

AN INVESTIGATION INTO THE INFLUENCE OF HEALTH EXPENDITURES AND HEALTH OUTCOME ON THE GROWTH OF WEST AFRICAN ECONOMIES

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Abstract

Healthcare inputs determines the health outcomes and in long-run endogenously improves the economic growth of any nation. However, the health expenditures of West African region flow to be increased year-on-year but the health status that improves the economic growth and productivity is reduced. This informs the interest of the study to investigate the relationship between health expenditure, health outcome, and economic growth in West African economies between 2000 and 2020, and if there exist a difference in the health expenditure, health outcome and economic growth based on their income categories. Ten West African economies were sampled due to the peculiar situation of the nations' poor health outcomes, low levels of health expenditure and being the top economies with high economic growth rate. Therefore, government current health expenditure, external health expenditure and out-of-pocket health expenditure peroxided health expenditure, total years of life expectancy at birth peroxided health outcome, while gross domestic product peroxided economic growth. As such, the fixed effect estimator was employed as revealed by the Hausmann test, and to this end, the results revealed that government current health expenditure, external health expenditure, out-of-pocket health expenditure and total years of life expectancy at birth negatively relates to economic growth in West Africa economies. Although, despite the negative relationship only government current health expenditure is statistically significant in the growth of top 10 West African nation economies. Amongst the light of proffering real life economic, the study recommends that developing infrastructure, diversifying the economy, and the need to encourage public-private partnerships cannot overemphasize.

Keywords: Economic growth, Health expenditures, Health outcomes, Total life expectancy, West African economies.

Introduction

Health in any nation is a major driver for economic growth. The health status of a nation is an integral part of government healthcare expenditure, health outcomes, and the amount of household spending on health. Therefore, the poorer the health of individuals in the country, the more dreadful the health outcomes. As such, the more dreadful the health outcomes, the less productive they become (Lowe, 2003; Hammuds & Revery, 2019). However, the health expenditure of most African nations increases at a rate that caters for the development, access to, and delivery of healthcare facilities and services to the immediate communities, but the level of health outcomes in African nations keeps decreasing while household expenditure is at a high rate annually as shown in Figure I, II, and III (Shoande, 2020; Ezeudu, 2020).

In West Africa, the quality of lives and property is a major focus of their economy, but the need to develop their economic growth is elastic (Mansi *et al.*, 2020). However, the poverty level among the West African nations is one of the detriments to improving the quality of health services and increasing health expenditure (Abubakar *et al.*, 2022; Malakoane *et al.*, 2020). Therefore, the

economic growth among the West African nations calls for a revisit. It is worthy to note that health is a major indicator of human capital, which at any point in time has an effect on economic growth and development (Piabuo & Tieguhong, 2017).

However, health expenditure among the West African countries varies as a result of their share of gross domestic product (GDP) on health, out-of-pocket expenditure on health (OOPEH), and external health expenditure (EHE), that is, the percentage share of external sources of direct foreign transfers and foreign transfers distributed by the government, encompassing all financial inflows into the national health system from outside the country either through the government scheme or are channeled through non-governmental organizations or other schemes. Therefore, Kiross *et al.* (2020) asserts that literally, the higher the share of gross domestic product (GDP) on health, OOPEH, and EHE, the higher the access to health services and facilities and the health outcome in terms of life expectancy (LFEXPY).

Health outcomes in West African countries have improved by taking various national-based policies to combat the health issues being faced as a result of low access to healthcare services and facilities, malnutrition, and the prevalence of infectious diseases like HIV/AIDS, Ebola, COVID-19, and many more, just to mention a few. These health issues keep occurring as a result of the governance structure on health expenditure and the share of gross domestic product (GDP) on health and EHE, which inflicts the persistency in OOPEH on West Africans.

Nevertheless, it should be noted that a number of factors, such as political stability, the availability of natural resources, agricultural productivity, foreign investment, trade, and the advancement of infrastructure restrains the rising role of health expenditure, also having an impact on economic growth in West Africa. As such, it should be noted that an increased productivity, decreased absenteeism, and a more trained workforce are all benefits of a healthy population (Tzenios, 2019). On the other side, a population with poor health can impede economic growth because it will result in lower labour productivity, higher healthcare expenses, and a slower development of human capital (Cai, 2020). Also, in most of the top 10 economies in West Africa, the Low-income (LInc) groups spend more than the Lower-middle income (LMInc) groups as shown in Figure I.

Thus, the objective of the study is to investigate the relationship between health expenditure, health outcome, and economic growth in West African economies between 2000 and 2020, also in relation to their income categories while its hypothesis could be stated to be that health expenditure and health outcome has no significant effect on economic growth in West Africa between the periods of 2000-2020. Therefore, the study asks the question that, does health expenditure and health outcomes influences economic growth of West African economies? And that, is there any difference in health expenditure, health outcome and economic growth between the LInc and LMInc groups in West Africa.

