healthy population is vital for long-term economic advancement (Alimi, Odugbemi & Osisanwo, 2023). At the micro level, improved health has been connected to higher productivity, greater income and happiness while at the macro level; it drives the nation's economic advancement (Osakede, 2021). A significant part of human capital is health, which requires ongoing investment because it deteriorates over time. These investments require the mobilization of both internal and foreign resources because reaching the SDGs depends on improving health. As a result, all levels of government have a moral responsibility to work toward improving health. Given the importance of good health to any economy, multiple health sector reform initiatives have been carried out across the various layers of the Nigerian healthcare system (Musa, 2022)

However, there is evidence that these reforms have not had the anticipated results. For instance, 40 million Nigerian women of childbearing age deal with a lot of health problems associated with childbirth. Despite only making up 2.4% of the world's population, the nation today represents 10% of maternal deaths worldwide. There are 576 maternal deaths for every 100,000 live births, and approximately 262,000 newborns die during birth each year. Fiscal measures, for example, are a viable option for enhancing health outcomes. According to the statistics from the World Bank (2022), Nigeria's government spending as a percentage of GDP increased from 1.8% in 1981 to 5.1% in 2021.

In Nigeria, there is a significant cause for concern over the relationship between fiscal policy and health outcomes. Understanding the connection between both variables becomes essential as the government struggles to provide its citizens with high-quality and affordable healthcare. The general health and well-being of the Nigerian people can be significantly impacted by fiscal policy choices, such as taxation, government expenditure, and resource distribution. Although there are studies on fiscal policy and health outcomes, these studies have captured health outcomes using either infant mortality (Hamzat et al, 2019; Adeosun & Faboya, 2020; Dodo & Isa, 2020; Musa, 2022; Umar et al, 2022) or life expectancy (Akintunde & Olaniran, 2022; Ebhotemhen & Hezekiah, 2021) or combination of life expectancy and infant mortality (Yaqub et al, 2012; Edeme et al, 2017, Alimi et al, 2023). However, these studies were unable to capture the multidimensional nature of health outcomes. In this study, we extend the literature by utilizing longevity, infant health and maternal health to capture health outcomes. This will provide a true picture of Nigeria's health outcomes thereby guiding decision-makers towards the attainment of SDG 3 by 2030.

Studies on fiscal policy and health outcomes have focused on infant mortality, life expectancy, or a combination of these factors. This study aims to capture health outcomes using longevity, infant health, and maternal health, guiding decision-makers towards SDG 3 by 2030. This study seeks to add to the continuing discussion on effect of government expenditure on health outcomes. In light of this the following research questions will guide this investigation:

i. What are the impact of fiscal policy on longevity in Nigeria?

ii. How does fiscal policy impact infant health in Nigeria?

Examining how Nigeria's fiscal policy affects health outcomes is the main goal of this study. These specific objectives provide a clear path for the research.

i. To ascertain the impact of fiscal policy on longevity in Nigeria

ii. To examine the effect of fiscal policy on infant health in Nigeria

These hypotheses act as fundamental guiding propositions that aid in organizing the inquiry and giving the research a defined course.
H_0: Fiscal policy does not significantly impact longevity in Nigeria
H_1: Fiscal policy has a significant impact on longevity in Nigeria
H_0: Fiscal policy does not significantly impact infant health in Nigeria
H_1: Fiscal policy has a significant effect on infant health in Nigeria

The primary goal of this research is to assess the impact of fiscal policy on Nigeria's health outcomes. The study spans from 1990-2021. This period represents a period of substantial changes in health outcomes as well as fiscal policy in Nigeria. Taxation, health spending, government expenditure, and fiscal deficit were employed as fiscal policy proxies while life expectancy was used to proxy longevity, infant mortality were employed to capture health outcome.

2. Literature Review

Concept of Fiscal policy

Fiscal policies are government initiatives aimed at influencing revenue and spending to establish economic balance and long-term development (CBN, 2017). Fiscal policy work with monetary policy to maximize citizen's welfare and achieve macroeconomic stability. Fiscal policy can limit the creation and usage of goods, services, and products, stabilize taxes and raise spending, and address economic imbalances during recessionary and depressive periods. Imide and Imoughele (2019) see fiscal policy as essential for stabilizing and improving economic progress, and can be applied to address health outcomes, health longevity, infant mortality, and health spending.

Concept of Health outcome

Studies suggest that government spending on health generally improves health outcomes, particularly in reducing mortality rates and improving life expectancy, with the impact being more significant in countries with higher quality of governance. According to Bokhari, Gai, & Gottret (2007), government health expenditures and income are linked to reduced under-five mortality and maternal mortality in developing countries, with a larger impact on expenditures than income. Increasing public health expenditure by 10% in Ghana reduces infant and under-five deaths and increases life expectancy at birth, but income has a greater impact on health outcomes (Boachie, Ramu, & Põlajeva, 2018).

Concept of Health Longevity

Public health expenditure plays a significant role in enhancing longevity, but its influence diminishes as the public health sector on GDP expands, reaching a maximum around 8%. Increasing health spending in countries with low life expectancy may have important returns to life expectancy and significantly diminish global inequalities in longevity and development (Obrizan & Wehby, 2018).

The impact of long-term care on longevity is a critical area of research, especially as the proportion of elderly individuals in the population continues to rise. Understanding how long-term care and proactive health behaviors influence longevity can inform healthcare policies and individual health strategies. Longevity increases total expenditures for long-term care significantly, particularly for those who live to very old ages. This is due to higher nursing home costs as individual's age. Engaging in proactive health behaviors such as regular exercise and avoiding tobacco use is associated with greater longevity and improved quality of life among the elderly. Exercise, in particular, predicts fewer limitations in daily activities and greater psychological well-being. Spillman, & Lubitz, (2000) opined that long-term care expenditures increase at an accelerated rate with longevity, but the increase in the number of elderly persons has a more important effect on total spending.

2.2 Theoretical Review

This section documents related theories employed in the literature to study the subject matter.

