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Education Expenditure, Health Expenditure and Human Development in West Africa.

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ABSTRACT

Human development remains uneven across West Africa despite sustained public investment in health and education. This study examines the separate and joint effects of public health and education expenditure, measured as shares of gross domestic product, on human development in West African countries using country-level panel data for the 16 West African nations from 2000 to 2023. The World Bank databank and UNDP Human Development Reports were the sources of the data. The results of the Pooled OLS showed severe autocorrelation (DW=0.185) and was rejected by Breusch-Pagan LM test (BP=1060.65, p=0.000). Hausman test (Chi²=22.47, p=0.0002) favoured Fixed Effects. The FEM with weighted statistics results (R^2=0.728, Adj R^2=0.715, F=53.91, p=0.000) showed that a 1% increase in education expenditure increases HDI by 0.0102 (p<0.05), a 1% increase in health expenditure increases HDI by 0.0051 (p<0.05), population growth reduces HDI by 0.0127 (p<0.05), while inflation effect becomes significant after controlling for heterogeneity. With the exception of Togo and Cote d'Ivoire, other West-African countries had substantial cross-section fixed effects. There were statistically significant time effects between 2006 and 2023. For human development in West Africa, the study concludes that spending on education is larger than spending on health. HDI is significantly hampered by population pressure. West African nations must undertake population control measures, boost health spending efficiency through public financial management reforms, and raise education spending to at least 5% of GDP to achieve meaningful human development in the region.

JEL Classifications: O15, H51, H52, Q56

KEYWORDS: HDI, Education Expenditure, Health Expenditure, Panel Fixed Effects, West Africa.

How to Cite

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1.0 Introduction

Human development encompasses more than economic growth; it involves improvements in health, education, living standards, and individuals' ability to lead productive and meaningful lives. Consequently, government expenditure on health and education serves as a critical mechanism for enhancing human capabilities, reducing deprivation, and fostering inclusive development. From the human capital perspective, investments in these sectors improve individuals' knowledge, skills, health status, and productive capacities, thereby contributing to higher levels of welfare and better living conditions (Oladosu et al., 2022). Similarly, Miranda-Lescano et al. (2023) contend that development should be evaluated in terms of the expansion of people's substantive freedoms and capabilities rather than solely through increase in income. Within this framework, public expenditure on health and education constitutes a vital policy instrument for advancing human development. Therefore, assessing the effects of government expenditure on health and education is essential for understanding the extent to which public policy contributes to human development in West

Africa.

Public expenditure on health promotes human development through the financing of healthcare infrastructure, primary healthcare services, disease prevention programmes, immunisation campaigns, maternal and child healthcare, medical personnel, and essential medicines. Adequate investment in these areas enhances access to healthcare services, lowers preventable mortality rates, increases life expectancy, and reduces the financial burden of illness on households. The theoretical basis for this relationship is rooted in Grossman's (1972) health capital model, which conceptualises health as a form of capital that generates healthy time and improves both individual welfare and productivity. Empirical studies investigating public health expenditure and health outcomes have been conducted across African countries, including Nigeria and Ghana (Oladosu et al., 2022), as well as within the broader West African subregion (Mustapha et al., 2021). In addition, research focusing on sub-Saharan Africa has examined the moderating role of government effectiveness in determining whether public spending translates into improved health outcomes (Arize et al., 2024). Collectively, these studies highlight the importance of evaluating not only the amount of public health expenditure but also the institutional and contextual factors that influence its effectiveness in improving health and well-being.

Despite its importance, increased public health expenditure does not necessarily guarantee improved health outcomes. Its effectiveness is contingent upon the adequacy of allocated resources, institutional capacity, governance quality, accountability mechanisms, and the efficiency with which public funds are transformed into accessible and high-quality healthcare services. Tandon and Cashin (2010) emphasise the need to assess health expenditure within the context of governments' fiscal capacities and competing budgetary priorities. Similarly, discussions on healthcare financing in Africa underscore the importance of effective resource mobilisation and allocation in achieving improved health outcomes and advancing universal health coverage (Thoumi & Bandara, 2019). The World Health Organization (WHO, 2017) further demonstrates, through its malaria elimination framework, the necessity of sustained and strategically targeted interventions in addressing major health challenges. These perspectives suggest that the developmental impact of public health expenditure depends not only on the level of funding but also on the effectiveness of its implementation.

