# Institutional Quality and Health Outcomes: Empirical Evidence from Nigeria

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***Abstract***

*Poor quality of institutions is detrimental to the performance of health sector. This study investigated the nexus between institutional quality and health outcomes in Nigeria. Time series secondary data were sourced form world development indicators and world governance indicators from 1988 to 2022. The study employed the Auto-regressive Distributed Lag Model. The short run result revealed that government effectiveness and political stability both have a negative and significant impact on maternal mortality rate in Nigeria while control of corruption on the other hand has a significant positive impact on life expectancy. The long-run result revealed that all the institutional quality indicators except control of corruption are positive and significant on both health outcomes. Based on the findings, the study recommended that efforts should be made to enhance control of corruption, strengthening the rule of law, promoting political stability, combating violence and terrorism, and improving government effectiveness. These policy measures can positively impact maternal health outcomes and overall life expectancy by ensuring transparent and accountable healthcare systems, equal access to justice, peaceful environments, and effective governance of healthcare resources.*

***Keywords****: Maternal mortality, life expectancy, Corruption, Rule of law, Political stability, Terrorism, Government effectiveness.*

## Introduction

Institutional quality encompasses various aspects such as legal framework, protection of individual rights, and effective government regulation and services (Bruinshoofd, 2016). Assessing a country's institutional quality involves evaluating factors like the strength of enacted laws, enforcement mechanisms, business environment, property rights protection, transparency, democratic practices, and social and economic safeguards for citizens (Ogbebor, 2021).

Prioritizing institutional quality is crucial for any nation, as poor quality can impede advancements in healthcare delivery, especially in developing countries (Rizvi, 2019). Strong institutions correlate with efficient fund management and allocation, fostering a more stable business environment (Abubakar, 2020). Nigeria serves as a notable case study, grappling with institutional challenges such as corruption,

governance weaknesses, and inadequate funding, hindering the provision of quality healthcare (Uzochukwu et al., 2016). Effective governance is indispensable for optimal functioning of national healthcare systems. Underfunding, insufficient regulatory oversight, and governance opacity can foster corruption and compromise healthcare quality. Globally, a significant portion of healthcare spending, approximately $455 billion annually, is lost to fraud and corruption (Gee and Button, 2015). Corruption also contributes to approximately 1.6% of annual deaths in children under 5 worldwide (Hanf et al., 2011).

Nigeria faces substantial health challenges, characterized by high morbidity and mortality rates, low life expectancy (55 years), and elevated maternal mortality ratios (512 per 100,000 live births) (WHO, 2021). Additionally, the country grapples with a heavy burden of communicable and non-communicable diseases, exemplified by the 2020 COVID-19 pandemic, with over 160,000 confirmed cases and 2,000 deaths reported (WHO, 2021). Furthermore, diseases like HIV/AIDS, tuberculosis, and malaria remain prevalent (WHO, 2016). Maternal mortality, under-five mortality, and maternal death rates are also alarming (World Bank, 2017), with poor institutional quality identified as a significant contributor to these health challenges (Uneke et al., 2012). Inadequate leadership, governance deficiencies, and weak accountability systems in the healthcare sector exacerbate these issues (Amedari et al., 2021). Primary healthcare suffers due to poorly enforced procurement laws, weak governance, inadequate healthcare worker remuneration, and transparency mechanisms (Amedari et al., 2021).

Extant studies have identified that quality government and economic institutions have a long way in improving the health care of a nation. For instance, Kibra and Toufique (2023) found that improvements in indicators of institutional quality such as voice and accountability, quality of regulation and rule of law have a positive long term impact on the quality of life. Sharma, Sharma and Tokas (2022) found that an improvement in the quality of economic institutions has a favourable effect on health. They further highlighted the importance of an efficient legal system, a stable macroeconomic environment, and fewer regulations on improving health outcomes in the E.U. countries. The problem of poor health sector performance in Nigeria is compounded by a lack of rigorous empirical research that can provide evidence-based solutions to the institutional challenges facing the sector. There is a dearth of literature on institutional quality and health outcome relationship especially from the Nigerian perspective as majority of the extant literatures only examined this relationship in a cross-country study (Kibra & Toufique, 2023; Suhaibu, Andani & Anafo, 2022, Sharma et al. 2022; Tibrewal & Chaudhuri, 2022; Rhemat, Majeed & Zainab, 2020). This study therefore seeks to critically investigate the impact of institutional quality on health outcomes in Nigeria.