2.2.1 Grossman's model of health demand

Michael Grossman's Grossman model of health demand, established in 1972, is a paradigm for studying health demand and medical care. It posits health as a long-term capital asset that produces healthy time output. The model is similar to human capital used in wage rate measurement. Health can be improved through nutrition,

exercise, and regular checkups, but it requires money or time. People often choose between leisure time and spending money on health-related expenses as a perfect balance essential for longevity.

2.2.1 Endogenous Growth Theory

Endogenous growth theory, proposed by Arrow, Romer, Lucas, and Rebelo, suggests that constant investment in human capital stimulates productivity and development outcomes. Grossman (1972) classified health as a durable capital stock that requires ongoing investment. According to Hartmann (2010) the theory assumes that production functions do not show diminishing returns to scale, allowing for endogenous growth and demonstrating a positive link between existing and additional human capital

2.2.2 Keynesian Theory of Fiscal Policy

Keynesian economics, developed by British economist John Maynard Keynes in the 1930s, focuses on the impact of economic spending on output, inflation, and employment. Keynes proposed increased government spending and reduced taxation to stimulate demand and prevent the Great Depression, aiming to maximize economic performance by influencing aggregate demand.

2.3. Empirical Review

Novignon, Olakojo and Nonvignon (2012) ascertained how healthcare spending affects SSA's population health status between 1995 and 2010 and the study indicated that health status is positively influenced by healthcare spending. Craigwell, Bynoe, and Lowe (2012) appraised the criticality of public health spending on life expectancy between 1995 and 2007. Using pooled OLS, the authors showed that health spending significantly improves health status. Ashiabi, Nketiah-Amponsah and Senadza (2016) appraised how maternal-child health outcomes in SSA are impacted by public spending between 2000 and 2010. Using the fixed effects model, the study highlighted that public health spending reduces infant and under-five mortality rates in SSA while the effect on maternal mortality is insignificant. Boachie, Ramu and Põlajeva (2018) assessed the connection between public health spending and health outcomes. Employing both OLS and two-stage least squares (2SLS), public health spending stimulates Ghana's health outcomes. Using Generalized Methods of Moments (GMM) and data from 98 developing economies from 2000 to 2013, Nyamuranga and Shin (2019) determined how public health spending affects child mortality and the study showed that public health spending significantly lowers infant and under-five death rates in developing economies.

Similarly, using GMM, Behera and Dash (2020) uncovered the efficacy of health expenditure on health outcomes in Asia from 2000 to 2014. The study highlighted that public health spending has favourable impact on increasing life expectancy and lowering infant mortality. The random effects model was employed in SSA by Kiross, Chojenta, Barker and Loxton (2020) to ascertain the influence of healthcare spending on infant mortality and the study showed a significant negative association between public spending and newborn and neonatal death, suggesting that public spending lowers infant mortality.

Byaro, Nkonoki and Mayaya (2021) utilized the GMM on data from 33 SSA nations between 2000 and 2016 and the study highlighted that health financing boosts health improvement. Specifically, health financing improves life expectancy while reducing under-five mortality. Ibukun (2021) employed the 2SLS technique on 15 West African economies to uncover how health outcomes are influenced by health spending between 2000 and 2018. The study demonstrated that the health performances of West African nations were considerably improved by health spending. Oladosu, Chanimbe and Anaduaka (2022) focused on two SSA economies (Nigeria and Ghana) to ascertain the influence of health spending on health outcomes and the study revealed that in both nations and find that public spending on healthcare is insufficient to boost health improvement.

Azuh, Osabuohien, Orbih and Godwin (2020) appraised the effect of government health spending on under-five mortality in Nigeria between 1985 and 2017. Using ARDL, the study discovered a positive correlation between public health spending and under-five mortality in Nigeria. Gwaison and Maimako (2020) appraised how government health spending affected Nigeria's health sector's performance between 1979 and 2017 and the study reported a positive correlation between both variables. Osakede (2021) appraised the conditional role of governance quality on the nexus between public spending and health outcome. Using 2SLS, the study revealed that public health spending had no meaningful effect on health outcomes unless it was combined with governance quality. Orji, Ogbuabor, Mba and Anthony-Orji (2021) appraised how public health spending has affected health outcomes in Nigeria between 1985 and 2019. The study revealed that government spending on health lowers the under-5 death rate considerably and raises life expectancy.

3.1 Theoretical framework

This study uses the Keynesian theory of fiscal policy, developed by economist John Maynard Keynes, to explain how government intervention can stabilize the economy during economic downturns. As observed by Akerlof (2007), Keynes suggests that changes in government spending and taxation stimulate demand, assuming the economy operates below full employment in the short run. This helps influence aggregate demand and stabilizes the economy.

3.2 Model Specification

The main thrust of this study is to determine the influence of fiscal policy on health outcomes in Nigeria. Based on the research objectives, three model equations are set up for estimations.

(a) Impact of fiscal policy on Longevity

Suppose the health status (H) is approximated to longevity (LGT). Equation 3.7 would be specified as follows:

$$LGT_t = \Omega_1 IPH_t + \Omega_2 TPH_t + \Omega_3 HPH_t \quad 3.1$$

Where:

t refers to time and t could be 1990, 1991, …, 2021.

$IPH = \frac{Y}{N} =$ income per head (or per capita income).

$TPH = \frac{T}{N} =$ tax per head

$HPH = \frac{Tr}{N}$ = health expenditure per head. Here we made two important assumptions. First, we assume that all health spending comes to the household as government transfers. Second, we also assume that health expenditure is the only government transfer.

Woodford (2009) also argues that instruments of fiscal policies include government spending and fiscal deficit. Thus, Equation 3.8 is then specified as:

$$LGT_t = \Omega_1 IPH_t + \Omega_2 TPH_t + \Omega_3 HPH_t + \Omega_4 GPH_t + \Omega_5 DEF_t \quad 3.2$$

Where GPH = government spending per head

DEF = fiscal deficit as a percentage of GDP

As noted by Arendt, Christensen and Hjorth-Trolle (2021), the education is vital for improving longevity. Another important variable is inflation. High inflation squeezes household income and increases the chances of diseases due to the inability to afford the requisite nutritional requirement or medicare.