As such, the study focuses on Sierra Leone, Gambia, Guinea, Mali, Nigeria, Cameroon, Ghana, Cote d'Ivoire, Benin, and Burkina Faso due to the peculiar situation of the nations' poor health outcomes, low levels of health expenditure and being the top 10 economies with high economic growth rate. The study lies on three peculiarities starting from the interest in health expenditures in terms of percentage share of government current health expenditure, percentage share of external health expenditure, health expectancy in terms of total years of life expectancy at birth, and economic growth in terms of GDP. Studies have charted the course of health expenditure, and or health

outcome on economic in sub-Saharan Africa (SSA) countries (Ifeanyi *et al.*, 2021; Asante *et al.*, 2020), in Sierra Leone (Cassell & Cassell, 2019), in Economic Communities of West African States (Anowor *et al.*, 2020), in Nigeria (Olayiwola *et al.*, 2021), in Cameroon (Nkemgha *et al.*, 2021), in Ghana (Bukari *et al.*, 2021), in Cote d'Ivoire (Guédé *et al.*, 2021), in Benin (Houeninvo *et al.*, 2023), and in Burkina Faso (Barroy *et al.*, 2022). But the need to review the scope of the study in West Africa which justifies the need for the study.

As such, this study offers new and solid evidence by offering a practical, and knowledge based research gap that is backed by relevant theoretical considerations and it's based on several econometric methodologies. As a result, it contributes significantly to the body of knowledge and is helpful to researchers and policymakers in West Africa and other developing countries. The rest of the paper is structured as follows: Section two review of existing literatures and theoretical review; section three includes the methodology, results and a discussion of findings, and lastly, the paper concludes with policy implications of results and recommendations.

Literature Review

The section reviews the theory of demand for health by Grossman (1972) since it best justifies the macroeconomic and health links between health expenditure, health outcomes and economic growth in West Africa. The section also reviews relevant studies from plethora time-series and cross-sectional studies on the related to the study.

Theory of the Demand for Health

The theory of the demand for health by Grossman in 1972, and later developed upon in 2017 postulates that investment in healthcare leads to a significant improvement in health outcomes. One general measure of health investment that has been agreed upon in the literature is health expenditure. It is argued that health expenditure, like many other health inputs, should lead to an improvement in health outcomes. Hence, it can be postulated that the primary objective of increasing health expenditure in a nation is to improve health outcomes. For that reason, it can be recalled that, the term demand is a term used in economics to refer to the consumer's willingness to pay a price for products and services. When a good or service's price rises, demand for it declines, while a drop in price will result in an increase in demand, all other things being equal. As such, the need for healthcare is rising across West Africa. Although this might be a result of West African countries' enormous urbanization and population increase (Nnaji *et al.*, 2021). Additionally, according to Grossman, the necessity for healthcare services drives the demand for healthcare (Mhlanga & Garidzirai, 2020).

However, it should be noted that the demand for healthcare is driven by customers' desire to build up their health capital (Grossman, 2017). Since people dedicate resources to its production and consumption, the demand for healthcare differs from that for the majority of other goods. In addition, it is possible to assert that urbanization and population expansion are the main factors driving the rise in health demand, and as this trend continues, health spending will inevitably follow. As a result, West Africa's demographic shift, which is typified by falling mortality rates and rising LFEPPY, places more strain on the country's healthcare systems. Because older populations typically have more healthcare demands, demand and costs for healthcare services are also on the rise.

Therefore, lower health outcomes for marginalized and rural communities may be a result of differences in healthcare access. Delays in diagnosis and treatment can have an adverse effect on health outcomes if patients do not have proper access to healthcare services. Thus, the relationship between the idea of health demand and an increase in healthcare spending, health outcomes, and their effects on economic growth. It is important to note that, in the majority of West African nations, despite differences in income levels and rates of economic growth, a sizeable portion of healthcare expenditures is made by the patient themselves, while some countries entirely rely on donor funding and foreign aid for their healthcare systems.

As such, due to financial constraints, fewer people can use healthcare services, which has an effect on health outcomes (National Academies of Sciences, Engineering, and Medicine, 2018). Therefore, relying on outside sources to cover health costs can lead to financing uncertainties and may not be long-term sustainable, which could have an impact on economic growth and healthcare quality (Kurowski *et al.*, 2021).

Review of Health Expenditure, Health Outcome and Economic Growth in West Africa

The effect of health expenditure in terms of the government current expenditure and external health expenditure on health outcome and economic growth remains a debatable issue in health economics, and in West Africa as a whole. However, the nature of the study in previous studies has reported a positive or negative effect or influence based on the country and scope of the study. Therefore, for the purpose of this article, the empirical review is shown in Table 1.

Table 1: Empirical Review

Name & Year of Authorship	Title of Review	Methodology	Variables	Results
Somé <i>et al.</i> , (2019)	Exploring the Impact of Healthcare on Economic Growth in Africa	Fixed effect growth model	Logged of real GDP per capita in constant 2010 US dollars, log of total health expenditure per capita, maternal mortality rate, infant mortality rate, under-five mortality rate, and adult life expectancy.	Maternal, infant and child mort rates were all negative but has a significant association with economic growth in Africa, wh expectancy at birth is positively associated with economic growth. Also, that health expenditures has a positive effect on economic growth.
Kilanko (2019)	The effects of health care expenditures on health outcomes in West Africa: Analysis of selected 14 countries from 2000-2018	Fixed effects	Infant mortality (death between birth and age 1 per 1000 live births), under-five mortality (probability of death by age 5 per 1000 live births), maternal mortality (per 100000 live births), percentage of gross domestic product, Per capita public health expenditure, Per capita private health expenditure, Per capita household consumption, malaria (incidence of malaria), percentage of the total population, and foreign aid (net official development aid) per capita.	The result showed a negative effect of health expenditure on economic growth on health outcomes.