Our results show that long-run relationship exists among the variables. The short run result shows that government effectiveness and political stability both have a

significant negative impact on maternal mortality rate in Nigeria while control of corruption on the other hand has a significant positive impact on Life expectancy. The long-run result shows that all the institutional quality indicators except control of corruption are positive and significant on health outcomes. Therefore, the outcome of this study would provide more information, understanding and serve as a guide to policy makers and would help the government to identify practical policy solutions that can help improve institutional quality and health outcomes in the country. This study would also be of immense benefits as it will contribute to the existing literatures on institutional quality and health sector performance in Nigeria which will aid further studies in the area of health. Thus, the rest of the paper is structured as follows: section two which draws insight from relevant literature and the theoretical framework; section three comprises of the methodology employed while discussion of results and the summary of findings are presented in section four. Finally, section five concludes the study with appropriate policy recommendation.

## Literature Review

### Empirical Literature Review

Limited studies have been done on institutional quality and health outcomes in Nigeria, however some of the related studies reviewed are discussed as follows:

In a recent study, Kibra and Toufique (2023) examined the nexus between institutional governance and quality of life using a panel data set constructed for 21 developing countries. The study adopted the ARDL model. The findings showed that an improvements in indicators of institutional quality such as voice and accountability, quality of regulation and rule of law have a positive long term impact on the quality of life.

Similarly, Suhaibu et al. (2022) used data from 2000 to 2019 on 20 sub-Saharan African countries to model the impact of Institutional Quality on Living Standards in a VAR framework, upon satisfactory data suitability tests. The impulse response functions and forecast error variance decomposition estimates provide evidence that Institutional quality does not directly impact living Standards but does so through its effects on financial development (FDI). As the forecast horizon moves from 1 to 5 forecast periods, Institutional Quality accounts for about 7.13% of FDI shocks, while FDI explains about 0.55% of Living Standard, and Living Standards account for about 1.13% of FDI shocks. Ultimately, Institutional Quality impacts Living Standards through FDI.

In a bid to examine the effect of the quality of economic institutions on health outcomes for the E.U. countries, Sharma et al. (2022) did a panel data analysis using data from World Bank and the Fraser Institute from 2000 to 2018 and employed the fixed effects and random effects models. The findings revealed that an improvement

in the quality of economic institutions has a favourable effect on health. Specifically, the findings highlight the importance of an efficient legal system, a stable macroeconomic environment, and fewer regulations on improving health outcomes in the E.U. countries.

In order to examine the effect of institutional factors on the quality of Ghana's healthcare delivery, Amporfu, Nonvignon & Ampadu (2013) utilized new survey data from malaria outpatients, health workers and administrators from sixty two health facilities in three regions across the country. They employed the ordered logistic regressions. The results showed that job satisfaction and involvement of health workers in decision making are important for the improvement of process quality. Job satisfaction also had a significant positive effect on all process quality indicators while the involvement of health workers in decision making also had a positive effect on attitude of health workers.

In a bid to investigate the role of institutional quality in the relationship between health expenditure and labour force participation (LFP) in Africa, Opeloyeru, Faronbi and Rafiu (2021) did a panel data analysis on 39 African countries for the period between 2000 and 2018 using Panel Fixed Effects with Driscoll and Kraay standard errors and two-stage System Generalized Method of Moments (GMM). The findings revealed that government health expenditure yields an increasing effect on total, female, and male LFP. The institutional quality was found to be detrimental to LFP. The magnitude of the positive effect of government health expenditure on LFP is reduced by the interaction of institutional quality with government expenditure.

In a bid to empirically investigate the impact of institutional quality on the effectiveness of public healthcare mechanisms around the world, Tibrewal and Chaudhuri (2022) did a panel data regression analysis for 173 countries over the period 2002-2018. The percentage of out-of-pocket expenditure from total health expenditure was taken as a proxy – the higher this percentage, the more people seem to rely on private institutions, implying lower effectiveness of government facilities. Their findings revealed a positive effect of institutional quality, and reaffirm the expected positive impact of government expenditure on healthcare quality.

