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Re-evaluating the impact of unemployment rate on Health outcomes in Nigeria using an ARDL approach

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ABSTRACT

This study examines the impact of unemployment rate on health outcomes in Nigeria from 1985 to 2022. The study adopts the annual time series data obtained from Central Bank of Nigeria. Statistical Bulletin and World Development Indicators. This study uses life expectancy and child mortality as the two metrics for health outcomes. The ARDL Bounds Test for co-integration shows there exists long run relationship between the variables. The study employed the ARDL model and results show that unemployment rate has negative and positive impacts on the two metrics respectively in both the short run and long run. While other variables like population growth, total labor force, and government expenditure on health show statistically significant impact on life expectancy in Nigeria. The study recommends that to improve life expectancy and reduce child mortality, there should be an investment in primary healthcare, health awareness campaigns, education, sustainable economic growth, social safety nets, population control strategies, and a skilled labor force.

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1. INTRODUCTION

Incessant unemployment rate in Nigeria is a persistent problem that has significant health implications for the country's economic and social being (Omoniyi, 2016). The impact of unemployment is not limited to economic consequences, but also has important implications for public health outcomes (Ilori & Ajiboye, 2015). The situation has been compounded by a reduction in healthcare utilization, delayed diagnosis and treatment of illnesses, and an increase in poverty rates, which have further worsened health problems in the country (Qing, 2015). Meanwhile, several past studies on the impact of unemployment rate on health outcomes in

Nigeria have shown that unemployment has adverse effects on health outcomes such as mental health, physical health, and well-being.

Therefore, the impact of unemployment on health outcomes is a crucial issue that requires extensive research and examination, particularly in Nigeria where the unemployment rate is at an all-time high, and health outcomes are deteriorating (Olaoye, Fadare, & Olaoye, 2021). The COVID-19 pandemic, poor health infrastructure, infectious diseases, malnutrition, low life expectancy, infant and child mortality increase, and environmental factors has further exacerbated the unemployment and health challenges in Nigeria, making it even more imperative to understand the impact of unemployment on health outcomes in the country (Aluko & Aigbedion, 2017). Thus, unemployment is a critical issue that affects the social, economic, and health outcomes of countries across the world (Orji, Ogbuabor, Anthony-Orji, Okoro & Aniorji, 2020).

In Nigeria, the unemployment rate has been a persistent problem for several years, with devastating effects on the country's economy and the well-being of its citizens (Orji, Anthony-Orji & Okafor, 2015). According to the most recent data from the National Bureau of Statistics (NBS), Nigeria's unemployment rate stood at 33.3% in the fourth quarter of 2020 (see Figure 1). This figure represents an increase from the 27.1% unemployment rate reported in the second quarter of 2020. The NBS report also indicates that the underemployment rate decreased from 28.6% in Q2 of 2020 to 22.8% in Q4 2020. These figures suggest that over half of Nigeria's working-age population is either unemployed or underemployed (NBS, 2021).



Figure 1. Nigeria Unemployment rate

Source: *Trading economics.com/National Bureau of Statistics (2022)*

The high unemployment rate in Nigeria is a result of several factors, including a weak economy, a poorly diversified job market, and inadequate infrastructure (Omoniyi, 2016). Omoniyi (2016) further stated that Nigeria's economy is heavily reliant on oil, which accounts for over 90% of the country's export earnings. The fluctuations in the oil market have had a significant impact on the country's economic growth, leading to high unemployment rates. Additionally, Nigeria's job market is not well-diversified, with many Nigerians' lacking the skills necessary to compete in the global economy. Inadequate infrastructure, including poor roads, lack of electricity, and limited access to credit, further exacerbates the unemployment problem in Nigeria (Orji et al, 2020). Thus, the high unemployment rate in Nigeria has significant health implications for its citizens. Unemployment has been linked to several negative health outcomes, including increased rates of depression, anxiety, and stress (Brenner, 2016). In Nigeria, the high unemployment has a significant effect on mental health, physical health, and social well-being (Orji et al, 2015). Some of the ways that unemployment can affect health outcomes in Nigeria are through the mental health, physical health, and social well-being. Thus,

unemployment led to an increased level of stress, anxiety, and depression (Ibiteye, 2016). The uncertainty of not having a job can be overwhelming, and the financial strain of not having a steady income can lead to mental health issues (Halliday, 2013). In Nigeria, the prevalence of mental health disorders is high, with a recent study showing that 20% of Nigerians have a mental health disorder (Suleiman, 2016). The link between unemployment and mental health is well established, with studies showing that unemployed individuals are more likely to experience mental health problems.