Government expenditure on education is equally critical to human development because it supports the acquisition of knowledge, skills, and competencies that enable individuals to improve their livelihoods and participate effectively in society. Investments in educational infrastructure, teaching personnel, instructional materials, and access to schooling contribute to higher educational attainment and broaden opportunities for employment and upward social mobility. According to human capital theory, education enhances individual capabilities and subsequently promotes productivity and improved living standards (Becker, 1962). Empirical evidence from West African countries has also examined the contribution of government educational expenditure to human capital development (Adewumi & Enebe, 2019). Furthermore, studies conducted within the West African Monetary Zone have explored the implications of educational expenditure on economic growth (Munkaila et al., 2022), thereby providing an important regional context for understanding the developmental effects of public investment in education.

Beyond its direct educational benefits, investment in education can also generate positive health outcomes by improving health literacy and enhancing awareness of preventive healthcare practices, nutrition, sanitation, maternal healthcare, and child welfare. Consequently, the developmental contribution of education expenditure extends beyond the education sector to other dimensions of human well-being. However, the magnitude of these benefits depends on the quality, distribution, and efficiency of educational spending, as well as the extent to which public investments translate into greater access to education and improved learning outcomes. These considerations underscore the importance of assessing government expenditure in terms of its capacity to enhance human capabilities and welfare rather than assuming that increased spending alone is sufficient to achieve development objectives.

The interaction between public expenditure on health and education is particularly important because investments in these sectors can reinforce one another in promoting human development. Improved health enhances school attendance, learning outcomes, and educational attainment, while education strengthens individuals' ability to understand health information and make informed healthcare decisions. Consequently, the combined effects of investments in health and education may generate broader and more substantial developmental outcomes than investments in either sector alone. Studies examining public expenditure and

human development, including analyses of decentralisation and human development outcomes, have highlighted the developmental relevance of public spending in these sectors (Miranda-Lescano et al., 2023). This provides further justification for adopting a holistic approach that considers health and education expenditures jointly when examining their influence on human development.

These issues are particularly pertinent in West Africa, where countries exhibit considerable differences in fiscal capacity, institutional effectiveness, demographic characteristics, and access to essential social services. Across the region, governments face challenges related to limited healthcare access, high disease burdens, inadequate infrastructure, shortages of skilled personnel, and disparities in service delivery. Although public expenditure can play a significant role in addressing these challenges, its effectiveness may be constrained by inefficient resource allocation, weak implementation frameworks, and inadequate accountability mechanisms. Furthermore, competing fiscal demands often limit the resources available for essential social services, making the efficient utilisation of public expenditure increasingly important (Tandon & Cashin, 2010). Research on healthcare financing in Africa similarly emphasises the need to strengthen financing systems and channel resources towards interventions that improve population health outcomes (Songwe, 2019). Consequently, the primary policy concern extends beyond the volume of government expenditure to the extent to which such spending produces measurable improvements in human well-being.

Notwithstanding the importance of public expenditure on health and education, there remains a need for more comprehensive region-specific analyses of their combined effects on human development in West Africa. Although existing studies offer valuable insights into the individual relationships between public spending and development outcomes, examining health and education expenditures simultaneously within a human development framework may provide a more integrated understanding of how government spending influences health outcomes, educational attainment, and living standards. Against this backdrop, the present study investigates the effects of public expenditure on health and education on human development in West Africa. The study seeks to generate empirical evidence that can inform policy measures aimed at improving the effectiveness of public expenditure and advancing inclusive human development across the region.

2.0 Methods

This study adopted a quantitative, longitudinal panel design to estimate the separate and joint effects of public health and education expenditure on human development in West Africa. It is anchored on the Human Capital Theory (Becker, 1962; Schultz, 1961) which argues that investment in education and health improves human capabilities, and Wagner's Law of Increasing state activity which posits that public expenditure grows with economic development. Human Development Index (HDI) is a function of capabilities created by expenditure on health and education.

The dependent variable is the Human Development Index (HDI), representing multidimensional development through health, education, and income achievements. The principal explanatory variables are general government education expenditure and government health expenditure, each measured as a percentage of GDP. Disaggregation was necessary because the development effects of spending may differ by country and implementation conditions (Omodero, 2019). Control variables include inflation rate and population growth rate. These accounted for macroeconomic and demographic change that may affect human development outcomes (Akanbi, 2014).

The HDI data were gathered from the UNDP Human Development Reports, while the EDU, HLT, POP, and INFL data were sourced from the World Bank. All variables are expressed in percentages except the HDI, which is on a scale of 0 to 1.