Rhemat et al. (2020) investigated the impact of institutional quality effect on population health outcomes. The explanatory variables employed were government stability, corruption, law and order, democratic accountability and bureaucracy quality. Whereas for the population health proxies are infant mortality rate and life expectancy. The sample of the study consist of 105 countries. Five years' average data from 1984 to 2012 was taken from the Political Risk Services Group and World Development Indicators 2015. The study employed econometric techniques like Fixed Effects, Random Effects and GMM. The findings revealed that population health is positively affected by the institutional quality.

Alimi and Ajide (2021) investigated the role of institutions in environment–health outcomes nexus in sub-Saharan African countries over the period 1996–2016. The study employed different surrogates for capturing the three key variables of concern. These include institutions consisting of control of corruption, government effectiveness, and regulatory quality; environment comprising of carbon emissions and ecological footprints; and health outcomes involving human longevity, child mortality and health expenditures respectively. Using a system of generalized method of moments. The findings revealed that environmental degradation captured with carbon emissions and ecological footprint was found to be significant on human life expectancy by substantial statistical magnitudes. In addition, carbon emission was found to amplify the infant mortality rates, even when the variable interacts with institutional quality variables like government ineffectiveness and poor regulatory quality.

Ouedraogo, Dianda and Adeyele (2020) identified the institutional dimensions that are most relevant to the improvement of health outcomes in sub-Saharan Africa. They integrated institutional quality measures into a health production model. The model was estimated using the Two-stage least squares method on a panel of 45 countries observed over the period 1996-2018. Their findings revealed that the most relevant institutional dimensions that improve health outcomes in the region are by order: rule of law, control of corruption, government effectiveness, voice and accountability and political stability and absence of violence.

Using a sample of 20 South, East Asian and Pacific developing countries for the period 1995-2017. Rizvi (2019) examined the effect of health expenditures on economic growth while taking into account the quality of health institutions, keeping in view the fact that it's not just the level rather the quality of expenditures or institutions that matters. The study employed the standard neoclassical Solow Growth Model at steady-state level as theoretical framework and made a production function adding institutional quality proxy by government effectiveness along with other variables like health expenditure, primary education completion rate, population growth etc. Economic growth was found to increase by 5% if health expenditure adjusted for the quality of government expenditures increased by 100%.

## Theoretical Framework

This study utilized the New Institutional Economics (NIE) theory, highlighting the significance of institutions in shaping economic outcomes across countries. According to North (1994), institutions play a crucial role in determining economic performance variations. Williamson (1998) observed that NIE is inherently interdisciplinary, encompassing various areas such as property rights analysis, legal and economic analysis, public choice theory, constitutional economics, collective

action theory, transaction cost economics, principal-agent theory, relational contract theory, and comparative economic systems.

Unlike neoclassical economics, the NIE framework does not presuppose institutions but treats them as subjects of study, considering their implications for economic behavior (Richter, 2005). NIE views institutions as internally determined, recognizing their role in facilitating development in some countries by promoting efficient behavior among agents, while others struggle due to ineffective institutions that fail to deter abuse and inefficiency (Leite et al., 2012). By integrating transaction costs into its analysis, NIE expands neoclassical economics' understanding of growth and development, highlighting the link between institutions and production costs (Commons, 1992).

Gagliardi (2008) argues for the necessity of institutions in reducing transaction costs, thus fostering coordination and enabling agents to derive greater benefits from collective action. NIE emphasizes that agents respond differently to incentives and that the institutional framework significantly influences expected outcomes. The focus on institutions stems from the recognition that they shape the incentive structure crucial for efficient economic performance (North, 1990).

According to NIE, countries require two distinct sets of institutions for development: those facilitating exchange by reducing transaction costs and promoting trust through contracts, enforcement mechanisms, commercial norms, shared values, and human capital accumulation; and those influencing the state and powerful actors to safeguard private property and individuals through constitutions, electoral rules, laws governing speech and education, and legal and civic norms (Shirley, 2005). Key institutions of interest to NIE include the institutional environment encompassing polity, judiciary, contract, and property laws, as well as governance institutions involving markets, hybrids, firms, and bureaus (Williamson, 1998).