Unemployment in Nigeria not only impacts the economy but also affects social well-being and access to healthcare. It leads to feelings of isolation, loss of social status, and self-esteem, contributing to negative mental health outcomes such as depression and anxiety (Qing, 2015; Maduka, Madichie & Ekesiobi, 2016). As a result, many Nigerians are unable to afford healthcare, leading to a decrease in healthcare utilization and delayed diagnosis and treatment of illnesses, which can have serious health consequences (Bakare & Olubokun, 2011).

In 2022, UNICEF reported that Nigeria has a disproportionately high level of health issues surrounding birth for its 40 million women of childbearing age. Despite representing only 2.4% of the world's population, it accounts for 10% of global deaths for pregnant mothers. Maternal mortality rate is at 576 per 100,000 live births, the fourth highest in the world, and approximately 262,000 babies die at birth annually, the second highest national total. Infant mortality rate is 69 per 1,000 live births, and for under-fives, it rises to 128 per 1,000 live births. More than half of the under-five deaths (64%) are due to malaria, pneumonia, or diarrhea. Additionally, data from the World Health Organization also revealed that Nigeria has one of the lowest life expectancies among all countries. According to Statista (2022), life expectancy at birth in Nigeria is totaled 61.33 years; 59.51 years for male, and 63.27 years for female; which shows that life expectancy is the lowest in Africa as well as the world.

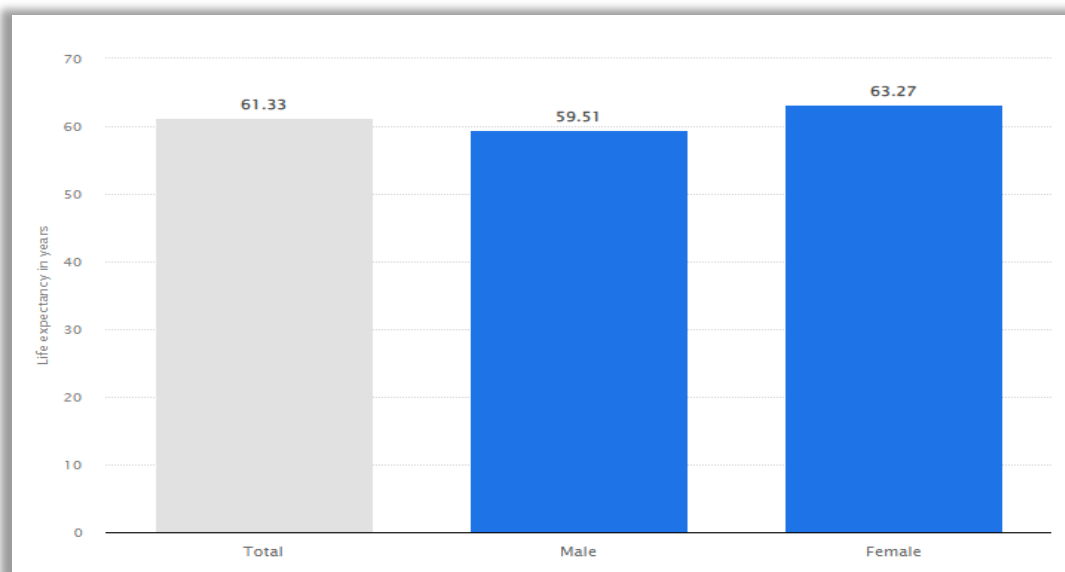


Figure 2. Life Expectancy at Birth in Nigeria in 2022, by Gender

Source: Statista (2022)

Meanwhile, the issue of unemployment in Nigeria is a complex problem that requires a comprehensive approach, including investment in education and training programs, job creation, and economic growth. Additionally, Nigeria's public health expenditure is currently less than the recommended international standard, highlighting the urgent need for the government to prioritize investment in the health sector (Nzeribe et al., 2022). The increasing

unemployment rate and inadequate public health spending may result in further escalation of morbidity and mortality rates, which are already high in the country (World Development Indicator, 2016). Therefore, addressing these issues is critical for improving social well-being and creating a more prosperous and equitable society for all citizens, and this study aims to examine the impact of unemployment on health outcomes in Nigeria.

Our article contributes to numerous strands of literature on the impact of unemployment on health outcomes such as Ha and Huong (2016), Brenner (2016), Qing (2015), Sede and Ohemeng (2015), Omoniyi (2016), Tekin, McClellan and Minyard (2015), Orji, Ogbuabor, and Anthony-Orji, Okoro and Aniorji (2020). Ha and Huong (2016) examined the correlation between county unemployment rates and mortality during the Great Recession in the United States. The study found that unemployment's impact on mortality was statistically insignificant, regardless of gender, age group, or most categories of mortality. The approach this study utilized is different from the approach we used since it adopted Ordinary Least Square (OLS) and Two Stage Least Square (2SLS) estimation while we used ARDL techniques to analyze the data. Consistently, Brenner (2016) investigated the impact of unemployment on the mortality rates for heart disease and stroke in European Union countries, and the primary result of the study indicated that as unemployment rates increased, there was a corresponding increase in mortality rates for heart disease and stroke in European Union countries. This study was conducted on a different population and different datasets that are limited to heart disease and stroke patients while the current study was done using a dataset of unemployment rates and health outcomes of the Nigerian population.