Model Specification

The functional form is:

$$HDI = f(EDU, HLT, POP, INFL) \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \quad (1)$$

Where, HDI = Human development index; EDU = education expenditure as % of GDP; HLT = health expenditure as % of GDP; POP = Population growth rate (%); and INFL = Inflation rate (%)

The Pooled OLS yields:

$HDI_{it} = \beta_o + \beta_1 EDU_{it} + \beta_2 HLT_{it} + \beta_3 POP_{it} + \beta_4 INFL_{it} + \varepsilon_{it}$ …….. (2)

Where β_o = the common intercept; ε_{it} = the composite error term

i = cross sectional units (i= 1 – 16 countries); t = time period (2000 - 2023)

The Random effect model is given as

$HDI_{it} = \beta_1 EDU_{it} + \beta_2 HLT_{it} + \beta_3 POP\ it + \beta_4 INFL_{it} + u_i + \varepsilon_{it}$ …….. (3)

Where u_i = the unobserved individual-specific random effect; ε_{it} = the idiosyncratic error term

The Fixed effect model:

$HDI_{it} = \beta_1 EDU_{it} + \beta_2 HLT_{it} + \beta_3 POP_{it} + \beta_4 INFL_{it} + u_i + \lambda_t + \varepsilon_{it}$ …… (4)

λ_t = time—specific fixed effect

u_i = unobserved country-specific effect

ε_{it} = Error term

Post-Estimation

The fixed effect model with weighted The Generalized Least Squares (GLS) blends Seemingly Unrelated Regression (SUR) and Cross-section residual covariance to correct for heteroscedasticity and cross-sectional dependence that are common in West Africa due to common economic and political shocks. The Histogram checks for normality in the distribution of the data.

3.0 Results

This section provides the sequence upon which the data were analysed. The analysis begins with pre-test through descriptive statistics, unit roots test and test for cointegration. This is followed by pooled OLS, Lagrange Multiplier test, REM test, Hausman test, and the FEM test. The diagnostic was conducted through the Histogram test for normality.

Table 1: *Descriptive statistics*

	HDI	EDU	HLT	POP	INFL
Mean	0.465953	3.092293	4.687150	2.581013	6.218399
Median	0.462000	2.815230	4.262316	2.580696	4.162301
Maximum	0.668000	8.140970	15.11887	5.905519	47.64287
Minimum	0.260000	0.319069	1.663432	0.013272	-3.700000
Std. Dev.	0.080964	1.525309	1.883590	0.755439	7.152562

Source: Authors' Computation using Eviews 14 (2026)

The average HDI across West African countries was 0.466, ranging from 0.260 to 0.668 over the study period. Average education and health expenditures were 3.09% and 4.69% of GDP respectively, while average population growth and inflation rates were 2.58% and 6.22%. These figures show considerable variation in the study variables, particularly inflation, with the standard deviation being 7.15, as shown in Table 1 above.

Table 2: *The Results of the Unit Root Test*

	HDI		EDU	HLT	POP	INFL
	Level	1st difference	Level	Level	Level	level
Levin, Lin & Chu t	-1.44356 (0.9744)	2.97099 (0.9985)	-2.22143 (0.0132)**	-0.14648 (0.4418)	-4.26517 (0.0000)**	-2.97984 (0.0014)**
Im, Pesaran and Shin W-stat	-0.44269 (0.3290)	-4.35513 (0.0000)**	-2.44331 (0.0073)**	-2.05855 (0.0198)**	-3.46545 (0.0003)**	-5.40601 (0.0000)**
ADF-Fisher Chi-square	38.8553 (0.1882)	77.1057 (0.0000)**	51.6828 (0.0152)**	47.1643 (0.0410)**	70.2610 (0.0001)**	92.9261 (0.0000)**
PP-Fisher Chi-square	22.4373 (0.8953)	112.273 (0.0000)**	62.8377 (0.0009)**	51.5954 (0.0156)**	30.7080 (0.5319)	129.040 (0.0000)**
DECISION		I(1)	I(0)	I(0)	I(0)	I(0)

** Significance at p<0.05

Source: Authors' Computation using Eviews 14 (2026)

The panel unit root test results in Table 2 implies that HDI is stationary after being integrated of order one, I(1), while education expenditure as a percentage of GDP, health expenditure as a percentage of GDP, population growth, and inflation rate are classified as being stationary at levels I(0). In essence, there is a mixed order of stationarity.