Adua <i>et al.</i> (2017)	Emerging issues in public health: A perspective on Ghana's healthcare expenditure, policies and outcomes	Mean and Standard deviation	Government health expenditure, external resources on health, out-of-pocket expenditure, infant mortality, and under-5 mortality and life expectancy.	Government healthcare have a positive results on the improvement of health outcomes but cannot be attributed to an increased health expenditure alone.
Edeme <i>et al.</i> (2017)	Public health expenditure and health outcomes in Nigeria	Error Correction Model	Life expectancy rate, infant mortality rate, public health expenditure, GDP per capita (constant USD), percentage of total urban population, and total prevalence of HIV	Public health expenditure and health outcomes have long-run relationship. Furthermore, that increase in public health expenditure improves life expectancy and reduces infant mortality rates.
Ogunjimi and Adebayo (2019)	Health expenditure, health outcomes and economic growth in Nigeria	Toda-Yamamoto causality framework	Government expenditure on health, real GDP growth rate, life expectancy, infant mortality, and maternal mortality.	Unidirectional causality running from health expenditure to infant mortality while there is no causality between real GDP and infant mortality. Also, a unidirectional causal relationship running from health expenditure and real GDP to life expectancy and maternal mortality; and lastly, a unidirectional causal relationship running from real GDP to health expenditure.

Source: Authors' compilation

Methodology

The study investigates the relationship between health expenditure, health outcome, and economic growth in the top 10 West African economies between 2000 and 2020 using the panel fixed effects (PFE). The study employed an explanatory research design. Empirically, the research design was adopted because the study typically investigates and explains the relationship between the dependent and independent variables, that is, how health expenditure influences economic growth and health outcomes in the top 10 West African economies between the periods of 2000 and 2020.

The study focuses on the choice of Sierra Leone, Gambia, Guinea, Mali, Nigeria, Cameroon, Ghana, Cote d'Ivoire, Benin, and Burkina Faso due to the peculiar situation of the nations' poor health outcomes, low levels of health expenditure, and being the top 10 economies with a high economic growth rate. Also, the period was chosen due to the availability of data on health expenditures and life expectancy from the World Bank's World Development Indicators (WDI) for the selected West African nations between the periods of 2000 and 2020. As such, it means that for periods before 2000 and after 2020, they were not available at the time of embarking on the study.

The study used the government's current health expenditure and external health expenditure as proxy for health expenditure, total years of life expectancy at birth as a proxy for health outcome, and gross domestic product as a proxy for economic growth. Thus, the data was sourced from the 2022 World Development Indicators. Therefore, based on the foregoing aims, the study adopts the econometric specification of Ibukun (2021) by highlighting the relationship between health expenditure, health outcomes, and economic growth among the top 10 West African economies. To establish the relationship between the variables, the simple econometric model is specified in Equation (Eq.) 1:

$$GDP_{it} = \beta_0 + \beta_1 GCHE_{it} + \beta_2 EHE_{it} + \beta_3 OOE_{it} + \beta_4 LFEXPY_{it} + \varepsilon_{it}$$

Eq. 1

Where,

GDP_{it} = Gross domestic product per year in period t at country i

$GCHE_{it}$ = Government current health expenditure per year in period t at country i

EHE_{it} = External health expenditure per year in period t at country i

$OOPEH_{it}$ = Out-of-pocket health expenditure per year in period t at country i

$LFEXPY_{it}$ = Life expectancy per year in period t at country i

$\beta_0, \beta_1, \beta_2, \beta_3$, and β_4 = coefficients of results

ε_{it} = Error term of estimated variables in period t at country i

Specifically, the study based its variate at investing, estimating, and ascertaining the following Eq.'s,

$$LFEXPY_{it} = \beta_0 + \beta_1 GCHE_{it} + \beta_2 EHE_{it} + \beta_3 OOPEH_{it} + \varepsilon_{it} \quad \text{Eq. 2}$$

And,

$$GDP_{it} = \beta_0 + \beta_1 GCHE_{it} + \beta_2 EHE_{it} + \beta_3 OOPEH_{it} + \varepsilon_{it} \quad \text{Eq. 3}$$

