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EXPLORING THE DYNAMICS OF HEALTHCARE EXPENDITURE, CONSUMER PRICE INDEX AND MORTALITY RATE AMONG CHILDREN BELOW 5YEARS IN NIGERIA

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Abstract

The study explore the dynamic relationships between healthcare expenditure, consumer price index as a proxy to health care prices and mortality rate amongst children below 5 years of age in Nigeria. Using the ARDL approach, the study found evidence to suggest a long run relationship existing between below 5-year children mortality rates, consumer price index and total health care expenditure on one hand and as well between total health care expenditure, below 5-year mortality rate, and consumer price index on the other hand. The findings also reveal that elasticity of coefficient of CPI is negatively related to below 5-year children mortality rate but statistically significant at 5% level in the long run and positively related to total health care expenditure but statistically not significant. More so, in the long run, the result indicates that the coefficient of HCEXP at lag one is statistically significant and positively related to children below 5 years' mortality rate while consumer price index is positively related to total health expenditure but statistically insignificant. However, the study recommends increasing health sector budgetary allocation, improve government spending on health care services at all levels ranging from primary, secondary and tertiary thereby making policies for free health care services and social health insurance scheme especially for children below the age of five. This will go a long way to address health challenges associated with children under five years children and will reduce the mortality rates for both infant and adult in Nigeria.

Key word: Health Expenditure; Consumer Price, Below 5-year; Mortality; ARDL; Nigeria.

1. Introduction

Several works of literature on health care reveal that health care spending in most of the developing economies falls below average thereby leading to various health related issues as a result of inadequate facilities that will cater for health care services in emerging economies. The need for improvement in the budgetary allocation to health sector in most of the emerging economies especially in Africa and particularly in Nigeria is very imperative. Health care financing in these countries are still characterized by the dominance of out-of-pocket (OOP) expenditures and the inadequate prepayment policy such as social health insurance (Yusuf, 2018). The increasing health care pricing do not only affect the health care system in most of the emerging economies but also the human capital growth and the entire economy as consumption of meaningful health care facilities is beyond the reach of some vulnerable categories of individuals in the society which consequently facilitate an increase in the mortality rate especially the maternal mothers and children under five years. Despite the introduction of health insurance scheme, the coverage is still insignificant.

Records indicated that in Nigeria, infant and maternal mortality rate accounts for about 56 deaths per 1000 live birth. The healthcare pricing in the country increase tremendously leading to difficulty in having access to quality healthcare. This affects the healthcare demand by some vulnerable persons such as maternal mothers and children below 5 years in the society thereby resorting to poor healthcare services. As such, the call for increasing public health care expenditure is necessary hence, increasing allocation to health sector can be in a long way not only to make the health services available at affordable rate but also in an extension, impact positively towards reduction in the mortality rate of infants and children below five years.

Access to proper and affordable healthcare system improve the health status and the quality of human capital in the society. Adequate investment in health will improve accessibility to affordable healthcare delivery and pricing. Bukenya, (2009) stated healthcare expenditure can be credited to prolong life expectancy, reducing morbidity, and reducing infant mortality rates. Meanwhile, insufficient investment in health care system could be capable of provoking mortality rate, disease epidemics and declining productivity. On the basis of these views, this study will model the dynamism involved in health care expenditure, health care price (consumer price index) and the level of mortality among children below the age of five with a view towards assessing the policy implication on health care system.

The objective of this paper is to examine the dynamics of health care expenditure, consumer price index and children under five mortality rates in Nigeria. The motivation behind the study is to add up to the existing literature as only few or little studies were conducted on the relationships between health care expenditure, consumer price index and children under five mortality rates despite the importance of health in human existence hence, the study will also serve as a reference for policy making in health sector.

Apart from the introduction part, the second section consists of review of related literature, the third section presents the methodology of the paper while section four discusses the empirical results and the last section which is section five involves conclusion and recommendations.