Thus, the econometric model in line with the two-stage least square as advanced by Wooldridge (2005) and Savin (2007) becomes

$$LGT_t = \Omega_0 + \Omega_1 IPH_t + \Omega_2 TPH_t + \Omega_3 HPH_t + \Omega_4 GPH_t + \Omega_5 DEF_t + \Omega_5 INF_t + \Omega_5 EPH_t + \varepsilon_{t,1}$$

Where $\varepsilon_{t,1}$ represents the stochastic error term, Ω_0 is the intercept term while Ω_1, Ω_2, … are the slope parameter, and EPH and INF refer to education per head and inflation respectively.

(b) Impact of fiscal policy on infant health

Another important health outcome is infant health. To appraise the effect of fiscal policy on infant health, Equation 3.9 is re-specified as follows

$$IFT_t = \Psi_0 + \Psi_1 IPH_t + \Psi_2 TPH_t + \Psi_3 HPH_t + \Psi_4 GPH_t + \Psi_5 DEF_t \quad 3.4$$

In the same vein, Aísa and Pueyo (2004) and Agénor (2008), posit that the infant health depends on the health of the state of the economy and the earning power of the child's parents. In this respect, we introduce economic growth (EG) and unemployment (UEM) as control variables. In this regard, Equation 3.11 within the framework of 2SLS becomes

$$IFT_t = \Psi_0 + \Psi_1 IPH_t + \Psi_2 TPH_t + \Psi_3 HPH_t + \Psi_4 GPH_t + \Psi_5 DEF_t \Psi_6 EG_t + \Psi_7 UEM_t + \varepsilon_{t,2} \quad 3.5$$

Where

INF = inflation
EPH = education spending per head
$\varepsilon_{t,2}$ = stochastic error term
Ψ_i = ith parameter

Description of Variables

Dependent Variables

1. **Longevity (LGT)** is a health condition indicating an individual's longevity, measured by life expectancy at birth. It is expected to be positively influenced by HPH, GPH, DEF, and negatively influenced by TPH.

2. **Infant health (IFH**) is a crucial factor affecting infants, especially under 5 years old, with infant mortality rate indicating a negative correlation with HPH, GPH, and DEF, and a positive correlation with TPH.

3. **(IFH)** are inversely related, we expect that IFH is a positive function of HPH, GPH and DEF, and a negative function of TPH.

Proxies for Fiscal Policies

1. **Health spending per head (HPH)** is government healthcare spending on individuals divided by population, expected to positively impact health outcomes.

2. **Government spending per head (GPH):** This is government spending on each individual. It is calculated as total government expenditure (recurrent plus capital) divided by the population. Health outcome is expected to be a positive function of GPH

3. **Fiscal Deficit (DEF):** This refers to the difference between fiscal revenue and expenditure expressed as a percentage of GDP. It is expected that as DEF increases, health outcome improves.
4. **Tax per head (TPH):** is the annual tax paid by businesses and individuals, potentially reducing personal income and potentially impacting an individual's health status**.**

3.3 Techniques of Data Analysis

The study utilized various data analysis techniques to estimate research models and analyze results. These included examining descriptive statistics, time series properties, and using standard econometric procedures to obtain long-run estimates of fiscal policy's impact on health outcomes.

3.4 Time series properties

(a) Unit Root Test

The classical normal linear regression model (CNLRM) assumes stationary time series data, with mean and variance constant throughout time. However, when non-stationary, the cointegration test becomes necessary. The Augmented Dickey-Fuller (ADF) test is preferred for testing unit roots and stationarity in time series data due to its robustness against non-stationarity, flexibility in capturing lagged values and differencing terms, and efficient parameter estimation. This test is valuable in econometric analysis.

The estimation equation for the ADF test can be written as:

$$\Delta y_t = \alpha + \beta y_{t-1} + \gamma_1 \Delta y_{t-1} + \gamma_1 \Delta y_{t-2} + ... + \gamma_\rho \Delta y_{t-\rho} + \varepsilon_t \quad 3.14$$

Where: Δyt represents the differenced time series, α is the intercept term, β is the coefficient of the lagged value, γ1, γ2, ..., γp are the coefficients of the differencing terms, εt is the error term.To perform the ADF test, the null hypothesis assumes the presence of a unit root, while the alternative hypothesis assumes the absence of a unit root.

(b) Cointegration Framework

Regression estimates with non-stationary time series data frequently produce unacceptable results, even when the overall results show a high degree of fit as measured by the coefficient of multiple correlations, R^2 or adjusted coefficient of R^2, high auto correlated residuals, and low standard significance as measured by the usual t-statistics (Gujarati, 2004). Furthermore, many economic variables have a significant tendency to trend over time, therefore their values can be classified as non-stationary because they do not have a steady mean across time.

(c) Error correction models

Error correction models (ECMs) are statistical models that are utilized to evaluate the connection between two or more variables. The basic premise of error correction models is that a long-run equilibrium connection between two cointegrated variables can be modelled using an error correction model. According to Hayashi, an error correction model involves estimating a system of equations that includes the variables of interest and their first differences. The first differences are used to capture the short-run dynamics of the system, while the cointegrating relationship captures the long-run equilibrium between the variables.

3.4 Two-Stage Least Square (2SLS)

The Two-Stage Least Squares (2SLS) estimation method is a widely used econometric technique that addresses endogeneity, a common problem in estimating causal relationships between variables. The 2SLS method was initially proposed by Theil (1953, 1961) and independently by Basmann (1957). Theil and Basman recognized the need to address endogeneity in econometric analysis and developed the method as a solution.

Let us consider a simple linear regression model with one endogenous variable, Y, and a set of exogenous variables, X:

$$Y = \phi_0 + \phi_1 X + \varepsilon$$

The 2SLS method involves a two-stage estimation process. In the first stage, a "valid" instrument or instrumental variable, Z, which is correlated with the endogenous variable X but not with the error term ε, is identified. Using the instrumental variable, a predicted value of X, denoted as X*, is obtained. This predicted value is uncorrelated with the error term.