Table 2: Definition of Variables and Expected Signs

Variables	Description	Source	Expected sign
Gross domestic product (GDP)	Annual percentage growth rate of GDP at market prices based on constant local currency.	WDI, 2022a	-/+
Government current health expenditure (GCHE)	It is the percentage share of GCHE including healthcare goods and services consumed during each year, and does not include capital health expenditures such as buildings, machinery, IT and stocks of vaccines for emergency or outbreaks.	WDI, 2022b	+
External health expenditure (EHE)	The EHE is the percentage share of external sources of direct foreign transfers and foreign transfers distributed by government encompassing all financial inflows into the national health system from outside the country either through the government scheme or are channeled through non-governmental organizations or other schemes.	WDI, 2022c	+
Out-of-pocket expenditure in health (OOPEH)	It is the share of total current health expenditure on out-of-pocket payments of total current health expenditures directly by households.	WDI, 2022d	+
Total year of life expectancy at birth (LEXPY)	It is the number of years an individual would live if prevailing patterns of mortality at the time of its birth were to stay the same throughout its life.	WDI, 2022e	+

Source: Authors' compilation

Figure 1 showed the means of percentage share of gross domestic products (GDP), government current health expenditure (GCHE), external health expenditure (EHE), out-of-pocket expenditure on health (OOPEH), and average age of life expectancy (LFEXPY) of the top 10 West African economies based on income category. The World Development Indicator of the World Bank revealed that Sierra Leone, Gambia, Guinea, and Mali are categorized as low-income (LInc) countries, while Nigeria, Cameroon, Ghana, Cote d'Ivoire, Benin, and Burkina Faso are categorized as lower-middle-income (LMInc) countries.

Descriptive Analysis

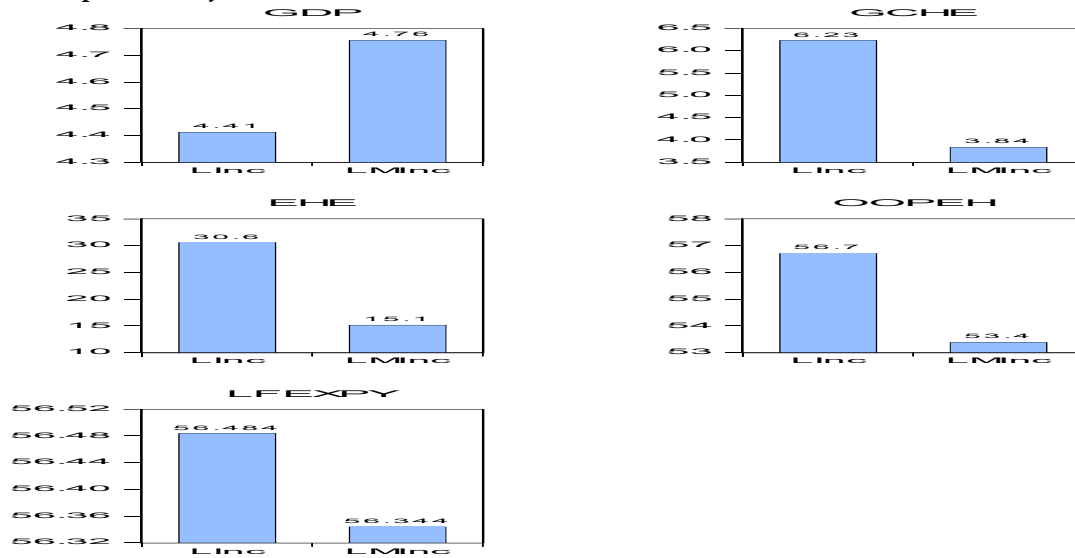


Figure 1: Means of Percentage Share of Gross Domestic Products, Government Current Health Expenditure, External Health Expenditure, Out-of-Pocket Expenditure on Health, and Average Age of Life Expectancy of the Top 10 Highest West African Economies Based on Income Category

Source: Authors' compilation.

Thus, the results in Figure 1 show that the GDP of the selected West African LMInc countries has a mean of 4.76% compared to LInc countries with a mean of 4.41%. Also, the LMInc countries spend a mean of 3.84% of GCHE, 15.1% of EHE, 53.4% of OOEPEH and lives an average age of 56 years 3 months during their lifetime. On the other hand, LInc countries spend more of the mean compared to that of LMInc with 6.23% of GCHE, 30.6% of EHE, 56.7% of OOEPEH and citizens of such countries lives an average age of 56 years 4 months in the lifetime.

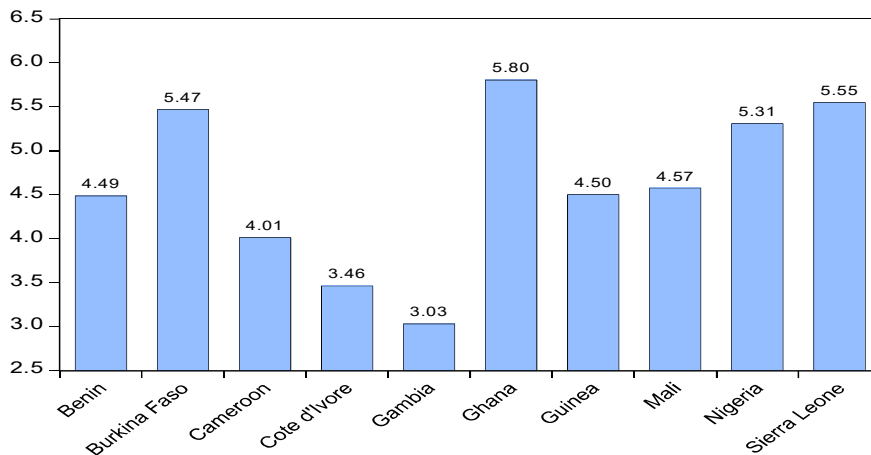


Figure 2: Mean of Percentage Share of Gross Domestic Products in West African nations

Source: Authors' compilation.