## Methodology

### Data Measurement and Sources

Poor institutional quality can cause severe restrictions on improving health with conveyance of health care services in case of developing countries. (Rizvi, 2019). This forms the motivation for this study. The study utilized time series data which span the period of 34 years (1988-2022). Data on maternal mortality rate and life expectancy were sourced from World Development Indicators while those of Control of corruption, Government effectiveness, political stability and absence of violence and terrorism and Rule of Law were sourced from the World Governance Indicators. The study engaged six variables with maternal mortality rate and life expectancy as the dependent variables for the respective models.

Maternal mortality ratio (MMR) is defined as the number of maternal deaths during a given time period per 100,000 live births. Life Expectancy (LEXP) is the average number of additional years that a person of a given age can expect to live. Control of Corruption (COR) captures the perceptions of the extent to which public power is exercised for private gain including both petty and grand forms of corruption, as well as capture of the states by elites and private interests. Rule of law (ROL) captures perception of the extent to which agents have confidence in and abide by the rules of society, and in particular the quality of contract enforcement, property rights, the police and the courts, as well as the likelihood of crime and violence. Government effectiveness (GOV) captures the perceptions of the quality of the civil service and the degree of its independence from political pressures, the quality of policy formulation and implementation and the credibility of the government's commitment to such policies. Lastly, political stability and absence of violence and terrorism (POL) measures the perceptions of the likelihood of political instability and or politically motivated violence and terrorism. Both, Control of corruption, rule of law, government effectiveness and political stability indices are on a scale of -2.5 to 2.5 with higher values showing improvement in the index.

**Model Specification and Estimation Procedure**

The model for this study is closely related to the study of Ouedraogo, Dianda and Adeyele (2020). Hence, the baseline for this study is specified as:

$$HO_t = f(\text{COR}, \text{ROL}, \text{GOV}, \text{POL}) - - - - - - - - - - - - - - - - - - (1)$$

where HO denotes health outcome components (maternal mortality rate and life expectancy) which are the dependent variables for models 1 and 2 respectively) while COR, ROL, GOV, and POL represents (control of corruption, rule of law, government effectiveness, voice and accountability and political stability and absence of violence respectively) are the explanatory variables.

Equations (1) can be explicitly specified as:

$$MMR_t = \alpha_0 + \alpha_1 COR_t + \alpha_2 ROL_t + \alpha_3 GOV_t + \alpha_4 POL_t - - - - - - (2)$$

$$LEXP_t = \beta_0 + \beta_1 COR_{t-i} + \beta_2 ROL_{t-i} + \beta_3 GOV_{t-i} + \beta_4 POL_{t-i} - - - (3)$$

This study employed most advance technique, Autoregressive Distributed Lag, commonly known as ARDL bound tests given by Pesaran, Shin and Smith (2001) aimed at examining how health outcomes will be achieved in the long-run, given the improvement in institutional quality. This technique has several advantages on other techniques like Engle and Granger technique [1987] and Johansen Cointegration [1988]. ARDL technique does not only overcome the weaknesses of these two techniques but it has also numerous other benefits. ARDL is more suitable in in case

of small sample size (Pesaran, & Shin, 1999). Also, ARDL can be used whether variables are purely I(0), purely I(1) or the mixture of both I(0) and I(1) (Pesaran, & Pesaran, 1997). Furthermore, it captures appropriate number of lags in DGP (Data generating process) particularly in general to specific process as is reported by Laurenceson and Chai [2003]. Fourth, the error correction model can be obtained from bound testing approach through simple OLS transformation. ECM shows short run to long run adjustment mechanism without the loss of long run information (Pesaran, & Shin, 1999). However, ARDL cannot be used if any of the variable under investigation is stationary at second difference i.e. I(2) as bound testing approach is based on I(0), I(1) or mixture of these two sets. To confirm that none of the variable is I(2), we check the unit root property of each variable. For this, we employed ADF (Dickey, & Fuller, 1981) and PP (Phillips, & Perron, 1988).