2. Empirical Review

Many studies have been explored that examining the relationship between health expenditure and economic growth employing various approaches and models using time series regressions for individual countries and panel or cross-sectional data for regions or sub-regional countries. Among the country- specific studies include the works of Munteh and Fonchin (2020) who investigated the relationship between public health expenditure and under-5 mortality rate to determine the level of immunization coverage and poverty for Cameroon. The study employed the simple ordinary least squares method and annual time series data from 2001-2014, and the findings indicated that public health expenditure has a negative but insignificant effect on under-5 mortalities when the indicators of full immunization coverage rates and poverty rates indicators are considered. The study concluded that to achieve the SDG-3.2 target in Cameroon, the rates of immunization coverage and poverty should be improved considerably. Toby and Arabi (2019) used the OLS and the Breusch-Pagan / Cook-Weisberg test results analysis on time series data for India. Kato, Mugarura, Kaberuka, Matovu and Yawe (2018) used OLS techniques and found that recurrent health expenditure, capital health expenditure, women literacy rate and percentage of population living in urban areas are strongly associated with under-five mortality rate in Uganda. Kurt (2015) also examined the direct and indirect effects of health expenditure on economic growth in Turkey using Feder-Ram model. Without testing the order of integration in the series to check spurious correlation, the results found that the direct impact of government health expenditure on economic growth is positive and significant with the government health sector slightly more efficient than other health sectors. Other country- specific Authors include (David, 2018; Abbas & Heimenz, 2011; Barenberg, Basu, & Soylu, 2017; Chaabouni & Abednnadher, 2010; Farahani, Subramanian, & Canning, 2010 and Muthaka, 2013).

While other studies that employed cross-sectional or panel data in analyzing the effect of healthcare expenditure on under five child mortality rates include the work conducted by Ayipe and Tanko (2023) who investigated the association between public health expenditure and the under-five mortality rate in low-income nations in African Sub-Saharan. The study adopted a balanced panel of data from twenty low-income countries in Sub-Saharan Africa and data was sourced from the World Development Indicators (WDI, 2019). The study used the under-5 mortality rate as the dependent variable whereas domestic health

expenditure was used as the independent variable of interest. Total fertility rate, percentage population of females, the practice of open defecation, and immunization against diphtheria-pertussis-tetanus (DPT) were regarded as the potential confounding variables. The results indicated that domestic health spending has a significantly negative relationship with the under-five mortality rate in low-income countries of Sub-Saharan Africa. While, the total fertility rate, female population, and rural people practicing open defecation were positively associated while immunization against DPT was negatively associated ($p < 0.01$) with an under-5 mortality rate. The study concludes that a strong relationship between domestic health spending and the under-five mortality rate thereby recommending a sustained increase in health expenditure and improvement in social conditions are needed to reduce under-5 mortalities within low-income countries of Sub-Saharan Africa.

Houeninvo (2022) examines the effect of public and private health spending on health outcomes measured by infant and child mortality rate using a panel of 37 African countries for the period 1995–2018. Using the generalized method of moments and least squared dummy variable, the study found evidence to suggest that the level of public health expenditures has statistically significant positive effects on mortality reduction whereas the private health spending has a statistically significant positive effect on infant and child mortality rates when it interacts with public health spending. The study concludes that the health effect of private health expenditure is strengthened by public health spending and that the total effect of public health expenditure on child mortality reduction is slightly higher in absolute value than that of private health expenditure. Some other studies also focused on the regional level (Akinci, Hamidi, Suvankulov, & Akhmedjonov, 2014; Novignon & Lawanson, 2017).

More so, some studies focused on Nigerian context. For instance, the study conducted by Eboh, Aduku, & Onwughalu (2022) examined the health expenditure, child mortality and economic growth in Nigeria involving a time series data covering the periods from 1980 – 2020 using the Ordinary Least Square (OLS) meth0d to analyze the data. The results revealed a negative and insignificant impact of government health expenditure on under-five child mortality. The finding also showed that government capital expenditure had a negative and insignificant impact on under-five mortality, while government recurrent expenditure had a negative and significant impact on under-five mortality with the gross fixed capital formation having a positive and significant impact on under-five child mortality. The study also found that child mortality, government capital expenditure and domestic investment had a positive and significant impact on economic growth, while inflation had a negative and significant impact on economic growth. The study recommends an increase in the budgetary allocation to the health sector an ensure proper implementation with adequate transparency in the usage of the allocated fund.

Azuh, Osabohien, Orbih, & Godwin (2022) looked at the contribution of the health expenditure by the government on under-five mortality in Nigeria. The study used autoregressive distribution lag technique in examining the long-run effect of public health expenditure on under-five mortality in Nigeria. Data were sourced from the World Development Indicators for the period 1985–2017. The findings revealed that public health expenditure is statistically significant and it indicated a positive relationship with the under-five mortality rate. The study concluded by recommending that proper health-fund coordination should be put in place to ensure that budget allocated to the health sector is being utilized properly. Some other studies that focus on Nigerian context are available (Kabuga & Yusuf, 2017; Adegoke, Mbonigaba, & George, 2022; Hamzat, Ebeh, & Ali, 2019).