Figure 2 shows the average mean values of the ten highest economies in terms of percentage share of GDP in West Africa between the period of 2000-2020. A cursory look at Figure 2 reveals that the

Ghana has the highest share of GDP with 5.80%, followed by Sierra Leone with 5.55%, Burkina Faso with 5.47%, Nigeria with 5.31%, Mali with 4.57%, Guinea with 4.50%, 4.49% in Benin, 4.01% in Cameroon, 3.46% in Cote d'Ivoire, and 3.03% in Gambia. The indicator shows that if these West African nations could be the top 10 economies in terms of GDP, then, other countries in the West African region are currently experiencing slow economic growth. The result further shows that the necessary economic drivers of economic growth in terms of human capital is basically neglected and not improved among the West African regions.

Figure 3 shows the average mean values of the percentage share of GCHE in West Africa between the period of 2000-2020. The superficial view at Figure 3 revealed that Sierra Leone has the largest percentage share on current health expenditure with 11.7%, followed by Burkina Faso with 4.7%, 4.6% in Mali, 4.4% in Cote d'Ivoire and Gambia respectively, 4.2% in Guinea, 3.7% in Cameroon and Ghana respectively, 3.6% in Nigeria, and 2.9% in Benin.

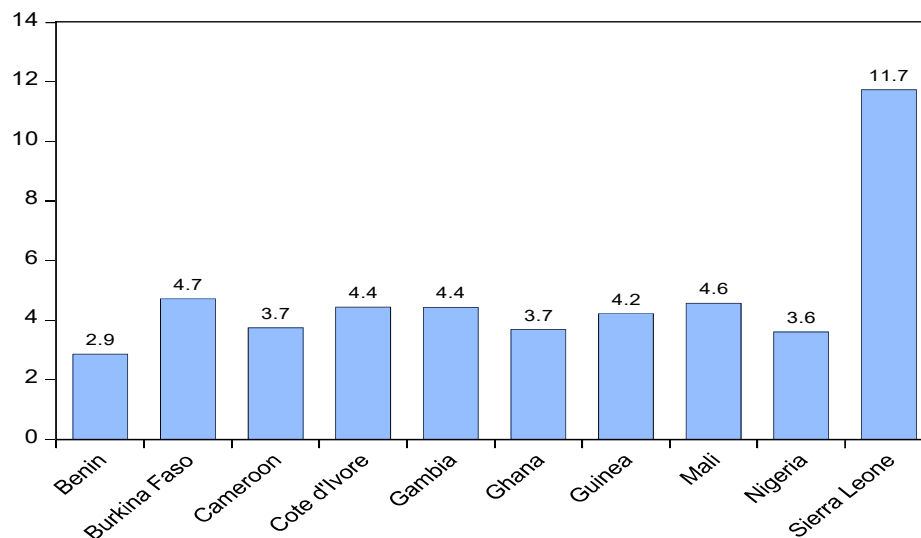


Figure 3: Mean of Percentage Share of Government Current Health Expenditure in West African nations

Source: Authors' compilation.

Figure 3 has revealed that the share of current health expenditure on health by most West African nations is poor and stands to tilt their human capital and economic growth. Obviously, this shows to relatively lower than the World Health Organization (WHO) recommended current share on health expenditure (Uddin *et al.*, 2021).

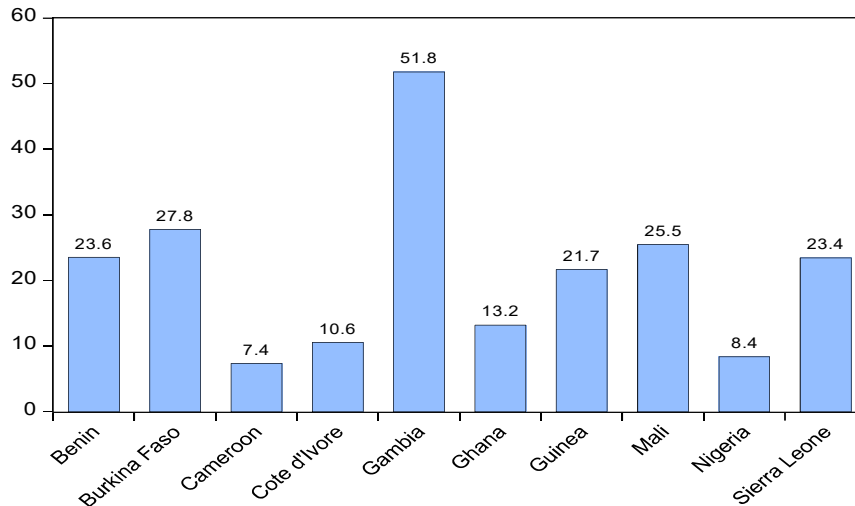


Figure 4: Mean of Percentage Share of External Health Expenditure in West African nations

Source: Authors' compilation.