**Model 1**

The ARDL Bound Cointegration Model 1 is formulated as follows:

$$\Delta MMR_t = \omega_0 + \gamma T + \delta_1 MMR_{t-1} + \alpha_2 COR_{t-1} + \alpha_3 ROL_{t-1} + \alpha_4 GOV_{t-1} + \alpha_5 POL_{t-1} + \sum_{i=1}^{m} \varphi_i \Delta MMR_{t-i} + \sum_{i=0}^{n} \beta_{1i} \Delta COR_{t-i} + \sum_{i=0}^{n} \beta_{2i} \Delta ROL_{t-i} + \sum_{i=0}^{q} \beta_{3i} \Delta GOV_{t-i} + \sum_{i=0}^{k} \beta_{4i} \Delta POL_{t-i} + \varepsilon_{1t} \text{ ----------[4]}$$

The Error Correction Model 1 is formulated as follows:

$$\Delta MMR_t = \omega_0 + \sum_{i=1}^{m} \varphi_i \Delta MMR_{t-i} + \sum_{i=0}^{n} \beta_{1i} \Delta COR_{t-i} + \sum_{i=0}^{P} \beta_{2i} \Delta ROL_{t-i} + \sum_{i=0}^{q} \beta_{3i} \Delta GOV_{t-i} + \sum_{i=0}^{k} \beta_{4i} \Delta POL_{t-i} + \partial ECT_{t-1} + \varepsilon_{1t} \text{ -----[5]}$$

The long run form of equation (6) is estimated as follows:

$$MMR_t = \omega_0 + \delta_1 MMR_{t-1} + \alpha_2 COR_{t-1} + \alpha_3 ROL_{t-1} + \alpha_4 GOV_{t-1} + \alpha_5 POL_{t-1} + \varepsilon_{1t} \text{ ----------[6]}$$

**Model 2**

The ARDL Bound Cointegration model 2 is formulated as follows:

$$\Delta LEXP_t = \pi_0 + \eta T + \rho_1 LEXP_{t-1} + \gamma_1 COR_{t-1} + \gamma_2 ROL_{t-1} + \gamma_3 GOV_{t-1} + \gamma_4 POL_{t-1} + \sum_{i=1}^{m} \theta_i \Delta LEXP_{t-i} + \sum_{i=0}^{n} \sigma_{1i} \Delta COR_{t-i} + \sum_{i=0}^{P} \sigma_{2i} \Delta ROL_{t-i} + \sum_{i=0}^{q} \sigma_{3i} \Delta GOV_{t-i} + \sum_{i=0}^{k} \sigma_{4i} \Delta POL_{t-i} + \varepsilon_{2t} \quad --[7]$$

The Error Correction Model 2 is given as:

$$\Delta LEXP_t = \sum_{i=1}^{m} \theta_i \Delta LEXP_{t-i} + \sum_{i=0}^{n} \sigma_{1i} \Delta COR_{t-i} + \sum_{i=0}^{P} \sigma_{2i} \Delta ROL_{t-i} + \sum_{i=0}^{q} \sigma_{3i} \Delta GOV_{t-i} + \sum_{i=0}^{k} \sigma_{4i} \Delta POL_{t-i} + \tau ECT_{t-1} + \varepsilon_{2t} \quad -------[8]$$

The long run form for model 2 is stated as follows:

$$LEXP_t = \rho_1 LEXP_{t-1} + \gamma_1 COR_{t-1} + \gamma_2 ROL_{t-1} + \gamma_3 GOV_{t-1} + \gamma_4 POL_{t-1} + \varepsilon_{2t} \quad -----[9]$$

Where ECT= Error corretion term $\omega_0$ and $\pi_0$ are the intercept of Model 1 and 2 respectively, $\varphi_i$ and $\theta_i$ are the coefficients of the lagged values of the dependent variable for model 1 and 2 respectively, $\alpha_1 - - -\alpha_4$ and $\gamma_1 - - -\gamma_4$ are the long run coefficients of model 1 and 2 respectively. $\beta_{1\,i}$ ---- $\beta_{4\,i}$ and $\sigma_{1i}$ ------$\sigma_{4i}$ are the short run coefficients of model 1 and 2 respectively, $\partial$ and $\tau$ are the coefficients of the error correction term for model 1 and 2 respectively, $\Delta$ is the Difference operator.

## 4.0 RESULTS AND DISCUSSIONS

### 4.1 Presentation and Analysis of Descriptive Statistics

Table 1 reveals the summary statistics of the variables. These include the mean, median, maximum value, minimum value, standard deviation and normality.