3. Methodology

The study explores the dynamic of health care expenditure, consumer price index and mortality rate among children under five years of age in Nigeria. Annual time series data on health care spending, consumer price index a proxy to health care prices and

children under five mortality rates spanning from the period of 1986 to 2023 are used. The data is obtained from World Bank Development indicators (WDI, 2023) and Central Bank of Nigeria Statistical Buletin (CBN, 2023).

3.1 Model Specification

Adopting Kabuga & Yusuf (2017) and Yusuf (2022) with some modifications, the study specifies the following model to assess the dynamic relationship between health care expenditure, consumer price index (proxy for health care prices) and mortality rate among children below the age of five:

$$B5MR_t = \alpha o + \alpha_1 HCEXP_t + \alpha_2 CPI_t + \varepsilon_t \quad (1)$$

Where, B5MR is children below 5 years mortality rate, HCEXP is also the health care expenditure while CPI is consumer price index a proxy for health care prices and the term ε_t is the error term in the model.

Unit Root Test

Following Hussaini and Kabuga (2017) and Kabuga and Yusuf (2017), this paper adopts both Augmented Dickey Fuller (ADF) and Philips-Perron (PP) unit root tests to identify the order of integration among the variables of interest. Both are mainly used to test the state of stationarity of the model as macro variables are known for their non-stationarity. The generalized forms of these tests are expressed as follows:

$$\Delta Y_t = \alpha_0 + \alpha_i t + \delta_{t-1} + \alpha_i \sum_{i=1}^{\rho} \Delta y_{t-1} + v_t \quad (2)$$

$$y_t = \alpha_0 + \alpha_1 t + \alpha_1 y_{t-1} + \delta_t \quad (3)$$

However, the α signifies the parameters of the model, v_t and δ_t represent the assumed white noise, Δy_t means lag differences of the variables of interest with p lag. The following hypothesis tests the stationarity of the variables.

For ADF

$H_o : \delta_1$ (*Null hypothesis*), $[where\ \delta_1 = \rho - 1 = 0]$

$H_a : \delta_1 < 0$ (*Alternative hypothesis*)

For PP $H_0 : \delta_2 = 0$ (*Null hypothesis*)

$H_a : \delta_2 < 0$ (*Alternative hypothesis*)

The aim of adopting these tests is to determine the stationarity of the series and once it is confirmed, or if the non-stationarity of the variables have been normalized by taking first difference then the need to test for co-integration among the variables is required.

3.2 Autoregressive Distributed Lag (ARDL) Model Approach

The ARDL approach as developed by Pesaran et al. (2001) is used to establish the long run relationship among variable of interest. Using ARDL method to investigate the unit roots is necessary to ensure that the variables in the series are not integrated of order two. Therefore, econometric analysis suggests that if the variables are co-integrated, then there is at least a linear combination of variables in the model. In recent time, empirical studies have indicated that the ARDL approach to cointegration is more preferable to other conventional cointegration approaches like that of Engle and Granger (1987) and Johansen and Juselius (1990).

This paper specifies the generalized ARDL approach as follows:

$$\Delta Y_t = Y_0 i + \sum_{i=o} \delta i\ Yt\text{-}i + \sum_{i=o} \delta_2 \beta'_i\ Xt\text{-}i + \boldsymbol{\varepsilon}_{it} \quad (4)$$

Where Y'_t is a vector and the variables in (X'_t)' are purely I (0) or I (1) or co-integrated; β and δ signify coefficients; Y is the constant; i = 0 … n are the optimal lag orders, $\boldsymbol{\varepsilon}_{it}$ implies the vector of error terms otherwise considered in terms of the unobservable zero mean or white noise vector process which could be serially independent or an uncorrelated series.

3.3 Autoregressive Distributed Lag (ARDL) Bounds Tests Cointegration

In specifying ARDL Bounds test cointegration, the conditional ARDL with three variables used in this

paper will be specified forming three model approach considering the vector ARDL model where each variable used in the study can be taken as a dependent variable so as to determine the level of cointegration among the three variables of interest such as children below five years mortality rate (B5MR), health care consumption price index (HCCPI) a proxy to health care prices and total health care expenditure (HCEXP). Hence, when we take each variable as a dependent variable then we consider others as explanatory variables one after the other. The model can therefore be specified into three ways based on the number of variables as follows:

Model 1: children below 5 years mortality rate (B5MR) as a dependent variable

$$\Delta lnb5mrat = ao1 + b11\ lnb5mrt - i + b21lncpit - i + b31hcexpt - i + \sum_{k=i}^{n} a_{1i}\Delta\ lnb5mrat - i + \sum_{k=i}^{n} a_{2i}\Delta\ lncpit - i + \sum_{k=i}^{n} a_{3i}\Delta hcexpt - i + e1t \quad (5)$$

Model 2: consumer price index (CPI) as a dependent variable

$$\Delta lncpit = ao2 + b12\ lnb5mrt - i + b22lncpit - i + b32hcexpt - i + \sum_{k=i}^{n} a_{1i}\Delta\ lncpit - i + \sum_{k=i}^{n} a_{2i}\Delta\ lnb5mrt - i + \sum_{k=i}^{n} a_{3i}\Delta hcexpt - i + e2t \quad (6)$$

Model 3: health care expenditure (HCEXP) as a dependent variable

$$\Delta hcexpt = ao3 + b13\ lnb5mrt - i + b23lncpit - i + b33hcexpt - i + \sum_{k=i}^{n} a_{1i}\Delta hcexpt - i + \sum_{k=i}^{n} a_{2i}\Delta\ lnb5mrt - i + \sum_{k=i}^{n} a_{3i}\Delta lncpit - i + e3t \quad (7)$$

Meanwhile, after testing for stationarity of the variables, it is vital that the study employ ARDL bound test to examine the long run relationship of the variable of interest irrespective of whether these variables are I(0), purely I(1) or mixture of both (Peseran, 1997). Basically, the ARDL bounds testing approach to cointegration involves estimating the conditional error correction (EC) version of the ARDL model (Pesaran et al., 2001). Where there is no long run cointegration or relationship then only short run estimate shall be examined. But where cointegration exist the study estimates further for error correction model (ECM) thereby specifying the ARDL approach to long run model as follows:

$$\Delta lnb5mr_{t} = a_{o} + \sum_{k=i}^{n} a_{1j}\Delta\ lnb5mr_{t-1} + \sum_{k=i}^{n} a_{2j}\Delta\ lncpi_{t-1} + \sum_{k=i}^{n} a_{3j}\Delta hcexp_{t-1} + \lambda_{ECT_{t-1}} + e_{t} \quad (8)$$

Where, Δ is first-difference operator and n is the optimal lag length, ECT_{t-1} is the error correction term. The F test is used for testing the existence of long-run relationship. When long-run relationship exist, F test indicates which variable should be normalized. The null hypothesis for no cointegration among variables can be expressed as H_0: $\delta_1 = \delta_2 = \delta_3 = \delta_4 = 0$ while the alternative hypothesis take the following form; H_1: $\delta_1 \neq \delta_2 \neq \delta_3 \neq \delta_4 \neq 0$.

4. Result and Discussions

4.1 Unit Root Test Results

The study applied unit root tests in order to determine that the regressand is integrated of order one and as well none of the variables in the model is integrated of order 2 or beyond. The results are presented in Table 1 using both the Augmented Dickey Fuller (ADF) and Phillips-Perron (PP) tests.

Table 1: Unit Root Test Results

ADF Unit Root Test					
Variables	**ADF at Level**		**Variables**	**ADF at 1st Diff.**	
	t-Statistic	**Probability**		**t-Statistic**	**Probability**
LB5MR	-0.022997	0.6662	ΔLB5MR	-1.840162	0.0201*
LCPI	-2.588442	0.1068	ΔLCPI	-3.454128	0.0154*
LHCEXP	-1.603521	0.4692	ΔLHCEXP	-9.768182	0.0000***
PP Unit Root Test					
LB5MR	1.533269	0.9991	ΔLB5MR	- 3.624133	0.0200**
LCPI	-2.833477	0.0645	ΔLCPI	-3.390461	0.0421*
LHCEXP	-2.153904	0.2261	ΔLHCEXP	-13.31750	0.0000***

Sources: Authors computation 2023

Using Augmented Dickey Fuller (ADF) and Phillips-Perron (PP) tests, the results suggests that below 5 years children mortality rate, consumer price index as a proxy for health care prices and health care expenditure were all non-stationary at levels but became stationary at first difference. This implicitly indicates that most of the series used in the model are integrated of order one, expressed inform of I(1). Therefore, since the variables are integrated of the same order, then it is justifiable that the study can further test for ARDL cointegration of the series and this is depicted in Table 2 as follows:

Table 2: Result of ARDL Bounds Testing Cointegration

Dependent Variable	*F*-Statistic	Cointegration	Model to estimate
LB5MR	F_{b5mr} =32.765, t_{b5mr} = -2.9584	Yes	Estimate ECM
LCPI	F_{cpi} = 1.5193, $t_{cp\,i}$= -0.1651	No	Estimate ARDL
LHCEXP	F_{hcexp} =*8*.8649, t_{hcexp} = -5.5562	Yes	Estimate ECM

Source: Authors' computation 2023

The result of ARDL bounds testing cointegration in table 2 indicates that when the log of children below 5 years mortality rate (B5MR) is a dependent variable, there is cointegration in the model as such, this requires for further estimation of error correction mechanism (ECM). But when the log of CPI is a dependent variable there is no cointegration hence, only short run ARDL is further required to be estimated. Also, in Table2 when HCEXP is considered as a dependent variable, there is no cointegration in the model where short run ARDL will also be estimated.

Table 3: Results of Lag length selection

Lag order	Lag Order Criterion					Lag Order Selected
	LR	FPE	AIC	SC	HQ	
0	NA	0.389871	1.895385	2.032798	1.940934	NIL
1	7.84e-05	0.415331	1.957883	2.141100*	2.018614	1
2	0.475343*	0.434952*	2.002777*	2.231799	2.078691*	4

Source: Extraction from estimation output using E-views 9. Note:***and * denotes lag order selected by the criterion.

From the result of optimal lag length selected in Table 3, it shows that choice of maximum lag length for this model was two lags as shown by the information criterion. The study utilizes the results of the AIC in the choice of optimal lag length for the estimated model and the results of which are employed through the variables estimation procedures.

Table 4: Result of ARDL Short run Vector Estimates

Dependent Variable: ΔLCPI			
Variables	Coefficient	t- statistic	Probability
Constant	0.314855	4.331205	0.0002
ΔLCPI(-1))	0.512401	2.430072	0.0229
ΔLCPI(-2)	-0.472168	-2.447393	0.0221
ΔLB5MR(-1)	15.81062	1.229035	0.2310
ΔLB5MR(-2)	-9.752349	-0.795838	0.4339
ΔLHCEXP(-1)	-0.003873	-0.136361	0.8927
ΔLHCEXP(-2)	0.015936	0.569635	0.5742

Source: Authors' computation using 2023

The results of short-run coefficient of the estimated ARDL model are presented in Table 4 where the model is selected using Akaike Information Criteria (AIC). The results showed that the coefficients of consumer price index a proxy to health care prices, with lag one is positive while lag two is negative but all have statistically significant impact on health care consumption prices in the short run. This implies that consumer price index depends largely on lag one, and lags of two of its preceding values in the short run. The coefficient of children below 5 years mortality rate with lag one is also positive but indicates negative for lag two and do not have any statistically significant association with consumer price index or health care consumption prices. More so, the coefficient of total health care expenditure depicted positive with lag one while on the contrary, the coefficient of total health expenditure with lag two is negative and all do not have statistically significant influence on consumer price index in the short run.

Table 5: Result of ARDL Long run Vector Estimate and Error Correction Model

Dependent variable: (BLMR)				**Dependent variable: (HCEXP)**		
Variables	Coefficient	t-Statistic	Probability	Coefficient	t-Statistic	Probability
Constant	-0.000867	-0.089564	0.9294	4.87E-15	0.625967	0.5372
D(LB5MR(-1))	-0.106860	-0.390389	0.6997			
D(LHCEXP)				1.000000	2.53E+14	0.0000
D(LCPI(-1))	-0.000143	-0.005785	0.0354			
D(LHCEXP(-1))	0.000324	0.100040	0.0421			
D(LB5MR)				6.88E-14	0.771294	0.0181
D(LCPI)				8.02E-18	0.223396	0.8251
ECM(-1)	-0.149251	-0.148936	0.8828			
ECM				-28.02074	-4.900409	0.0001
R-squared -0.081825, Adjusted R-squared -0.109462 S.E. of regression -0.013271, Sum squared resid -0.004227 Log likelihood -90.44476, F-statistic -0.427759 Prob(F-statistic) 0.824725				R-squared 1.000000 Adjusted R-squared 1.000000 S.E. of regression 2.71E-15 Sum squared resid 1.77E-28 F-statistic-7.39E+29, Prob(F-statistic)0.00		

Source: Authors' computation 2023

The results in table 5 indicates that in the short run, the coefficient of BL5MR in model (I) is negatively signed relative to its lagged value but statistically insignificant. This implies that mortality rate in children below 5 years in the immediate past year has a negative and insignificant influence on the current mortality rate among children below five years of age. While in model (II), the coefficient of HCEXP is positive in the short run and statistically significant at 1% level meaning that an increase in total health care expenditure in the short run will have effect on total health spending in the long run.