Figure 4 shows the average mean values of the percentage share of EHE in West Africa between the period of 2000-2020. This cursory chart highlights the direct foreign transfers and foreign transfers distributed by each government encompassing all financial inflows into the national health system from outside the country. Therefore, the apparent view at Figure 4 show that Gambia spends the highest external inflow and outflow on health with 51.8%, followed by Burkina Faso with 27.8%, 25.5% in Mali, 23.6% in Benin, 23.4% in Sierra Leone, 21.7% in Guinea, 13.2% in Ghana, 10.6% in Cote d'Ivoire, 8.4% in Nigeria, and 7.4% in Cameroon. The EHE by these countries in the West African region has shown that the level at which these countries has keen themselves in ensuring health boost their economic growth is relatively high. This shows that these countries depend relatively more on EHE than their GCHE.

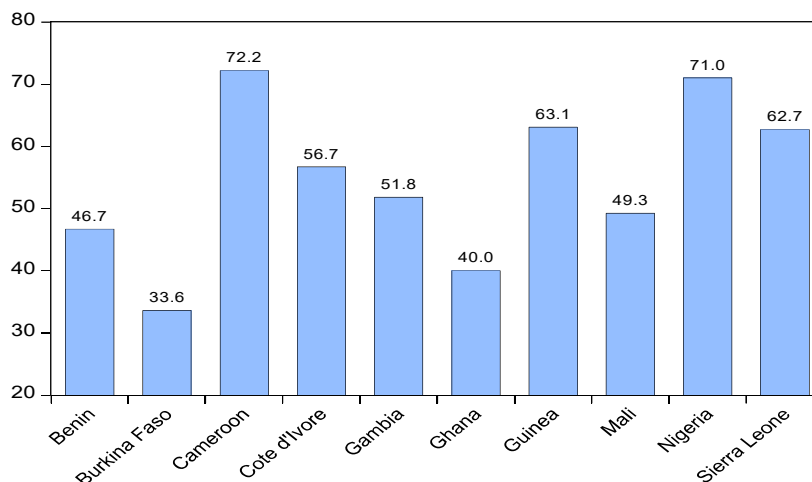


Figure 5: Mean of Percentage Share of Out-of-Pocket Expenditure on Health in West African nations

Source: Authors' compilation.

Figure 5 shows the average mean values of the percentage share of OOEPH in West Africa between the period of 2000-2020. The Figure 5 snapshots the direct household expenditure on health. Thus, it was revealed that household in Cameroon spends more of the income on health with an average percent of 72.2%, 71.0% in Nigeria, 63.1% in Guinea, 62.7% in Sierra Leone, 56.7% in Cote d'Ivoire, 51.8% in Gambia, 49.3% in Mali, 46.7% in Benin, 40.0% in Ghana, and 33.6% in Burkina Faso. The result shows that Burkina Faso spends low percent on OOEPH due to their external inflows on health expenses. However, it should also be reaffirmed that most of the West African nations despite having some relatively high large share of GDP on health expenditure, their household still spend more of the income on health expenditure.

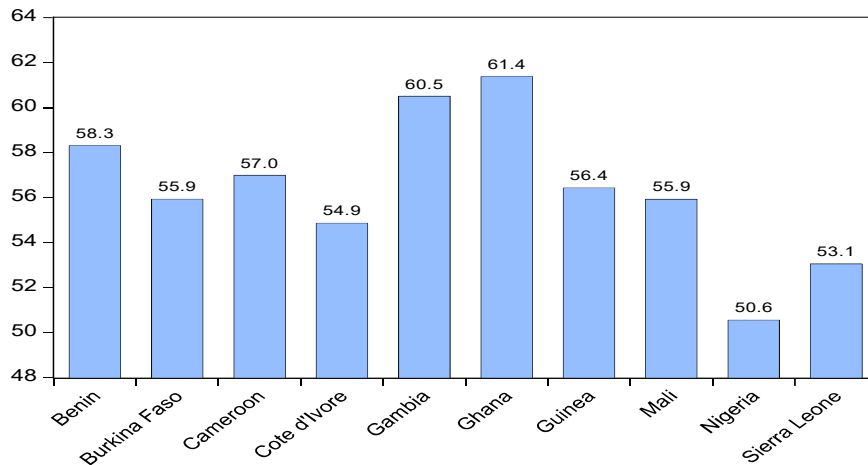


Figure 6: Mean of Total Years of Life Expectancy at Birth in West African nations

Source: Authors' compilation.

Figure 6 shows the average total years of individual LFEXPY right from birth among West Africa between the period of 2000-2020. Figure 6 indicates the number of years an individual will live right from newborn infant provided if the prevailing patterns of mortality prevails at the time of its birth throughout its life. The average age of individual upon birth signifies the health outcome of the individual in relation to his or her individual health expenditure in terms of OOEPH, and by the government and non-government organizations through GCHE, and EHE respectively. Hence, it was revealed that the average life expectancy of individual in Ghana has the highest with 61 years 4 months, 60 years 5 months in Gambia, 58 years 3 months in Benin, 57 years in Cameroon, 56 years 4 months in Guinea, 55 years 9 months in Mali and Burkina Faso respectively, 54 years 9 months in Cote d'Ivoire, 53 years plus a month in Sierra Leone, and 50 years and 6 months in Nigeria.