Table 3: *The Result of the Cointegration Test*

Null Hypothesis: No cointegration	
ADF	**t-Statistic** **Prob.** -1.420663 0.0777
Residual variance **HAC variance**	7.41E-05 0.000252

Source: Authors' Computation using Eviews 14 (2026)

The Kao cointegration test yields a p-value of 0.0777, indicating that we do not reject the null hypothesis of no cointegration at the 5% significance level. In other words, the result does not establish a long-run equilibrium relationship among the variables.

Table 4: *The Result for Pooled OLS*

Variable	Coefficient	Std. Error	T-Statistic	Prob.
EDU	0.010532	0.002135	4.932859	0.0000
HLT	-0.005504	0.001647	-3.341723	0.0009
POP	-0.061468	0.004275	-14.37729	0.0000
INFL	0.001123	0.000439	2.559362	0.0109
C	0.610851	0.018175	33.60931	0.0000
R-squared	0.454523	Mean dependent var	0.465953	
Adjusted R-squared	0.448766	S.D. dependent var	0.080964	
S.E. of regression	0.060112	Akaike info criterion	-2.772284	
Sum squared resid	1.369491	Schwarz criterion	-2.720844	
Log likelihood	537.2786	Hannan-Quinn criter.	-2.751881	
F-statistic	78.95106	Durbin-Watson stat	0.185227	
Prob(F-statistic)	0.000000			

Source: Authors' Computation using Eviews 14 (2026)

The pooled OLS model assumes homogeneous intercepts and slope coefficients across cross-sectional

units and time periods, with unobserved individual and temporal heterogeneity subsumed in the error term. The pooled OLS results reveal a notably low Durbin-Watson statistic (0.185227), suggesting potential positive serial correlation in the residuals.

To test the suitability of the pooled OLS model, the Breusch-Pagan Lagrange Multiplier (LM) test was conducted to determine whether unobserved cross-sectional and/ or time-specific effects were present in the model. The null hypothesis (H_0) assumes that pooled OLS is appropriate, while the alternative hypothesis (H_1) suggests the presence of panel effects, favouring the random effects model over pooled OLS.

Table 5: *Lagrange Multiplier Tests for Random Effects*

Test Hypothesis	Cross-section	Time	Both
Breusch-Pagan	952.2868 (0.0000)**	108.3655 (0.0000)**	1060.652 (0.0000)**
Honda	30.85915 (0.0000)	10.40988 (0.0000)	29.18160 (0.0000)
King-Wu	30.85915 (0.0000)	10.40988 (0.0000)	30.54833 (0.0000)
Standardized Honda	35.88837 (0.0000)	10.75784 (0.0000)	27.58119 (0.0000)
Standardized King-Wu	35.88837 (0.0000)	10.75784 (0.0000)	29.55500 (0.0000)
Gourieroux, et al.	--	--	1060.652 (0.0000)

Source: Authors' Computation using Eviews 14 (2026)

The results of Lagrange Multiplier test in table 5 above indicates that the p-values for the cross-sectional and time-specific effects are below the 5% significance level. Consequently, the null hypothesis that favours the suitability of pooled OLS is rejected. This finding therefore results in the estimation of the model through the Random Effect Model (REM).

Table 6: *Result of the Random Effect Model (REM)*

Variable	Coefficient	Std. Error	t-Statistic	Prob.
EDU	0.012741	0.002031	6.274176	0.0000
HLT	0.004897	0.001354	3.617473	0.0003
POP	-0.020112	0.003997	-5.032136	0.0000
INFL	0.000227	0.000370	0.614150	0.5395
C	0.454094	0.018671	24.32102	0.0000

Effects Specification	S.D.	Rho
Cross-section random	0.041804	0.5751
Idiosyncratic random	0.035930	0.4249

Weighted Statistics			
R-squared	0.187419	Mean dependent var	0.080517
Adjusted R-squared	0.178843	S.D. dependent var	0.040605
S.E. of regression	0.036795	Sum squared resid	0.513120
F-statistic	21.85378	Durbin-Watson stat	0.182646
Prob(F-statistic)	0.000000		
Unweighted Statistics			
R-squared	0.253935	Mean dependent var	0.465953
Adjusted R-squared	1.873092	S.D. dependent var	0.050034

Source: Authors' Computation using Eviews 14 (2026)

According to table 6 above, the REM estimates show an unsatisfactory adjusted R-square (0.187419) and

Durbin-Watson statistic (0.182646). This necessitates testing for the appropriateness of REM in this model through the Hausman test.