In the same vein, the coefficient of CPI at lag one, as indicated in model (I), is negative and statistically significant at 5% meaning that 1% increase in consumer price index or health care prices in the short run will negatively affect children below five years' mortality rate by 0.03% in the long run. But this is not the case in model (II) where CPI exhibits positive coefficient but statistically not significant. This implies that a change in consumer price index in the short run will lead to a change in total health care expenditure but not necessarily having significant effect in the long run.

Again, in table 5, the result shows that the coefficient of HCEXP at lag one is positive and statistically significant for model (I) which suggests that 1% increase in total health care expenditure (HCEXP) will affect the below 5 years' mortality rate by 0.04% in the long run. The result also suggests below 5 mortality rates positive in model (II) but do not explain total health expenditure hence, the coefficient is statistically insignificant. This indicates that an increase in below 5 mortality rates result into an increase in total health spending but the insignificant nature of parameter suggests it does not contribute to health care spending in the long run.

The coefficients of Error Correction Mechanism (ECM) for both models are correctly signed negative and statistically significant which was in line with the results of ARDL long run co-integration among the variables of interest. The result of ECM coefficient is about -0.149251 for model I and -28.02074 for model II suggesting that about 15% and 28% of last years' disequilibrium for both model I and model II respectively are corrected in the current year. This means that the speed of adjustment towards which the last shocks is to converge to equilibrium levels are 15% and 28% for model I and model II respectively. These indicate a slow movement for both models in the adjustment of disequilibrium in the short run to equilibrium level in the long run.

4.2 Serial Correlation Tests

The diagnostic test for serial correlation effect of the estimated ECM model is employed in this studywith the aid of the Breusch – Godfrey Serial correlation LM test as shown in the table below:

Table 6: Results of Breusch – Godfrey Serial correlation test

Breusch – Godfrey Serial correlation test for Model I			
F-statistic	Obs*R-squared	Prob. F(2,22)	Prob. Chi-Square(2)
0. 602840	4.18106	0.6726	0.6350
Breusch – Godfrey Serial correlation test for Model II			
0.523431	0.38970	0.7697	0.7432

Source: Authors' estimation 2023.

The result of serial correlation tests in Table 6 indicates that the statistic observed R- squared probability value for model I is 4.1811 and for model II is 0.38970 which are all greater than 0.05 critical values. This suggests that the two models are free from the effect of serial correlation.

5. Conclusion and Recommendations

The purpose of this study was to examine the dynamic interplay between below 5-year children mortality rates, consumer price index as proxy to health care prices and health care expenditure in Nigeria using ARDL approach and annual time series data sourced from World Bank Development Indicators (WDI, 2023) spanning from 1986 to 2023. The empirical results suggest a long run relationship exist between below 5-year children mortality rates, consumer price index and total health care expenditure on one hand and as well between total health care expenditure, below 5-year mortality rate and consumer price index on the other hand. The finding also suggests in the long run, the elasticity of coefficient of CPI in model (I) is negatively related to below 5-year children mortality rate but statistically significant at 5% level while in model (II) the CPI exhibits positive relationship with total health care expenditure but statistically not significant.

However, the result of HCEXP at lag one is positively related to below 5 years' mortality rate and statistically significant in model (I) while in the long run the below 5-year mortality rate is also positively related to total health expenditure in model (II) and statistically significant. Also. Consumer price index is positively related to total health expenditure but statistically insignificant.

The coefficients of Error Correction Mechanism (ECM) for both models are correctly signed and statistically significant which was in line with the results of ARDL long run co-integration among the variables of interest suggesting about 15% and 28% of last years' disequilibrium for both model I and model II respectively corrected in the current year indicating slow movement both models towards adjustment to equilibrium level in the long run.

Based on the foregoing, the paper recommends adequate increase in government health spending to improve health care services at all levels ranging from primary, secondary and tertiary and as well increasing health sector budgetary allocation to the prescribed 15% of the country's annual budget as recommended by WHO and also making policies for free health care services and social health insurance for some vulnerable members in the society especially children below the age of five. This will go a long way to address health challenges associated with children and reduction in mortality rate for both infant and adult in Nigeria.

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