The effects of unemployment on health outcomes of the Chinese population were also examined by Qing (2015) using data from 1990-2011. The results revealed a positive relationship between unemployment and mortality in China, indicating that increased unemployment could have harmful effects on population health. This study differs from our study in the sense that it was conducted on a different population and applied both a fixed effect model and an infinite distributed lag (IDL) model, and the 2-step GMM estimation technique for model estimation.

In a study that investigated socio-economic factors that affect life expectancy in Nigeria, Sede and Ohemeng (2015) discovered that unemployment has a noteworthy impact on life expectancy in the country. This study differs from our study since it focused on socio-economic factors, applied time series data spanning from 1980 to 2011, and they utilized the vector autoregressive (VAR) and vector error correction (VEC) methods for their analysis, which are entirely different from our model. Likewise, Omoniyi (2016) explored the mental health consequences of unemployment and underemployment on Nigerian youth, as well as the potential solutions offered by effective governance and the agricultural revolution. The outcomes of the study revealed that unemployment is a distressing life event and that the level of stress experienced by males and females did not differ significantly. This study is different from the current study because it used primary data collected through questionnaires on a small sample. In contrast, this study used secondary datasets that covered the entire country over a long period.

A similar study by Tekin, McClellan and Minyard (2015) investigated the correlation between unemployment and health in California through the Ordinary Least Square (OLS) technique. According to the results, the relationship between health and unemployment at the state level was too minimal to have significant implications. In contrast, when examining unemployment at the individual level, the findings revealed a negative effect of personal unemployment on both physical and mental health. This study differs with our study based on the target population and approach adopted for the study. Orji, Ogbuabor, Anthony-Orji, Okoro and Aniorji (2020) examined the impact of unemployment on health outcomes in Nigeria. This

study found that a high unemployment rate was found to negatively impact Nigerian health outcomes. Our approach is entirely different from that of Orji et al since they used a classical linear regression model to estimate the relationship between various factors and health outcomes while the current study used the ARDL model. In addition, this study used updated datasets. Similarly, Sulemana et al. (2019) examined the association between unemployment and self-rated health. The study confirm that unemployment is negatively correlated with self-rated health among Ghanaians and men are about 26.68 percent less likely to report good health. This study differs from our study since it employed primary data extracted from a self-report questionnaire while this current study used secondary datasets. This study also differs with respect to the variables included in the model.

In our literature review, we found that no study has investigated the impact of unemployment on health outcomes of Nigeria using ARDL model. Empirical evidence on the association between unemployment and health outcome is mixed with the majority of these studies conducted abroad. Hence, the population of the study used was entirely different. Some of the studies conducted in Nigeria such as Orji et al (2020) among others utilized different approaches such as OLS, classical regression models, vector autoregressive (VAR), vector error correction (VEC) methods among others. There were some differences between the variables used in this study and most previous studies.

As expected, our study contributes the following findings. This study is the first of its kind to use the ARDL model to re-evaluate the impact of unemployment on the health outcomes of Nigerians based on current datasets from CBN and the World Bank. This study used life expectancy and mortality rates to measure Nigerian health outcomes. We contribute to the existing literature and ongoing debates on the impact of unemployment on the health outcomes of the Nigerian population both in the short-run and in the long-run. Economists, public health practitioners, and policy makers will find this study useful as it exposes the current relationship between unemployment and health.

2. METHOD

2.1 Data

The study used annual time series data that covers the period 1985-2022 and are sourced from the Central Bank of Nigeria (CBN, 2022) Statistical Bulletin and World Bank Development Indicators (WDI, 2022). The variables sourced includes life expectancy, child mortality rate (which were used as measurement proxies for health outcome variable), unemployment rate, population growth, government health expenditure, government education expenditure, per capita GDP and labor force participation.

2.2 Theoretical Framework

This study adopts the Grossman Model of Health Demand as the theoretical framework. The Grossman Model of Health Demand is an economic theory developed by Michael Grossman in 1972. The theory is effective for the examination of the economic and social factors influencing the demand for health in terms of unemployment. Thus, the tenets and idea of the theory provides a comprehensive framework for analyzing the factors that influence the demand for health and medical care; as health is recognized as a capital good that deteriorates overtime. Adopting this theory shows how changes in the unemployment rate impacts individual's investment in health, access to medical care, and overall health outcomes. Also, the theory showcases the potential indirect effects of unemployment on health through the influence on individuals' resources, behaviors, and lifestyles.