Thus, in the second stage, the predicted value X* is used as a proxy for X in the original model to estimate the parameters ϕ_0 and ϕ_1. The estimation equation for the second stage can be written as:

$$Y = \phi_0' + \phi_1' X^* + \varepsilon'$$

Here, ϕ_0' and ϕ_1' represent the estimated parameters for the second stage. The 2SLS method provides consistent estimates of the causal effect of X on Y by utilizing the instrumental variable to eliminate endogeneity bias.

3.5 Nature and Sources of Data

The data scope covers the period from 1990-2021. This study employed secondary time series data which would be obtained from the Central Bank of Nigeria (CBN), World Development Indicator (WDI) and World Economic Outlook (WEO). The researcher resorted to the use of secondary data to avoid the likely problems associated with primary data collection. Secondary data collection is time and cost-saving and it allows the researcher to carry out a time series study and examine the relationship that existed over time.

4.1. Presentation of Results

4.1.2. Descriptive of Statistics

Descriptive statistics focuses on summarizing and describing the main features of a dataset. It involves the use of various statistical measures and techniques such as mean, median, maximum value, minimum value and standard deviation to analyze and interprete the data. Specifically, they provide insights into the central tendencies, variabilities, and distributions of the dataset. Table 4.1 shows that on average, 97 out of every 1,000 infants born die before reaching one year. The maximum and minimum values are 124 and 71 infant deaths out of every 1,000 live births. Mean infant mortality of 97 deaths out of every 1,000 live births is quite high, especially when compared with 5 deaths and 23 deaths in the US and South Africa respectively.

Similarly, maternal mortality ratio records a maximum value of 1,350 deaths out of 100,000 live births. Note that maternal death refers to the death of a woman during pregnancy, childbirth, or within 42 days after the termination of pregnancy, regardless of the duration or site of the pregnancy, from any cause related to or aggravated by the pregnancy or its management. The mean maternal mortality ratio was 1,157 while the minimum value was 1,047. Again, this ratio is relatively high, when compared with South Africa (88) and United States (23).

Also, the mean life expectancy, which refers to the average number of years a person is expected to live, based on statistical data and demographic factors, is 49 years, with maximum minimum values of 53 years and 45 years respectively. Again, this is relatively low when compared with the US and South Africa which are 77 years and 63 years respectively. The standard deviation of 2.7 suggests that the annual series are not far from the mean value.

Table 4.1: Summary of Statistics

	Mean	Median	Maximum	Minimum	Std. Dev.
Infant mortality rate (per 1,000 live births): Proxy for IFH	97.197	93.700	124.200	70.600	18.512
Life expectancy (years): Proxy for LGT	49.145	49.514	52.910	45.487	2.723
Maternal mortality ratio (per 100,000 live births): Proxy for MTH	1156.563	1125.000	1350.000	1047.000	89.539
Economic growth (EG,%)	4.753	3.713	33.736	-1.790	6.260
Unemployment (UEM,%)	14.764	12.667	33.333	5.515	8.152
Inflation (INF,%)	18.062	12.720	72.840	5.390	16.366
Fiscal deficit (DEF,%): Proxy for fiscal policy	-2.388	-1.950	0.800	-8.600	2.015
Government spending per head (GPH,N): Proxy for fiscal policy	18285.850	14053.560	57540.910	632.600	15969.920
Health spending per head (HPH, N): Proxy for fiscal policy	644.419	418.705	2053.600	1.500	647.962
Tax per head (TPH, N): Proxy for fiscal policy	5248.950	3114.850	18457.380	184.250	4871.245
Education per head (EPH, N)	1078.002	730.220	3137.420	2.910	998.882

Source: Estimated by the researchers using Eviews 12.1; *INF =infant health, LGT = longevity, MTH = maternal health*

The data in Table 4.1 also shows that the mean annual growth rate of the economy in the past 32 years was 4.75%. The standard deviation of 6.26%, as well as the maximum and minimum values of 33.74% and -1.79% suggests that the economy experienced substantial cyclicality within the period under review. In the same vein, unemployment averaged 14.76%, hitting a peak of 33.3% and a low of 5.52%. On the other hand, inflation averaged 18.06%, which is 6% higher CBN upper target band of 12%. The maximum and minimum values were 72.84% and 5.39% respectively. The results also show that the mean fiscal deficit was 2.39% of GDP with a maximum value of 8.6%. Although the mean value is less than the benchmark of 3% set by the Fiscal Responsibility Act, the maximum value of 8.6%, which is almost 3 times the benchmark, is indicative of poor management of the fiscal balance.

Table 4.1 also shows that government spending per head averaged ₦18,285 per year while health spending and education spending averaged ₦644.42 and ₦1,072.00 respectively. In the US, healthcare spending per capita averaged $12,900 (₦5,572,800.00). Also, in South Africa, healthcare spending per capita is estimated at $589 (₦254,448.00). On the other hand, tax per head averaged 5,248.95 for the period under review.

Table 4.2 also presents the results of correlation analysis. Correlation is a statistical measure that quantifies the relationship between two variables. It describes the extent to which changes in one variable are associated with changes in another variable. A high correlation means that two or more variables have a strong relationship with each other, while a weak correlation means that the variables are hardly related. In terms of the strength of relationship, the value of the correlation coefficient varies between +1 and -1. A value of ± 1 indicates a perfect degree of association between the two variables.