Table 7: *Hausman Test Result*

Test Summary	Chi-Sq. Statistic	d.f.	Prob.
Cross-section random	22.479740	4	0.0002

The model selection results favour the fixed-effects model over the random-effects model. The Hausman test is statistically significant ($\chi^2 = 22.480,\ p = 0.0002$), indicating that the random-effects estimator may be inconsistent. Accordingly, the fixed-effects specification is more appropriate for accounting for unobserved, time-invariant differences across countries.

Table 8: *The fixed effect model with weighted statistics*

Variable	Coefficient	Std. Error t-Statistic	Prob.
EDU	0.010211	0.000343 29.79248	0.0000
HLT	0.005062	0.000241 20.97800	0.0000
POP	-0.012698	0.000919 13.81550	0.0000
INFL	0.000245	5.90E-05 4.150449	0.0000
C	0.441902	0.003002 147.2098	0.0000
Effects Specification			
Cross-section fixed (dummy variables)			
Weighted Statistics			
R-squared	0.994480	Mean dependent var	15.09392
Adjusted R-squared	0.994191	S.D. dependent var	27.03193
S.E. of regression	0.960057	Sum squared resid	335.5019
F-statistic	3451.242	Durbin-Watson stat	1.468199
Prob(F-statistic)	0.000000		
Unweighted Statistics			
R-squared	0.811642	Mean dependent var	0.465953
Sum squared resid	0.472898	Durbin-Watson stat	0.144152

Source: Authors' Computation using Eviews 14 (2026)

Fixed Effect Model estimation was adjusted for heteroskedacity and cross-sectional correlation. This provides the option of normalizing the error term through the Generalized Least Squares (GLS) method. The FEM estimation reflected low DW, thus, GLS weight of cross-section Seemingly Unrelated Regression was infused alongside coefficient variance of cross section weight (PCSE). With the results of the FEM with weighted statistics indicating a better Durbin-Watson statistic (1.468199) and stronger adjusted R^2 (0.994191), the estimates provide the output required for this model.

EDU has a positively significant effect on HDI (t= 29.79248, p=0.000). Its co-efficient indicates that a 1% increase in education spending as a percentage of GDP improves the HDI by 0.010211 units. The effect of HLT on HDI turns positive after correcting for heterogeneity. Hence, a 1% increase in health expenditure as a percentage of GDP raises the HDI by 0.0051 and it is less than the education effect (0.0102), indicating that for HDI in West Africa, education expenditure is larger than health spending. The effect of population

growth on HDI is significantly negative. A 1% increase in population growth reduces HDI by 0.0127. The effect of inflation rate becomes significant after fixed effects adjustment. The coefficient of 0.000245 on HDI still remains relatively negligible.

Having arrived at general findings of the effects of the explanatory variables on HDI, it becomes pertinent to examine the cross-county effect of the same variables on HDI.

Table 9b: *Cross section Effect*

Variable	Coefficient	Std. Error	t-Statistic	Prob.
HLT	0.005738	0.001377	4.166984	0.0000
EDU	0.012291	0.002094	5.869553	0.0000
POP	-0.016359	0.004114	-3.976230	0.0001
INFL	0.000228	0.000377	0.603492	0.5466
Guinea Bissau	-0.061558	0.011328	-5.434143	0.0000
Burkina	-0.130766	0.011240	-11.63361	0.0000
Cabo Verde	0.085161	0.015091	5.643251	0.0000
Cote d' Ivoire	-0.006669	0.010549	-0.632200	0.5277
The Gambia	-0.028939	0.010949	-2.643069	0.0086
Ghana	0.043433	0.012753	3.405693	0.0007
Guinea	-0.063455	0.011488	-5.523509	0.0000
Liberia	-0.027388	0.013157	-2.081533	0.0381
Mali	-0.097482	0.010615	-9.183116	0.0000
Mauritania	0.035244	0.010468	3.366798	0.0008
Niger	-0.143338	0.011233	-12.76039	0.0000
Nigeria	0.039037	0.012183	3.204063	0.0015
Sierra Leone	-0.088420	0.012033	-7.348083	0.0000
Senegal	-0.030351	0.010933	-2.775988	0.0058
Togo	-0.018274	0.010760	-1.698285	0.0903
C	0.472716	0.016681	28.33790	0.0000
R-squared	0.812836	Mean dependent var		0.465953
Adjusted R-squared	0.803066	S.D. dependent var		0.080964
S.E. of regression	0.035930	Akaike info criterion		-3.763834
Sum squared resid	0.469900	Schwarz criterion		-3.558071
Log likelihood	742.6561	Hannan-Quinn criter.		-3.682219
F-statistic	83.20081	Durbin-Watson stat		0.183645
Prob(F-statistic)	0.000000			