The theory can be represented in a functional form as:

$$H=f(U, I, C, R, B, L) \dots\dots\dots(3.1)$$

Notes:

H = represents health outcomes, U = rate of unemployment, I = investment in health, C = access to medical care, R = individual resources, B = individual behaviours, and L = individual lifestyle.

Model Specification

To investigate the impact of unemployment rate on health outcomes using life expectancy as a proxy and a dependent variable, the study employed the Auto-regressive distributed lag model and is specified as follows;

Functional Form:

$$LE =f(UNPR, GEH, GEE, POPG, PGDP, TLF) \dots\dots\dots (3.2)$$

Notes:

LE = Life Expectancy; UNPR =Unemployment Rate; GEH= Government Expenditure on Health; GEE = Government Expenditure on Education; POPG = Population Growth; PGDP = Per Capita Income; TLF = Total Labour Force

The Generalized ARDL (p, q) model is represented as:

$$Y_t=\alpha_0+\sum_{i=1}^p \pi_1 i Y_t - i + \sum_{i=0}^q \pi_2 i X_t - i + \omega t \dots\dots\dots (3.3)$$

Notes:

Provided that p and q do not necessarily suggest symmetry of lag-lengths; p = optimum lag length for the predicted parameter; q = optimum lag length for the predictors

The ECM Model is specified as:

$$\Delta LE_t = \alpha_0 + \sum_{i=1}^p \phi_i \Delta LE_t - i + \sum_{i=0}^p \theta_i \Delta UNPR_t - i + \sum_{i=0}^p \mu_i \Delta GEH_t - i + \sum_{i=0}^p \phi_i \Delta GEE_t - i + \sum_{i=0}^p \psi_i \Delta POPG_t - i + \sum_{i=0}^p \Omega_i \Delta PGDP_t - i + \sum_{i=0}^p \varrho_i \Delta TLF_t - i + \delta_1 UNPR_{t-1} + \delta_2 GEH_{t-1} + \delta_3 GEE_{t-1} + \delta_4 POPG_{t-1} + \delta_5 PGDP_{t-1} + \delta_6 TLF_{t-1} + \omega t \dots\dots\dots (3.4)$$

Notes:

Δ = first difference operator; The parameters $\alpha_1 - \alpha_6$ = short-run relationship parameters; The parameters $\beta_1 - \beta_6$ = long-run relationship parameters; (t – i) = Lagged term on respective variables; $\sum \omega_i$ = Summation operator and error term of the equation.

To examine the impact of unemployment rate on health outcome using child mortality rate as a proxy and a dependent variable.

Functional Form:

$$CMR=f(UNPR, GEH, GEE, POPG, PGDP, TLF) \dots\dots\dots (3.5)$$

Notes:

CMR = Child Mortality Rate; UNPR =Unemployment Rate; GEH = Government Expenditure on Health; GEE = Government Expenditure on Education; POP= Population Growth; PGDP = Per Capita Income; TLF = Total Labour Force.

The Generalized ARDL (p, q) model is represented as:

$$Y_t= \alpha_0+\sum_{i=1}^p \pi_1 i Y_t - i + \sum_{i=0}^q \pi_2 i X_t - i + \omega t \dots\dots\dots (3.6)$$

Notes:

provided that p and q do not necessarily suggest symmetry of lag-lengths; p = optimum lag length for the predicted parameter; q = optimum lag length for the predictors

The ECM model is specified as:

$$\Delta \text{CMR}_t = \alpha_0 + \sum_{i=1}^p \phi_i \Delta \text{CMR}_{t-i} + \sum_{i=0}^p \theta_i \Delta \text{UNPR}_t - i + \sum_{i=0}^p \mu_i \Delta \text{GEH}_t - i + \sum_{i=0}^p \phi_i \Delta \text{GEE}_t - i + \sum_{i=0}^p \psi_i \Delta \text{POPG}_t - i + \sum_{i=0}^p \Omega_i \Delta \text{PGDP}_t - i + \sum_{i=0}^p \varrho_i \Delta \text{TLF}_t - i + \delta_1 \text{UNPR}_{t-1} + \delta_2 \text{GEH}_{t-1} + \delta_3 \text{GEE}_{t-1} + \delta_4 \text{POPG}_{t-1} + \delta_5 \text{PGDP}_{t-1} + \delta_6 \text{TLF}_{t-1} + \varpi_t \dots (3.7)$$

Notes: Δ = first difference operator.; The parameters $\alpha_1 - \alpha_6$ = short-run relationship parameters; The parameters $\beta_1 - \beta_6$ = long-run relationship parameters; $(t - i)$ = Lagged term on respective variables; $\Sigma \varpi_i$ = Summation operator and error term of the equation.