Table 4.2: Correlation coefficients of the data matrix

	IFH	LGT	MTH	EG	UEM	INF	DEF	GPH	EPH	HPH	TPH
IFH	1.00										
LGT	-0.99	1.00									
MTH	0.84	-0.79	1.00								
EG	0.00	-0.01	-0.20	1.00							
UEM	-0.79	0.79	-0.69	-0.04	1.00						
INF	0.49	-0.48	0.48	-0.23	-0.33	1.00					
DEF	-0.24	0.18	-0.44	0.29	0.02	-0.24	1.00				
GPH	-0.93	0.93	-0.67	-0.14	0.87	-0.36	0.03	1.00			
EPH	-0.92	0.93	-0.66	-0.16	0.85	-0.37	0.05	0.97	1.00		
HPH	-0.91	0.92	-0.64	-0.19	0.82	-0.35	0.02	0.97	0.99	1.00	
TPH	-0.90	0.91	-0.63	-0.16	0.82	-0.33	0.01	0.98	0.96	0.96	1.00

Source: Researchers' estimations using Eviews 12.1

The association between the two variables will be weaker as the correlation coefficient value approaches zero. The sign of the coefficient denotes the direction of the relationship; a positive relationship is denoted by a + sign, and a negative relationship is denoted by a - sign (Kotari, 2004; Stephens, 2015). Woodridge (2001) predicted that variables that are linearly dependent will have correlation coefficient in excess of 0.70. If there is endogeneity problem, the OLS breaks down as an estimation technique. The results obtained show that some coefficients have correlation coefficients in excess of 0.70. This could suggest that there is endogeneity. However, insights from correlation coefficient are not sufficient. There will be need to carry out a formal test of endogeneity, which will be done in subsequent sections.

4.1.3. Unit Root Test

To ascertain the stochastic properties of the time series, Augmented Dicker-Fuller (ADF) and Phillip-Perron (PP) tests of unit root were employed.

Table 4.3: Summary of Unit Root Test

	ADF Test		Philip-Perron Test	
Variable	ADF statistics	Order of Integration	PP statistics	Order of Integration
Government spending per head (GPH)	-5.097***	I(1)	-5.208***	I(1)
Income per head (IPH)	-26.355***	I(1)	-25.872***	I(1)
Tax per head (TPH)	-8.027***	I(1)	-8.109***	I(1)
Health spending per head (HPH)	-4.278***	I(1)	-4.479***	I(1)
Infant health (IFT)	-7.428***	I(1)	-7.403***	I(1)
Maternal health (MTH)	-4.599***	I(1)	-5.139***	I(1)
Longevity (LGT)	-8.671***	I(1)	-8.452	I(1)
Fiscal deficit (DEF)	-6.837***	I(1)	-6.425**	I(1)
Inflation (INF)	-4.278***	I(1)	-16.479***	I(1)
Economic growth (EG)	-7.976**	1(1)	-7.633**	1(1)
Unemployment (UEM)	-4.599	I(1)	-5.139***	I(1)
Education spending per head (EPH)	-6.837***	I(1)	-6.425**	I(1)

Source: Estimated Using Eviews 12.1

The result obtained is summarized on Table 4.3. Both ADF and PP tests indicate that the time series are integrated of order one. In other words, the series are difference stationary. Stationarity, which refers to a condition where the statistical properties of a time series, such as mean and variance, remain constant over time, is critical for model selection. These findings support Kim and Schmidt (1993) assertion that time series are realization of stochastic processes.

4.1.4. Cointegration Test

To test for cointegration among the time series**,** Phillip-Quliaris cointegration framework was employed. For the null hypothesis of no cointegration to be rejected, the Phillip-Quliaris cointegration matrix must indicate at least one cointegrated relation.

Table 4.4: Summary of Philip-Quliaris Cointegration Test

Dependent	tau-statistic	Prob.*	z-statistic	Prob.*	Remarks
LGT	-18.97623***	0.0016	-52.0186***	0.0000	Cointegrated
IFT	-16.97623	0.0025	-49.01857	0.0000	Cointegrated
MTH	-76.01704***	0.0000	-66.67750	0.0000	Cointegrated
IPH	-4.427398	0.8861	-22.33619	0.9024	Not Cointegrated
TPH	-4.096862	0.9434	-20.73914	0.9512	Not Cointegrated
HPH	-16.21856	0.0088	-45.62870	0.0000	Cointegrated
GPH	-20.21856***	0.0023	-50.6287***	0.0000	Cointegrated
DEF	-19.30816***	0.0009	-42.5443***	0.0001	Cointegrated
INF	-17.08016***	0.0091	-30.033***	0.0019	Cointegrated
EG	-20.55028***	0.0001	-27.1289**	0.0492	Cointegrated
UEM	-11.13635**	0.0517	-39.0052***	0.0011	Cointegrated
EPH	-13.65209**	0.0323	-28.7421***	0.0022	Cointegrated

Source: Estimated Using Eviews 12.1

A relation is said to be cointegrated if the probability of both tau-statistic and z-statistics are at least less than 0.05. This suggests that the time series are cointegrated. That is, there is long run relationship between longevity, infant health, maternal health and the covariates.

4.1.5. Error Correction

Although this study focused on long run relationships, the error correction model was estimated to ascertain how the variables adjust to long run equilibrium through short run dynamics. .

The error correction term (ECT) is negative and strongly statistically significant for LGT, IFH and MTH equations. The statistical significance of the negatively signed error correction term (ECT) further lends credence to the co-integration among the variables under investigation. The ECT are -0.610, -0.299 and -0.475 respectively. This suggests that about 61%, 30%, 48% of last year's disequilibrium is corrected in the current year respectively.

4.1.6. Test of Endogeneity and Instruments

The Durbin-Wu-Hausman (DWH) test is a statistical procedure used to detect and address endogeneity in regression models. It compares the estimates obtained from two different estimation methods: the OLS estimator and an instrumental variable (IV) estimator.

The DWH test helps determine whether using instrumental variables provides more reliable and consistent estimates. The null hypothesis of no endogeneity is rejected if the p-value of all the statistics is less than 0.05, otherwise we accept that the variable(s) is(are) truly exogenous. The result of Durbin-Wu-Hausman test is summarized in Table 4.6. From the results shown on Table 4.6, the null hypothesis of no endogeneity is rejected. Thus, we conclude that there is endogeneity problem.

Table 4.6: Endogeneity Test

Null: Variables are exogenous			Remarks
	Coefficient	p-value	
Durbin, χ^2	4.800	0.019	Reject H_0
Wu-Hausman, F-stat	4.485	0.022	
Robust score, χ^2	3.731	0.043	
Robust regression, F-stat	4.114	0.027	

Source: Estimated Using Eview 12.1

Given that the null hypothesis of no endogeneity is rejected, Staiger and Stock (2017) noted that the option available to the researcher is to use instrumental variable (IV) procedure for the estimation.