Source: Authors' Computation using Eviews 14 (2026)

It is evident from table 9a above that all the countries, except Cote d'ivoire and and Togo, have individually significant cross section effect as their p-values are less than 1. The individual country's intercept is estimated in table 9b below.

Table 9b: *The individual intercept of the countries*

Country	Estimation	Intercept
Benin	C = 0.472716	0.472716
Guinea Bissau	-0.061558 + 0.472716	0.411158
Burkina Faso	-0.130766 + 0.472716	0.341950
Cabo Verde	0.085161 + 0.472716	0.557877
Cote d'Ivoire	-0.006669 + 0.472716	0.466047
The Gambia	-0.028939 + 0.472716	0.443777
Ghana	0.043433 + 0.472716	0.516149
Guinea	-0.063455 + 0.472716	0.409261
Liberia	-0.027388 + 0.472716	0.445328

Mali	-0.097482 + 0.472716	0.375234
Mauritania	0.035244+ 0.472716	0.507960
Niger	-0.143338+ 0.472716	0.329378
Nigeria	0.039037 + 0.472716	0.511753
Sierra Leone	-0.088420 + 0.472716	0.384296
Senegal	-0.030351 + 0.472716	0.442365
Togo	-0.018274 + 0.472716	0.454442

Source: Authors' Computation using Eviews 14 (2026)

Whereas, Ghana and Nigeria have the highest intercepts above average, Niger and Burkina Faso have the least as indicated by table 9b.

To test whether the cross-section countries are significantly different statistically, the Wald Test was conducted.

Table 10: *The Wald Test*

Test Statistic	Value	df	Probability
F-statistic	202.8219	(4,364)	0.0000
Chi-square	811.2877	4	0.0000

Source: Authors' Computation using Eviews 14 (2026)

The Wald test for cross-section as shown in table 10 above (F = 202.8219, p = 0000) confirms that the West African countries are significantly heterogenous.

Table 11: *Time Variant*

Variable	Coefficient	Std. Error	t-Statistic	Prob.
HLT	-0.009027	0.001512	-5.970039	0.0000
EDU	0.008298	0.001918	4.326247	0.0000
POP	-0.057231	0.003857	-14.83978	0.0000
INFL	0.001119	0.000411	2.723104	0.0068
C	0.560726	0.020600	27.21986	0.0000
@YEAR=2001	0.010163	0.018877	0.538399	0.5906
@YEAR=2002	0.016063	0.018850	0.852141	0.3947
@YEAR=2003	0.007644	0.018843	0.405644	0.6852
@YEAR=2004	0.017688	0.018846	0.938596	0.3486
@YEAR=2005	0.032692	0.018907	1.729084	0.0847
@YEAR=2006	0.046837	0.018855	2.484012	0.0135
@YEAR=2007	0.051946	0.018846	2.756257	0.0061
@YEAR=2008	0.050539	0.018967	2.664625	0.0081
@YEAR=2009	0.062608	0.018861	3.319399	0.0010
@YEAR=2010	0.068955	0.018844	3.659161	0.0003
@YEAR=2011	0.073311	0.018861	3.886885	0.0001
@YEAR=2012	0.074588	0.018844	3.958165	0.0001
@YEAR=2013	0.080655	0.018863	4.275715	0.0000
@YEAR=2014	0.090713	0.018944	4.788558	0.0000
@YEAR=2015	0.091067	0.018943	4.807465	0.0000
@YEAR=2016	0.093042	0.018905	4.921489	0.0000
@YEAR=2017	0.087868	0.018876	4.655118	0.0000
@YEAR=2018	0.087311	0.018874	4.626110	0.0000
@YEAR=2019	0.092241	0.018877	4.886522	0.0000
@YEAR=2020	0.091485	0.018991	4.817370	0.0000
@YEAR=2021	0.087789	0.018982	4.624860	0.0000