Granger Causality Test

To determine the direction of causality between unemployment rate and child mortality rate, and life expectancy in Nigeria.

First, we specify the causality equation between unemployment rate and life expectancy as;

$$\text{UNPR}_t = \sum_{i=1}^n \alpha_i \text{LE}_{t-1} + \sum_{j=1}^n \beta_j \text{UNPR}_{t-j} + \mu_t \dots (3.8)$$

$$\text{LE}_t = \sum_{i=1}^n \lambda_i \text{UNPR}_{t-1} + \sum_{j=1}^n \sigma_j \text{LE}_{t-j} + \mu_t \dots (3.9)$$

Second, we specify the causality equation between unemployment rate and child mortality equation as;

$$\text{UNPR}_t = \sum_{i=1}^n \alpha_i \text{CMR}_{t-1} + \sum_{j=1}^n \beta_j \text{UNPR}_{t-j} + \mu_t \dots (3.10)$$

$$\text{CMR}_t = \sum_{i=1}^n \lambda_i \text{UNPR}_{t-1} + \sum_{j=1}^n \sigma_j \text{CMR}_{t-j} + \mu_t \dots (3.11)$$

3. RESULTS AND DISCUSSION

3.1 Results

3.1.1 Descriptive Statistics

The descriptive statistics summarizes the characteristics of the variables estimated in the regression analysis. The table 1 shows there are 38 observations for each of the variables. The Probability value of Jarque-Bera statistic for the life expectancy (LE), child mortality rate (CMR), population growth rate (POPR), per capita gross domestic product (PGDP), and total labor force (TLF) are greater than (0.05) level of significance, indicating that the variables are normally distributed.

The skewness and kurtosis statistics further support the findings of the descriptive statistics. Thus, a positive skewness shows there is a long right tail, while negative skewness indicates a long-left tail in the distribution. From the result in Table 4.1 above, LE, UNPR, PGDP, TLF, GEH and GEE are positively skewed i.e., have long-right tails; while CMR and POPR are negatively skewed i.e., have a long-left tails.

Table 1. Descriptive Statistics for the Variables

	LE	CMR	UNPR	POPR	PGDP	TLF	GEH	GEE
Mean	48.749	100.92	4.7562	2.6069	1326.0	453778	99.440	164.21
Median	48.441	100.80	4.0610	2.6028	882.28	452926	34.200	76.500
Maximum	53.189	124.80	9.7880	2.7640	3200.9	651156	423.32	646.74
Minimum	45.487	70.650	3.7000	2.4063	270.02	272088	0.0413	0.2250
Std. Dev.	2.7586	19.679	1.7877	0.0959	908.31	112712	126.73	197.61
Skewness	0.2072	0.0581	1.9628	-0.1155	0.4715	0.0298	1.1973	1.1008
Kurtosis	1.4345	1.3923	5.1740	2.0083	1.7412	1.7764	3.2565	2.9976
Jarque-Bera	4.0429	4.0054	31.045	1.5983	3.8140	2.3135	8.9429	7.4728
Probability	0.1324	0.1349	0.0000	0.4496	0.1485	0.3145	0.0114	0.0238
Sum	1803.7	3734.3	175.97	96.456	49065.	1.68	3679.2	6075.7
Sum Sq. Dev.	273.96	13941	115.06	0.3316	297010	4.57	578195	14058
Observations	38	38	38	38	38	38	38	38

Source: Author's computation using e-views

3.1.2 Pre-Estimation Test

Test for Stationarity/Unit Root Test

The Augmented Dickey-Fuller (ADF) unit root test will be estimated. For these tests, the null hypothesis of a unit root cannot be rejected if the P-value is greater than 0.05 at 5% level of significance. See Table 4.2 below.

Table 2- Result for Stationarity Test for the Models

Variables	ADF test statistic	T-Statistic	P-value	Order of Integration	Decision
LE	-4.156455	-3.536601	0.0119	I(0)	Stationary
LCMR	-3.737155	-3.533083	0.0317	I(1)	Stationary
UNPR	-4.719425	-3.533083	0.0027	I(1)	Stationary
POPR	-4.055718	-3.533083	0.0150	I(0)	Stationary
LPGDP	-4.238404	-3.533083	0.0324	I(1)	Stationary
LTLF	-7.549431	-3.533083	0.0000	I(1)	Stationary
LGEH	-3.544284	-3.470347	0.0485	I(1)	Stationary
LGEE	-6.264155	-3.533083	0.0000	I(1)	Stationary

Source: Author's computation using e-views

The results of the unit root test in table 2 shows that the variables child mortality rate (LCMR), unemployment rate (UNPR), per capita gross domestic product (LPGDP), total labor force (LTLF), government expenditure on health (LGEH) and government expenditure on education (LGEE) are stationary at first difference i.e order I(1); while life expectancy rate (LE), and population growth rate (POPR) are stationary at level form i.e I(0). Since we have both I(1) and I(0) series, the study employed the Autoregressive Distributed Lag (ARDL) bound test co-integration estimation technique to examine the long run relationship.