4.1.7. Impact of fiscal policy on longevity

To investigate the impact of fiscal policy on health outcomes, three long run model of health outcomes were estimated for longevity, infant health and maternal health. Both baseline estimates of ordinary least square regression (undermined by endogeneity problem) and two-stage least square (2SLS) results are presented for each of the health outcome equation.

Table 4.7: Summary of estimates of longevity

	Baseline Regression		2SLSEstimates	
	Coefficient	Standard error	Coefficient	Standard error
IPH	-0.027***	0.006	0.012***	0.004
TPH	0.018***	0.003	0.144***	0.040
HPH	-0.006	0.005	0.041***	0.015
GPH	0.002***	0.000	0.263***	0.089
DEF	-0.002***	0.001	0.206***	0.060
INF	-0.003***	0.001	-0.015**	0.006
EPH	0.038**	0.016	0.067***	0.026
C	0.013***	0.001	0.142***	0.013
R2	0.992		0.672	
Obs	32		32	

Source: Estimated Using Eview 12.1

The results shown on Table 4.7 are for longevity. The proxies for fiscal policies include tax per head (TPH), health spending per head (HPH), government spending per head (GPH) and fiscal deficit (DEF). The estimates obtained shows that the coefficient of TPH is 0.144 with standard deviation of 0.040. This shows that longevity is a positive function of tax. Particularly, it shows that one unit increase in tax may engender 0.144 unit increase in longevity.

Similarly, the coefficient of HPH is 0.041. This suggests that a unit increase in health spending could raise longevity by 0.041 unit. In the same vein, the coefficients of GPH and DEF are 0.263 and 0.206 respectively. This suggests that a unit increase in government spending and fiscal deficit will raise longevity by 0.263 and 0.206 respectively. This indicates that one unit increase in inflation will lead to 0.015 unit decrease in longevity. It also shows that one unit increase in income per head and education spending per head will lead to 0.012 unit and 0.067 unit increase in longevity respectively.

4.1.8. Impact of fiscal policy on infant health

In this subsection the results of the estimates of the impact of fiscal policy on infant health are presented analyzed. Infant mortality rate was used as a proxy for infant health for the estimation. Note that increase in infant mortality rate implies deterioration in infant health.

Table 4.8: Summary estimates for impact of fiscal policy on infant health

	Baseline Regression		2SLSEstimates	
	Coefficient	Standard error	Coefficient	Standard error
IPH	0.017***	0.004	-0.011***	0.002
TPH	-0.009***	-0.002	0.350***	0.076
HPH	0.003	0.002	-0.054**	0.026
GPH	0.005***	0.000	-0.360***	0.074
DEF	-0.014**	-0.006	-0.133***	0.022
EG	-0.011***	0.003	-0.020	0.012
UEM	0.004**	0.002	0.031*	0.017
C	-0.193***	0.025	0.189***	0.024
R2	0.982		0.698	
Obs	32		32	

Source: Estimated Using Eview 12.1

The estimates obtained show that the coefficient of tax per head (TPH) is 0.350 which indicates that one unit increase in tax could lead to 0.350 unit increase in infant mortality rate. This further suggests that tax is a negative function of infant health (notice that infant health and infant mortality are inversely related). The results obtained also show that the coefficients of health spending per head (HPH), government spending per head (GPH) and fiscal deficit (DEF) are -0.054, -0.360 and -0.133 respectively. This indicates a negative relationship with infant mortality rate and a positive relationship with infant health. It suggests that raising HPH, GPH and DEF by one unit will reduce infant mortality rate by 0.054 unit, 0.360 unit and 0.133 unit respectively.

On the other hand, the coefficient for income per head (IPH) is -0.011.

Tests of Hypothesis

As stated in chapter one of this article, there are three hypotheses proposed to be tested. In this section, the stated hypotheses are tested. The test of hypotheses was carried out using t-test of significance. The test statistics is t-statistics. Given that hypothesis testing is carried out at 5% significance level or 95% confidence level, the p-value of the critical t-statistics is therefore 0.05. The decision rule is to reject the null hypothesis if and only if the p-value of the obtained or reported t-statistics is equal or less than 0.05, otherwise, the null hypothesis is accepted, or at least, not rejected. The summary of the statistics for test of hypotheses is shown on Table 4.16.

Table 4.16: Summary of Statistics for Test of Hypotheses I

Variable Name	Coefficient	t-statistic	p-value	Outcome	Decision
Null Hypothesis: Fiscal policy does not have significant impact on longevity					
Tax per head (TPH)				0.000 < 0.050	Reject H0
	0.144	3.551	0.000		
Health spending per head (HPH)				0.007 < 0.050	Reject H0
	0.041	2.694	0.007		
Government spending per head (GPH)				0.003 < 0.05	Reject H0
	0.263	2.950	0.003		
Fiscal deficit (DEF)				0.001 < 0.05	Reject H0
	0.206	3.452	0.001		

Source: Estimated Using Eview 12.1

From Table 4.16, it can be clearly seen that the null hypothesis is rejected for all indicators of fiscal policy. This is because the p-values for the t-statistic of all the coefficients are less than 0.05. Thus, we conclude that fiscal policy has significant impact on longevity. To be precise, our conclusion implies that taxation, health spending, general government spending and expansionary fiscal policy have significant positive impact on longevity

Summary of Statistics for Test of Hypotheses II

The null hypothesis for infant health is rejected for all indicators of fiscal policy, suggesting that fiscal policy has significant impact on infant health. From the foregoing, the test of hypothesis shows that:

a) Tax has significant positive impact on infant mortality. Thus, we conclude that tax has significant negative impact on infant health

b) Health spending, general government spending and expansionary fiscal policy have significant negative impact on infant mortality. Hence, we conclude that health spending, general government spending and expansionary fiscal policy have significant positive impact on infant health.