Table 3: Descriptive Statistics

Statistics	GDP_{it}	$GCHE_{it}$	EHE_{it}	$OOPEH_{it}$	$LFEXPY_{it}$
Mean	4.62	4.79	21.33	54.71	56.40
Skewness	-0.30	3.05	1.52	-0.27	-0.41
Kurtosis	13.11	14.33	5.33	1.77	2.62
Jarque-Bera	896.48	1447.37	128.11	15.75	7.17
Probability	0.000	0.000	0.000	0.000	0.028
Observations	210	210	210	210	210

Source: Authors' compilation.

Table 3 shows the descriptive statistics of the variables, with the mean for GDP as 4.62%, GCHE as 4.79%, EHE as 21.33%, OOEPEH as 54.17%, and LFEXPY of 56 years and 4 months. The skewness shows that GDP, OOEPEH, LFEXPY were negatively skewed while GCHE and EHE mirrors a long-right tailed, that is, they were positively skewness. Therefore, GDP, GCHE and EHE were leptokurtic, while OOEPEH and LFEXPY were platykurtic. From the probability value of the Jarque-Bera statistic, the result showed that all the variables were normally distributed at 5% level of significance.

Table 4: Optimal Lag Length Criteria Results

Exogenous variable: C						
Endogenous variables: GDP_{it} CHEP_{it} EHEP_{it}						
OOP_{it} LFEXP_{it}						
Included observations: 130						
<i>Lag</i>	<i>LogL</i>	<i>LR</i>	<i>FPE</i>	<i>AIC</i>	<i>SIC</i>	<i>HQIC</i>
0	-2034.60	NA	29182	31.38	31.49	31.42
1	-1343.99	1317.47	1042.40	21.14	21.81*	21.41
2	-1297.34	85.42	748.30*	20.81*	22.02	21.30*
3	-1280.34	29.81	849.93	20.93	22.70	21.65
4	-1252.34	46.95*	818.18	20.88	23.20	21.82
5	-1232.37	31.96	895.57	20.96	23.83	22.12
6	-1218.67	20.86	1086.59	21.13	24.55	22.52
7	-1196.36	32.27	1163.92	21.17	25.15	22.79
8	-1181.11	20.87	1403.46	21.32	25.85	23.16

Where **LR** = sequential modified LR test statistic (each test at 5% level), **FPE** = Final prediction error, **AIC** = Akaike Information Criterion; **SIC** = Schwarz Information Criterion; **HQIC** = Hannan-Quinn Information Criterion, and * indicates lag order selected by the criterion.

Source: Authors' compilation.

To determine and select the optimal lag order for the model which is critical for the determination of the order of the Autoregressive (AR) process, the study adopts the AIC having the least value at 20.81 at the lag length of two (2) period is the optimal lag as jointly suggested by SIC, HQIC, and FPE criteria with the exception of likelihood ratio (LR) that suggest 2 lags. This means that the study relies on AIC to proceed with lag two (2) as shown in Table 4. As such, the AIC at lag two were employed to determine the decision of the unit root test whether the variables are stationary or not. Results of the panel Augmented-Dickey Fuller (ADF) Fisher Chi-Square unit root test are shown in Table 5.

Table 5. Unit Root Test Results

<i>Variables</i>	<i>Levels</i>		<i>First difference</i>		<i>Decision</i>
	<i>ADF Fisher</i>	<i>Prob.</i>	<i>ADF Fisher</i>	<i>Prob.</i>	
	Chi-Sq.		Chi-Sq.		
GDP _{it}	83.03	0.0000	-	-	I(0)
GCHE _{it}	31.52	0.0487	-	-	I(0)
EHE _{it}	29.74	0.0741	147.39	0.0000	I(1)
OOPEH _{it}	20.84	0.4064	107.02	0.0000	I(1)
LFEXPY _{it}	40.04	0.0049	-	-	I(0)

Source: Authors' compilation.

Table 5 revealed results of the ADF Fisher Chi-Square unit root test results. Thus, the results shows that EHE and OOEPEH were stationary at the first difference, I(1), while GDP, GCHE, and

LFEXPY were stationary at levels, $I(0)$. Therefore, it shows that there exists a mixed stationarity between the variables. Thus, there is need to determine the best estimator for the model, that is, is it the fixed effect or the random effect model. However, the generalized model for a panel data is,

$$Y_{it} = \alpha_{it} + \beta_1 X_{it} + \varepsilon_{it}$$

.....

(4)

Where, α is independent of the explanatory variables in the model. To a large extent, it means that random effects are correlated with the explanatory variables. As such, this highlights the Hausman hypothesis which states that,

Ho: Random effects are independent of explanatory variables.

H₁: Ho is not true.

Thus, in determining the best estimator to adopt for the study, it should be noted that if the p-value from the Hausman test is statistically significant, it therefore means that we reject the null hypothesis, and the implication for this is that, the fixed effect estimator would be applied by the study and if vice versa, the random effect will be applied.