3.1.3 Bounds Test for Co-Integration for life expectancy model

The ARDL bounds test developed by Pesaran Shin, and Smith (2001) is used to examine the existence of co-integration among the variables. H_0 = No Co-integration, H_1 = Co-integration.

Decision Rule: Reject H_0 if f-statistics > upper critical boundary at 5% level of significance. Otherwise, do not reject and conclude that long run relationship does not exists. The results of the bounds test for model one and two are presented in table 3 and 4 below.

Table 3. Bounds Test F-Statistic for Model 1

F-Statistic	Critical Value					
	1%		5%		10%	
	I(0)	I(1)	I(0)	I(1)	I(0)	I(1)
5.859286	2.88	3.99	2.27	3.28	1.99	2.94

Source: Author's estimation using e-views

From Table 3, the F-statistic of the Wald test (5.859286) is greater ($>$) than the lower and upper critical boundaries at the 5% level of significance. We reject the null hypothesis and conclude that there is co-integration among the variables used in this study. That is, a stable, long-term relationship exists.

Table 4. Bounds Test F-Statistic for child mortality model

F-Statistic	Critical Value					
	1%		5%		10%	
	I(0)	I(1)	I(0)	I(1)	I(0)	I(1)
4.328628	2.88	3.99	2.27	3.28	1.99	2.94

Source: Author's estimation using e-views

From Table 4, the F-statistic of the Wald test (4.328628) is greater ($>$) than the lower and upper critical boundaries at the 5% level of significance. We reject the null hypothesis and conclude that there is co-integration among the variables used in this study. That is, a stable, long-term relationship exists. Conclusively, from Table 3 and 4, the bound test for model one and two shows that long-run and short-run autoregressive distributed lag (ARDL) model will be examined.

3.1.4 Presentation of Estimation Results for life expectancy Model

Table 5. Long Run Regression Result (Dependent Variable: LE)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
UNPR	-0.699576	0.098057	7.134408	0.0000
POPR	-0.932956	0.311346	-2.996521	0.0059
LPGDP	0.043266	0.135457	0.319411	0.7520
LTLF	0.012824	0.004367	2.936840	0.0069
LGEH	0.003100	0.001454	2.131991	0.0426
LGEE	2.147882	1.123897	1.911102	0.0671
C	-0.589945	0.723160	-0.815788	0.4220
R-squared = 0.987431		F-statistic = 170.2088		Durbin-Watson stat = 1.440268
Adjusted R-squared = 0.981629		Prob(F-statistic) = 0.000000		

Source: Author's computation using e-views

Table 6. Short Run & ECM Regression Result

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(UNPR)	-0.963436	0.307661	3.131482	0.0043
D(POPR)	-0.804287	0.432415	-1.859988	0.0742
D(LPGDP)	-0.362394	0.187881	-1.928853	0.0647
D(LTLF)	0.010526	0.004370	2.408772	0.0234
D(LGEH)	0.013309	0.003457	3.849336	0.0007
D(LGEE)	0.819038	0.856632	0.956114	0.3478
ECM(-1)	-1.377171	0.355815	-3.870474	0.0007

Source: Author's computation using e-views

3.2 Discussion

Table 5 above shows that unemployment rate has a long run coefficient of -0.699576, and is statistically significant at a 5% level of significance. As a result, holding other variables constant, on average, a unit increase in unemployment rate decreases health outcomes (proxy with life expectancy) by -0.699576 unit in the long-run. The regression result shows that unemployment rate has a negative relationship with life expectancy in Nigeria. This conforms to *a priori* expectation of the study, and the findings of Sede and Ohemeng (2015), Onwube, Chukwu and Ahamba (2021), and Aigheyisi (2020) in their study on how unemployment rate impact on life expectancy. The results revealed that unemployment had a negative and significant impact on life expectancy in Nigeria.

Also, in Table 6, the short run coefficient of the result shows that unemployment rate in the short-run is -0.963436, which shows that, all other variables held constant, a percentage increase in unemployment rate significantly decreases life expectancy by -0.963436% in the short-run. Thus, the reason for the negative coefficient in the long-run and short-run could be said to be as a result of the negligence by the government in providing jobs and adequate healthcare, insurance coverage and awareness that health is wealth. Therefore, government should ensure that unemployment rate is ameliorate to spur increase in the life expectancy of Nigerians.