Finally, the null hypothesis is that fiscal policy does not have significant impact on maternal health. From the test outcome, the null is rejected for all indicators of fiscal policy. Thus, we conclude that fiscal policy has significant impact on maternal health. Put differently, the test of hypothesis shows that:

a) Tax has significant positive impact on maternal mortality. This indicates that tax has significant negative impact on maternal health

b) Health spending, general government spending and expansionary fiscal policy have significant negative impact on infant mortality. Thus, we conclude that health spending, general government spending and expansionary fiscal policy have significant positive impact on maternal health.

Discussion of finding

This study reveals that fiscal policy significantly impacts health outcomes, including longevity and maternal and infant health. Government spending on healthcare directly affects access to medical services and affordability, particularly for vulnerable populations. Policies aimed at reducing income inequality can positively influence health outcomes by reducing social disparities and promoting overall well-being. Fiscal policy also impacts population health, including longevity, by increasing health spending and improving the quality of medical services. Investments in healthcare infrastructure, workforce, and technology contribute to enhanced healthcare delivery, early disease detection, and effective treatment.

Conclusion

The study reveals that taxation, health spending, government spending, and expansionary fiscal policy have positive impacts on longevity and infant health. Taxation negatively affect infant health, while increased health spending, government spending, and expansionary fiscal policies positively affect infant health. To improve longevity and maternal and infant health in Nigeria, policy recommendations include increasing investment in health spending, implementing expansionary fiscal policies, strengthening general government spending, and reforming the tax system. These measures can lead to a healthier population and a better quality of life for all.

Recommendations

The study suggests policy recommendations to enhance Nigeria's longevity and maternal and infant health, thereby promoting a healthier population and improved quality of life.

- Increase investment in health spending to improve longevity and infant and maternal health.
- Implement expansionary fiscal policies to stimulate economic growth and increase public spending.
- Strengthen general government spending.
- Reform the tax system to avoid disproportionate burden on low-income individuals and families, as taxation has a positive impact on longevity.

References

Adeosun, O.T., & Faboya, O.M. (2020). Health care expenditure and child mortality in Nigeria. *International Journal of Health Care Quality Assurance*, 33(3), 261-275

Agénor, P. R. (2008). Health and infrastructure in a model of endogenous growth. *Journal of Macroeconomics*, 30, 1407–1422.

Akerlof, G.A. (2007). The missing motivation in macroeconomics. *American Economic Review*, 97(1), 5-36

Akintunde, T.O., & Olaniran, O.D. (2022). Financial development, public health expenditure and health outcomes: Evidence from Nigeria. *Journal of Economics and Allied Research*, 7(1), 13-24

Alimi, O. Y., Odugbemi, A. A., & Osisanwo, B. G. (2023). Public policy and health outcomes: impact of health expenditure on life expectancy and child mortality. *Journal of Business Administration and Social Studies*, 7(1), 19-31.

Amaghionyeodiwe, L.A. (2009). Government health care spending and the poor: Evidence from Nigeria. *International Journal of Social Economics*, 36(3), 220-236.

Anwar, A., Hyder, S., Nor, N.M., & Younis, M. (2023) Government health expenditures and health outcome nexus: a study on OECD countries. *Frontiers in Public Health*, 11, 1-11

Arendt, J.N, Christensen, M.L., & Hjorth-Trolle, A. (2021). Maternal education and child health: Causal evidence from Denmark. *Journal of Health Economics*, 80, 1-15

Arrow, K.J. (1962). The economic implications of learning by doing. *The Review of Economic Studies*, 29(3), 155-173

Ashiabi, N., Nketiah-Amponsah, E., & Senadza, B. (2016). The effect of health expenditure on selected maternal and child health outcomes in Sub-Saharan Africa. *International Journal of Social Economics*, 43(12), 1386-1399

Azuh, D.E., Osabohien, R., Orbih, M., & Godwin, A. (2020). Public health expenditure and under-five mortality in Nigeria: An overview for policy intervention. *Open Access Macedonian Journal of Medical Sciences*, 20(8), 353-362.

Babalola, A., & Onikosi-Alliyu, O.S.(2020). The crowding-out effect of fiscal policy on capital inflows in Nigeria. *Economics and Organization*,17(1), 43-56.

Basmann, R.L. (1957). A generalized classical method of linear estimation of coefficients in a structural equation. *Econometrica*, 25, 77-83.

Behera, D.K., & Dash, U. (2020). Is health expenditure effective for achieving healthcare goals?

Empirical evidence from South-East Asia Region. *Asia-Pacific Journal of Regional Science*, 4, 593–618.

Bein, M.A., Unlucan, D., Olowu, G., & Kalifa, W. (2017). Healthcare spending and health outcomes: evidence from selected East African countries. *African Health Sciences*, 17(1), 247-300

Boca Raton, FL: Chapman and Hall/CRC. Dodo, H.M., & Isa, U. (2020). The impact of government expenditure on health outcome in Nigeria for the period of 1995-2017.*African Scholar Journal of Management Science and Entrepreneurship*, 18(7), 249-270

Boachie, M.K., Ramu, K., & Põlajeva, T. (2018). Public health expenditures and health outcomes: New evidence from Ghana. *Economies*, 6, 1-25

Bokhari, F., Gai, Y., & Gottret, P. (2007). Government health expenditures and health outcomes.. Health economics, 16 3, 257-73 . https://doi.org/10.1002/HEC.1157.

Bunyaminu, A., Mohammed, I., Yakubu, I.N., Shani, B., & Abukari, A.L. (2022). The effect of health expenditure on average life expectancy: Does government effectiveness play a moderating role? *International Journal of Health Governance*, 27(4), 365-377.

Byaro, M., Nkonoki, J., & Mayaya, H. (2021). The contribution of trade openness to health outcomes in sub-Saharan African countries: A dynamic panel analysis. Research in *Globalization*, 3, 1-17Central Bank of Nigeria (2022), Annual Economic Report.