@YEAR=2022	0.085755	0.019149 4.478377	0.0000
@YEAR=2023	0.102233	0.019144 5.340238	0.0000
R-squared	0.597484	Mean dependent var	0.465953
Adjusted R-squared	0.566956	S.D. dependent var	0.080964
S.E. of regression	0.053279	Akaike info criterion	-2.956420
Sum squared resid	1.010568	Schwarz criterion	-2.668352
Log likelihood	595.6326	Hannan-Quinn criter.	-2.842159
F-statistic	19.57175	Durbin-Watson stat	0.207939
Prob(F-statistic)	0.000000		

Source: Authors' Computation using Eviews 14 (2026)

According to table 11, time effect on the model is significantly present between 2006 and 2023 as the p-values of the years are less than 1. However, periods 2001 to 2005 witnesses time effect not significantly present as the p-values are greater than 1.

Diagnostic

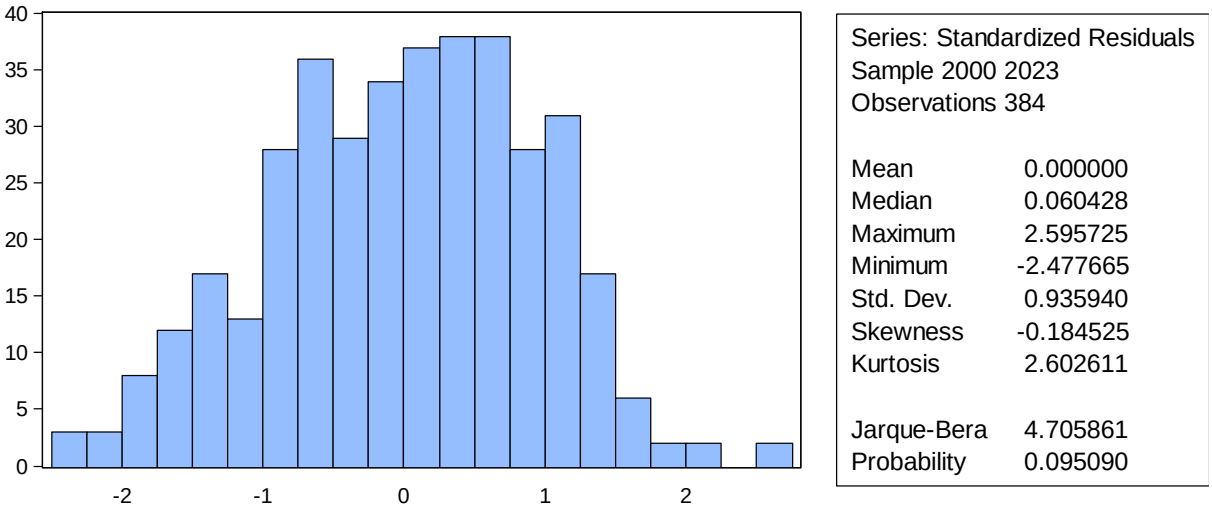


Figure 1: Histogram test for Normality

The Jacque Bera statistic of 4.705861 is statistically insignificant at 0.05 level of significance. Hence, the normality assumption for the model is valid.

4.0 Discussion of Findings

The descriptive statistics show that the average HDI of 0.4659 for West Africa fall within the UNDP threshold of low human development (0.550). Education expenditure as a percentage of GDP averages 3.09% below the recommended range of 4 – 6% of GDP by UNESCO. The mean health expenditure as a percentage of GDP is far below the WHO recommended Abuja target. Meanwhile, mean population growth of 2.58% in West Africa is among the highest globally. The average of the inflation rate of West Africa in the study period stood at 6.21%; this is considered moderate but volatile with a standard deviation of 7.15%

The preferred fixed-effects model, estimated using cross-section SUR weighting and panel-corrected standard errors, indicates that education and health expenditure are positively and statistically significantly associated with the Human Development Index (HDI). Education expenditure has a positive coefficient of 0.0102, suggesting that increased investment in education is associated with improved human development, holding other factors constant. Higher education expenditure can improve access to education, learning outcomes, and human capital, thereby enhancing people's capabilities and overall well-being. This finding is consistent with Al-Zyoud et al. (2021), Nurvita et al. (2022), and Zahari and Sudirman (2017). However, Ruzima and Veerachamy (2023) reported a negative effect of government education expenditure on HDI.