The Table 5 empirical result shows that population growth rate has a negative or indirect relationship with life expectancy in the long-run. With a coefficient of -0.932956, a unit increase in population growth rate will on the average lead to 0.932956% decrease in life expectancy in Nigeria holding other variables constant. This means increase in the population growth rate decreases life expectancy in Nigeria. This conforms to *a priori* expectation, and also in line with the findings of Bakare and Olubokun (2011), Osobase, Ohioze and Olowoyo (2021) who found a negative relationship between population growth rate and life expectancy. Meanwhile, in Table 6, the short run coefficient shows that population growth rate in the short-run is -0.804287, which shows that, all other variables held constant, a unit increase in population growth significantly decreases life expectancy by -0.804287% in the short-run. Therefore, the government should ensure that measures are taking to investment on the human capital of the population to ameliorate decrease in life expectancy precipitated by population growth rate.

The coefficient of total labor force in Table 5 is 0.012824. This shows that a positive and direct relationship exists between life expectancy and total labor force in the long run. Thus, a percentage increase in total labor force will on the average increase life expectancy by 0.012824%, holding other variables constant. This conforms to *a priori* expectation and studies done by Olayiwola, Adedokun and Abiodun (unpublished) that increase in labor force increases the life expectancy. Meanwhile, in Table 6, the short run coefficient of the regression shows that total labor force in the short-run is 0.010526, this means, all other variables held constant in the model, a percentage increase in total labor force significantly increases life expectancy by 0.010526% in the short-run.

The coefficient of government expenditure on health in Table 5 has a positive sign. This indicates that a positive and direct relationship exists between life expectancy and government expenditure on health. With the coefficient of 0.003100, a percentage increase in government expenditure on health will, on the average, lead to about 0.003100% increase in life expectancy holding other variables constant. This conforms to *a priori* expectation, which states that the increase in government expenditure on health strengthens the life expectancy of the populace. This is in line with the work of Alhowaish (2014) who found government expenditure on health has a positive impact on life expectancy. Meanwhile, in Table 6, the short run coefficient of the regression shows that government expenditure on health in the short-run is 0.013309, which

shows that, all other variables held constant in the model, a percentage increase in government expenditure on health significantly increases life expectancy by 0.013309% in the short-run.

The coefficient of the error correction model (ECM (-1)) is -1.377171. This value reveals that 137.717% of the error or disturbances in the previous year is corrected in the following year. This satisfies the criteria for error correction which is that the coefficient must be statistically significant and must be negative.

3.1.5 Presentation of Estimation Results for child mortality rate Model:

Table 7. Long Run Regression Result (Dependent Variable: LCMR)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
UNPR	0.133794	0.094334	1.418308	0.1668
POPR	-0.018332	0.014788	-1.239668	0.2250
LPGDP	0.122959	0.123329	0.997004	0.3270
LTLF	-0.005164	0.003715	-1.390350	0.1750
LGEH	-0.002334	0.001131	-2.064502	0.0480
LGEE	-1.228090	0.644091	-1.906701	0.0665
C	1.497567	0.255492	5.861497	0.0000
R-squared = 0.891763		F-statistic =26.54781		Durbin-Watson stat =2.307845
Adjusted R-squared = 0.858172		Prob(F-statistic) = 0.000000		

Source: Author's computation using e-views

Table 8. Short Run and ECM Regression Result

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(UNPR)	0.616527	0.233713	2.637963	0.0133
D(POPR)	-0.009473	0.007149	-1.325065	0.1955
D(LPGDP)	0.063537	0.058740	1.081660	0.2883
D(LTLF)	0.000796	0.001829	0.434987	0.6668
D(LGEH)	-0.001206	0.000584	-2.063846	0.0481
D(LGEE)	-0.634593	0.314679	-2.016638	0.0531
ECM(-1)	-0.516732	0.133623	-3.867094	0.0006

Source: Author's computation using e-views

From Table 7 above, unemployment rate has a long run coefficient of 0.133794, and is statistically insignificant at 5% level of significance. Thus, holding other variables constant, on average, a percentage increase in unemployment rate increases child mortality rate by 13.3794% in the long-run. The result shows that unemployment rate has a positive relationship with child mortality rate in Nigeria though insignificant. This conforms to *a priori* expectation, and the work of Edeme and Olisakwe (2019) and Raji (2020) who found a positive relationship between unemployment rate and child mortality rate in their study.

Meanwhile, in Table 8, the short run coefficient of the regression shows that unemployment rate in the short-run is 0.616527, which shows that, all other variables held constant, a percentage increase in unemployment rate significantly increases child mortality rate by 61.6527% in the short-run. The coefficient of government expenditure on health in Table 7 has a negative sign. This indicates that a negative and indirect relationship exists between child mortality rate and government expenditure on health. With the coefficient of -0.002334, a percentage increase in government expenditure on health will, on the average, lead to about -0.002334% decrease in child mortality rate holding other variables constant. This conforms to *a priori* expectation, which states that the increase in government expenditure on health

decreases the rate of child mortality. Edeme and Olisakwe (2019) in their study found similar result. Also, in Table 8, the short run coefficient of the regression shows that government expenditure on health in the short-run is -0.001206, which shows that, all other variables held constant, a percentage increase in government expenditure on health significantly decreases child mortality by -0.001206% in the short-run. The coefficient of the error correction model (ECM(-1)) is -0.516732. This value reveals that 51.6732% of the error or disturbances in the previous year is corrected in the following year. This satisfies the criteria for error correction which is that the coefficient must be statistically significant and must be negative.