Central Bank of Nigeria (2017). Fiscal policy at a glance. Abuja: CBN

Craigwell, R., Bynoe, D., & Lowe, S. (2012). The effectiveness of government expenditure on education and health care in the Caribbean. *International Journal of Development Issues*, 11(1), 4-18

Ebhotemhen, W., & Hezekiah, O. (2021). Impact of public health expenditure on the Nigerian health sector performance: Empirical investigation. *Gusau International Journal of Management and Social Sciences, Federal University, Gusau*, 4(2), 86-100

Edeme, R.K., Emecheta, C., & Omeje, M.O. (2017). Public health expenditure and health outcomes in Nigeria. *American Journal of Biomedical and Life Sciences*, 5(5), 96-102

Gwaison, P.D., & Maimako, L.N. (2020). Effects of government health expenditures on the performance of health sector in Nigeria (1979-2017). An empirical analysis. *International Journal of New Economics and Social Sciences*, 2(12), 87-102

Hamzat, S., Ebeh, J.E., & Ali, M. (2019). Impact of health expenditure on child mortality rate in Nigeria, 1980-2015. *Lafia Journal of Economics and Management Sciences (LAJEMS)*, 4(1), 33-49

Harmann J. Y (2010) , Sources of health financing and health outcomes: A panel data analysis. *Health Economics*. https://doi.org/10.1002/hec.3817

Ibukun, C.O. (2021). The role of governance in the health expenditure-health outcomes nexus: insights from West Africa. *International Journal of Social Economics*, 48(4), 557-570.

Imide, l.O., & Imoughele, L.E. (2019). The impact of fiscal policy on human development index: empirical evidence from Nigeria's democratic era. *International Journal of Economics, Commerce and Management*, VII (2), 133-155

Kiross, G.T., Chojenta, C., Barker, D., Loxton, D. (2020). The effects of health expenditure on infant mortality in sub-Saharan Africa: Evidence from panel data analysis. *Health Economics Review*, 10, 5, 1-15

Kouton, J., Bétila, R.R. & Lawin, M. (2021). The impact of ICT development on health outcomes in Africa: Does economic freedom matter? *Journal of Knowledge Economy*, 12, 1830-1869

Lucas, R.E. (1988). On the mechanics of economic development. *Journal of Monetary Economics*, 22(1), 3-42.

Muurinen, J. (1982). Demand for health: A generalised Grossman model. Journal of Health Economics, 1(1), 5-28

Musa, N. (2022). Analysis of the impact of the health expenditures and health status in Nigeria. *Journal of Applied and Theoretical Social Sciences*, 4(1), 76-88

Novignon, J., Olakojo, S.A., & Nonvignon, J. (2012). The effects of public and private health care expenditure on health status in sub-Saharan Africa: new evidence from panel data analysis. *Health Economics Review*, 2, 1-22

Nyamuranga, C., & Shin, J. (2019). Public health expenditure and child mortality in Southern Africa. *International Journal of Social Economics*, 46(9), 11371154.

Obrizan, M., & Wehby, G. (2018). Health Expenditures and Global Inequalities in Longevity. World Development, 101, 28-36. https://doi.org/10.1016/J.WORLDDEV.2017.08.003.

Ogar, A., Eyo, I.E., & Arikpo, O.F.(2019). Public expenditure and economic growth in Nigeria: VAR approach. *European Journal of Economic and Financial Research*, 3(3), 36-60.

Osakede, U.A. (2021). Public health spending and health outcome in Nigeria: the role of governance. *International Journal of Development Issues*, 20(1), 95-112.

Oladosu, A. O., Chanimbe, T., & Anaduaka, U. S. (2022). Effect of public health expenditure on health outcomes in Nigeria and Ghana. *Health Policy OPEN*, 3, 1-12.

Onwujekwe O, Obi F, Ichoku H, Ezumah, N., Okeke, C., Ezenwaka, U., Uzochukwu, B., & Wang, H. (2019). Assessment of a free maternal and child health program and the prospects for program re-activation and scale-up using a new health fund in Nigeria. *Nigerian Journal of Clinical Practice*, 22, 1516-1529.

Orji, A., Ogbuabor, J.E., Mba, P.N., & Anthony-Orji, O.I. (2021). Are wealthy countries always healthy? Health outcomes and public health spending nexus in Nigeria. *SAGE Open*, 1-14

Savin, N.E. (2007). Two-stage least squares and the k-Class Estimator. In: The New Palgrave Dictionary of Economics. Palgrave Macmillan, London.

Spillman, B., & Lubitz, J. (2000). The effect of longevity on spending for acute and long-term care.. The New England journal of medicine, 342 19, 1409-15 . https://doi.org/10.1056/NEJM200005113421906.

Umar, A.P., Rotimi, M.E., & John, N.W. (2022). The link between government health expenditure and health outcome in Nigeria, 1981-2019. *ABUAD Journal of Social and Management Sciences (AJSMS)*, 3(1), 12-29

Wang, Y., Wang, X., Zhang, Z., Cui, Z., & Zhang, Y. (2023). Role of fiscal and monetary policies for economic recovery in China. *Economic Analysis and Policy*, 77, 51-63.

Woodford, M. (2009). Convergence in macroeconomics: elements of the new synthesis. *American Economic Journal: Macroeconomics*, 1(1), 267-79

Wooldridge, J.M. (2005). Introductory econometrics: A modern approach. Mason, OH: Thomson/SouthWestern.

World Health Organization (2019a). Global health observatory (GHO) data: infant mortality situation and trends. www.who.int/gho/child_health/mortality/neonatal_infant_text/en/

World Health Organization (2019b). World health statistics 2019: monitoring health for the SDGs, sustainable development goals. https://www.who.int/publications/i/item/9789241565707

World Health Organization (2020) Children: improving survival and wellbeing. World Health Organization

World Health Organization (2021). World health statistics 2019: monitoring health for the SDGs, sustainable development goals. https://www.who.int/publications/i/item/9789241565707

Yusuf, A., & Mohd, S. (2021). Asymmetric impact of fiscal policy variables on economic growth in Nigeria. *Journal of Sustainable Finance & Investment*. https://doi.org/10.1080/20430795.2021.1927388