**Table 1 Descriptive Statistics**

| Variables | Mean | Median | Max. | Min. | Std. | Jaque- B. | Obs. |
|---|---|---|---|---|---|---|---|
| Maternal Mortality Rate | 1115.38 | 1105 | 1400 | 850 | 178.76 | 3.1418 | 34 |
| Life Expectancy | 49.159 | 47.986 | 55.5 | 45.843 | 3.4013 | 3.7711 | 34 |
| Control of Corruption | -1.1926 | -1.1892 | -0.9009 | -1.5021 | 0.1306 | 0.3425 | 34 |
| Rule of Law | -1.0807 | -1.1094 | -0.0934 | -1.5125 | 0.2537 | 48.320* | 34 |
| Government Effectiveness | -0.9894 | -1.001 | -0.11 | -1.2048 | 0.1872 | 277.12* | 34 |
| Political Instability | -1.5756 | -1.7105 | -0.5882 | -2.2111 | 0.4685 | 3.1727 | 34 |

** indicates that variable is not normally distributed at 5%*

**Source: Author's Compilation, 2023**

The statistical overview of maternal mortality rates (MMR) and life expectancy in Nigeria highlights concerning trends in health outcomes. With an average MMR of 1115 per 100,000 live births, ranging from 1400 to 1105, and an average life expectancy of 49 years, ranging from 56 to 48 over the study period, it is evident that Nigeria faces significant health challenges. These figures underscore the urgent need for targeted interventions to improve healthcare delivery and maternal health services in the country. Furthermore, the analysis of institutional quality reveals a particularly alarming finding: the average index of governance indicators is negative, indicating the poor quality of institutions in Nigeria. This underscores the imperative for the government to prioritize policies aimed at enhancing institutional quality to foster socio-economic development and improve public health outcomes. The Jaque bera statistics shows that of all the variables employed in the study, only rule of law and government effectiveness are not normally distributed at 5% level of significance.

## Correlation Matrix

These section present the relationship among the variables. It also checks the presence of multicollinearity in the model with the aid of the Variance Inflation Factor (VIF).

**Table 2 Correlation Matrix and Variance Inflation Factor**

| Variables | MMR | LEXP | COR | ROL | GOV | POL |
|---|---|---|---|---|---|---|
| MMR | 1.0000 | | | | | |
| LEXP | -0.9381 | 1.0000 | | | | |
| COR | -0.5819 | 0.5951 | 1.0000 | | | |
| ROL | -0.0236 | 0.2219 | 0.3515 | 1.0000 | | |
| GOV | 0.5009 | -0.4071 | -0.2924 | -0.0367 | 1.0000 | |
| POL | 0.8909 | -0.7937 | -0.3768 | 0.0678 | 0.3887 | 1.0000 |
| **VIF** | - | - | 1.23 | 1.38 | 1.44 | 1.43 |
| **1/VIF** | - | - | 0.8130 | 0.7246 | 0.6944 | 0.6993 |
| **Mean VIF** | | | 1.37 | | | |

**Source: Author's Compilation, 2023**

From the table 2, it can be seen that POL has a strong positive correlation with MMR and a strong negative correlation with LEXP. Also, COR has strong negative correlation with MMR and a strong positive correlation with LEXP. There is also a very strong negative relationship between MMR and LEXP. And lastly, there is a moderately positive correlation between GOV and MMR. The correlation among the explanatory variables is weak. This is also evident by the mean variance inflation factor of 1.37 which is significantly below the threshold of 5. Based on this, we can conclude that there is no evidence of multi-collinearity in the model.

## Pre-Estimation Test

To avoid having a spurious result, it is always important to examine the econometric properties of the variables we are employing in the model. This section helps to test for the presence of unit root within the variables using both the Augmented Dickey-Fuller and Phillips-Perron Unit root tests.