3.2.1 Post Estimation Tests

Stability Test (CUSUM Test) for the Models:

CUSUM tests of parameter stability plot recursively updated test statistics over time to see if any significant breaks in the statistics may be observed. The results of this test, shown in Figure 4.1 and 4.2 below, show that all of the estimated model's coefficients are stable over time within the critical boundaries of 5%. We can accept the model's results based on this stability test.

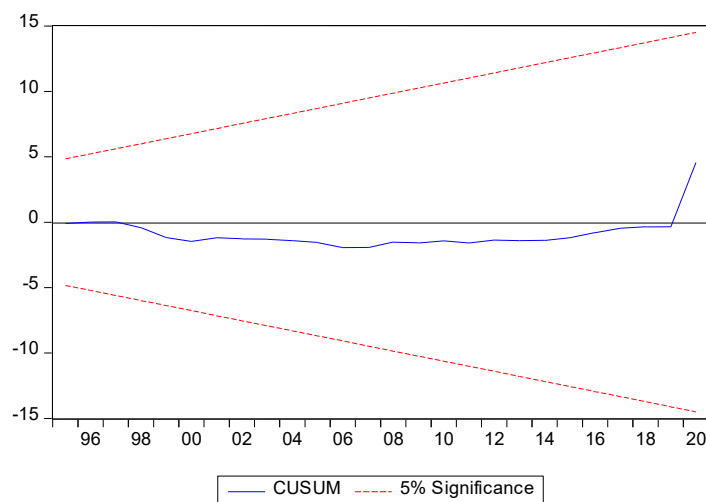


Figure 3. CUSUM Plots for Stability Test for Model 1

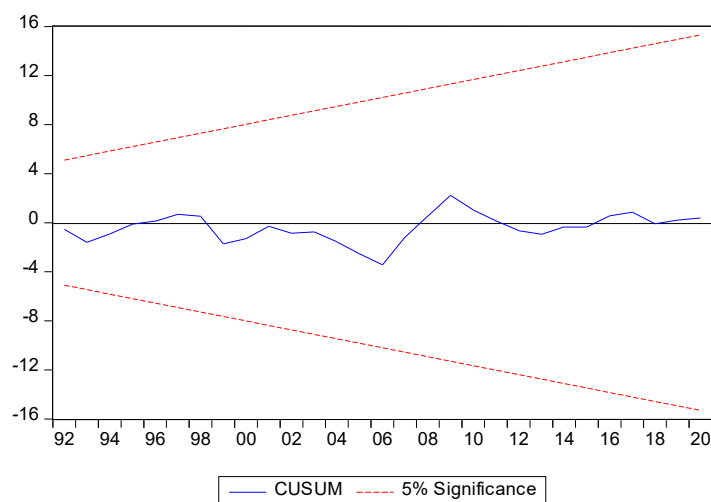


Figure 4. CUSUM Plots for Stability Test for Model

4. CONCLUSION

The study examined the relationship between the unemployment rate and health outcomes in Nigeria from 1985 to 2022. The findings of this study underscore the undeniable impact of unemployment on health outcomes in Nigeria of which the statistical analysis revealed a strong positive and negative correlations between the unemployment rate and various health indicators both in the short run and long run respectively, signifying that higher unemployment rates are associated with poorer health outcomes. Thus, this aligns with the notion that economic hardship resulting from unemployment lead to reduced access to healthcare, inadequate nutrition, and heightened stress levels among individuals and families. However, it is evident that addressing unemployment extends beyond its economic implications; it has profound public health outcome. As such, policy interventions that solely focus on economic growth should be re-evaluated to incorporate strategies that simultaneously prioritize job creation, skills development, and social safety nets. This study therefore recommends that the government should ensure and enact adequate policies that are favourable to the private sector to promote job creation, vocational training, and workforce development in order to enhance economic stability, increase income levels, and subsequently contribute to improved life expectancy and reduced child mortality rate in Nigeria. This study enriches scholarly research by deepening the understanding of the interconnectedness between unemployment rates and health outcomes in Nigeria. Its empirical findings, policy implications, and methodological approach collectively advance knowledge in the fields of economics, public health, and policy studies, guiding future research and fostering meaningful societal change.

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