Table 6: Correlated Hausmann Test Results

Test Summary	Chi-Sq. Statistic	Chi-Sq. d.f.	Prob.
Cross-section random	13.321385	4	0.0098

Source: Authors' compilation.

However, the Hausman test result is shown in Table 6 is statistically significant at 5% level of significance. As such, the result shows that the null hypothesis is rejected, and that the appropriate estimator for the model is the fixed effect as shown in Table 7. As such, Table 7 shows that GCHE, EHE, OOEPH, and LFEXPY negatively relates to the economic growth of top 10 highest GDP economies in West Africa. However, despite the negative relationship between GCHE, EHE, OOEPH, LFEXPY, and economic growth in West Africa, GCHE revealed to be statistically significant while EHE, OOEPH, LFEXPY shows to be non-significant with economic growth in West Africa. Thus, the result shows that at any 1% change in GCHE, EHE, OOEPH, and LFEXPY will cause 81%, 2%, 1%, and 7% decrease respectively in the growth of top 10 West African nation economies.

Table 7: Fixed Effect Results

Variable	Coefficient	Std. Error	t-Statistic	Prob.
Constant	13.18	8.63	1.53	0.1282
GCHE _{it}	-0.81	0.25	-3.29	0.0012
EHE _{it}	-0.02	0.03	-0.61	0.5398
OOEPH _{it}	-0.01	0.04	-0.20	0.8413
LFEXPY _{it}	-0.07	0.13	-0.53	0.5983
R-squared	0.112197	Mean dependent var.		4.618645
Adjusted R-squared	0.053312	S.D. dependent var.		4.186033
S.E. of regression	4.072922	Akaike info criterion		5.710939
Sum squared resid.	3251.383	Schwarz criterion		5.934079
Log likelihood	-585.6486	Hannan-Quinn criter.		5.801146
F-statistic	1.905363	Durbin-Watson stat.		1.851121
Prob. (F-statistic)	0.031416			

Source: Authors' compilation.

Although, GCHE, EHE, OOPEH and LFEXPY are jointly statistically significant at 5% level of significance. Besides, the variation of the independent variables, GCHE, EHE, OOPEH, and LFEXPY affect the dependent variable by 11.2% which shows that the remaining 88.8% variations are explained in other unspecified variables of the study. Furthermore, Figure 7 shows that the data used in analyzing the fixed effect results have a normal distribution at 1%, 5% and at 10% which conforms with the results in Table 3.

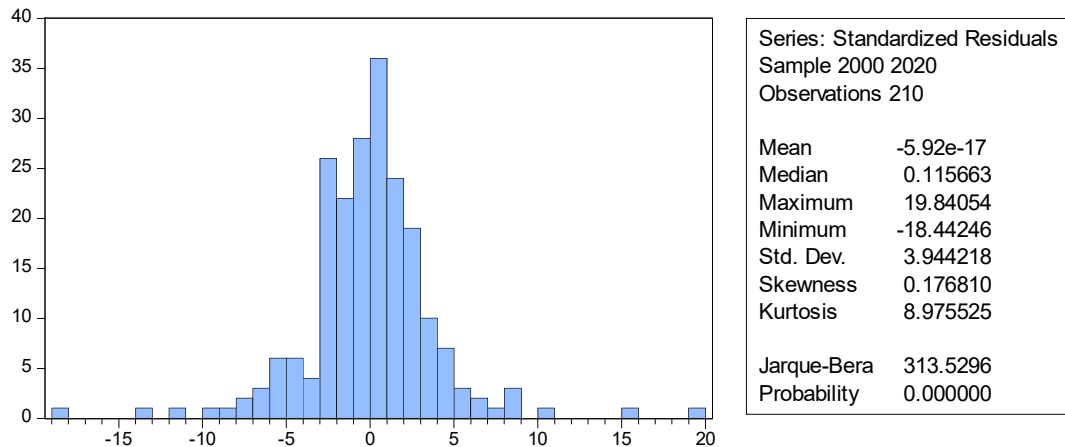


Figure 7: Standardized Residuals Normality Test

Policy Implications of Results

The contemporary literature has given careful analysis to the connections between health spending, health outcomes, and economic growth in West Africa top 10 economies. Nevertheless, present research has not fully addressed any potential gaps in the nature of the health-growth connection, but based on the results, the study laid emphasis on economic strategies and useful suggestions in order to address the situation impacting the top 10 West African countries' economies and in their health sectors respectively. Amongst the light of proffering real life economic and health policies, the study recommends that there is need to focus on preventive healthcare, developing infrastructure, diversifying the economy, assisting small and medium-sized businesses, encouraging public-private partnerships, increasing government health spending, enhancing external health spending, lowering out-of-pocket health spending, and strengthening primary healthcare facilities.

Recommendations

Monitoring and assessment, capacity building and technical assistance, regional collaboration, transparency and accountability, public awareness and engagement, and a long-term vision are some concrete recommendations. The top 10 West African countries can improve their inhabitants' general health and well-being while achieving balanced economic growth by putting these policies and suggestions into practice.

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