Fadlli et al. (2019) found no significant effect, while Miranda-Lescano et al. (2023) reported inconclusive evidence. These differences may reflect variations in spending efficiency, resource allocation, and the extent to which education expenditure translates into improved human development.

Health expenditure also has a positive and statistically significant coefficient of 0.0051, indicating that higher health expenditure is associated with improved human development, other factors held constant. Increased investment in healthcare can improve access to medical services, reduce preventable deaths, and enhance life expectancy, which is a key component of HDI. This finding supports the results of Miranda-Lescano et al. (2023), Ruzima and Veerachamy (2023), Nurvita et al. (2022), Al-Zyoud et al. (2021), and Razmi et al. (2012).

Conversely, population growth has a negative and statistically significant coefficient of −0.0127, indicating that higher population growth is associated with lower HDI, holding other factors constant. Rapid population growth can place additional pressure on public services and infrastructure, including schools, healthcare facilities, and other essential resources. Where investment in these services does not keep pace with population growth, improvements in human development may be constrained. Inflation exhibits a positive and statistically significant coefficient of 0.000245 $(p < 0.05)$. However, its small magnitude warrants cautious interpretation rather than the conclusion that inflation necessarily improves human development.

All countries except Cote d'Ivoire and Togo have significant individual effects (p<0.05). Their performances are not significant as their spending on health and education is around regional average.

The time effect is significant from 2006-2023 as their p. value is less than 0.05. This is a period of common shocks that affected all West African countries, which include global financial crises (2008), Ebola outbreak, COVID-19, and education reforms in West African counties. However, the reverse is the case for 2001 to 2005 (p.value >0.05). This marks the post-HIPC debt relief period.

5.0 Conclusion

This study examined the effects of education expenditure as a percentage of GDP and health expenditure as a percentage of GDP on human development in West Africa. The findings from the preferred fixed-effects model, estimated using cross-section SUR weighting and panel-corrected standard errors, reveal that the explanatory variables have different relationships with human development.

The results show that education and health expenditures are positively and statistically significantly associated with HDI. These findings underscore the importance of investment in education and healthcare in promoting human development. Education expenditure can enhance access to education and human capital development, while health expenditure can improve healthcare access, health outcomes, and life expectancy. However, the extent to which public expenditure translates into improved human development may depend on the efficiency of resource allocation and the quality of service delivery.

By policy implication for West Africa, raising education spending from 3.09% to at least 5% of GDP to meet the UNESCO target is vital. The current coefficient of 0.0102 implies moving the spending to 5% would increase regional HDI from 0.465 to 0.484, which is a 4% improvement. With the effect of population growth on HDI, it becomes necessary for West Africa to adopt population policy that lowers the growth from 2.58% to 2.0%. This would increase HDI by 0.0073 [(2.58-2.0) x 0.0127]. The Wald test shows that West African countries are heterogenous. Hence, adopting a uniform strategy in terms of spending on education and health may not produce the desired expectations. As such, country-specific strategies should be tailored towards improving the human development of each West African country.

In contrast, population growth has a negative and statistically significant relationship with HDI. This finding suggests that rapid population growth may constrain human development when the provision of education, healthcare, and other essential public services fails to keep pace with increasing demand. It highlights the importance of aligning public investment and social infrastructure with population dynamics to ensure that improvements in human development are sustained.

Inflation exhibits a positive and statistically significant relationship with HDI, although the estimated coefficient is small. This result should be interpreted cautiously, as it does not establish that inflation improves human development. Rather, the observed relationship may reflect the influence of other economic

conditions or developments during the study period. Further investigation may be necessary to establish the robustness of this finding and clarify the channels through which inflation relates to human development.

Overall, the findings suggest that human development is associated not only with the level of public expenditure on essential social services but also with demographic pressures and broader macroeconomic conditions. The positive relationships between education and health expenditure and HDI highlight the importance of sustained investment in these sectors, while the negative relationship between population growth and HDI underscores the need to strengthen public expenditure capacity as population expands. Accordingly, policies aimed at improving human development should prioritise effective resource allocation, efficient delivery of education and healthcare services, and adequate provision of social infrastructure. The unexpected positive relationship between inflation and HDI also warrants further empirical investigation before any policy conclusions are drawn.

Finally, the study contributes to the empirical literature by demonstrating that education expenditure and health expenditure alongside population growth and inflation rate are differently associated with human development within the study's analytical framework. These findings provide evidence to inform human development policy, while recognising that the estimated relationships should be interpreted within the scope of the model and study period.

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