**Table 3 Unit Root Test Result**

| Variables | Level | 1ST Difference | I(d) | Level | 1ST Difference | I(d) |
|---|---|---|---|---|---|---|
| | ADF Test Statistic | ADF Test Statistic | | PP Test Statistic | PP Test Statistic | |
| MMR | -3.2280[c**] | - | I(0) | -5.7978[c**] | - | I(0) |
| LEXP | - | -4.5866[b**] | I(1) | -3.900[b**] | - | I(0) |
| COR | -4.0923[b**] | - | I(0) | - | -4.9886[a**] | I(1) |

| | | | | | | |
|---|---|---|---|---|---|---|
| ROL | - | -3.7021[a**] | I(1) | - | -7.4990[a**] | I(1) |
| GOV | -4.3238[a**] | - | I(0) | -4.2615[a**] | - | I(0) |
| POL | - | -6.3927[a**] | I(1) | - | -6.6689[a**] | I(1) |

Note: The term ADF implies Augmented Dickey Fuller the superscript (a) implies model with constant, (b) implies model with constant and trend while (c) implies model with no constant and trend. While the asterisks ***, **, * signify stationarity at 1%, 5% and 10% level of significance respectively. I (d) represents the order of integration, where I(0) denotes stationary at levels and I(1) represents stationary at first difference.

**Source: Author's Compilation, 2023.**

## Model Estimation and Discussions

### 1 Lag Length Criteria

To estimate the model for the study, it is always appropriate to determine the optimal lag length so as to avoid any error of omission of important lags or error of including any irrelevant lags.

**Table 4 Optimal Lag Length Selection for Model 1**

| Lag | LR | FPE | AIC | SC | HQ |
|---|---|---|---|---|---|
| **0** | NA | 0.0076 | 9.3160 | 9.5472 | 9.3913 |
| **1** | 180.88 | 2.83e-05 | 3.6936 | 5.0814 | 4.1461 |
| **2** | 57.932* | 9.00e-06 | 2.4100 | 4.9541* | 3.2393 |
| **3** | 34.810 | 6.54e-06* | 1.7022* | 5.4028 | 2.9085* |

**Source: Author's Compilation, 2023.**

**Table 5 Optimal Lag Length Selection for Model 2**

| Lag | LR | FPE | AIC | SC | HQ |
|---|---|---|---|---|---|
| **0** | NA | 0.004755 | 8.840645 | 9.071933 | 8.915039 |
| **1** | 188.6734 | 1.29e-05 | 2.906611 | 4.294341 | 3.358977 |
| **2** | 56.00177* | 4.51e-06 | 1.719426 | 4.263597* | 2.548762 |
| **3** | 35.94630 | 3.04e-06* | 0.935909* | 4.636521 | 2.142216* |

**Source: Author's Compilation, 2023.**

Three of the criteria in table 4 and 5 i.e. Final prediction error, the Akaike information criterion and Hannan-Quinn information criterion all suggested an

optimal lag length of 3 for both model one and two which necessitated the employment of a lag length of 3 for the ARDL model.

### 4.3.2 Cointegration Test

This section helps to check if there is a long run relationship between institutional quality and health outcomes.

**Table 6 ARDL Bound Cointegration Test Result**

| Test- statistic | Value | Critical Values of I(0) Bound at 5% Level of Significance | Critical Values of I(1) Bound @5% Level of Significance |
|---|---|---|---|
| **Model 1** | | | |
| F-statistic | 6.0149 | 3.47 | 4.57 |
| T- Statistic | -6.0951 | -3.41 | -4.36 |
| **Model 2** | | | |
| F-statistic | 7.3945 | 3.47 | 4.57 |
| T-statistic | -6.9534 | -3.41 | -4.36 |

**Source: Author's Compilation, 2023.**

From the bound cointegration test result, the absolute value of both the f-statistic and t-statistic are greater than the critical value of the upper bound. Hence we are rejecting the null hypothesis of no levels relationship and therefore conclude that the variables have a long-run relationship.

### 4.3.3 Long Run, Short Run and Error Correction Estimates (Parsimonious)

This section presents the short run, long-run and error correction estimates of the ARDL model based on a lag length of two for both the dependent and explanatory variables. The Parsimonious ARDL (2 2 2 2 2) model is presented in Table 7.

**Table 7 Long Run, Short Run and Error Correction Estimates (Parsimonious)**

**Source: Author's Compilation, 2023.**

***, **, * signify stationarity at 1%, 5% and 10% level of significance respectively

| | **Dependent Variable: $MMR_t$** | | **Dependent Variable: $LEXP_t$** | |
|---|---|---|---|---|
| **Variables** | **Coefficients** | **T-statistics** | **Coefficients** | **T-statistics** |
| **Short-run** | | | | |
| $\Delta MMR_{t-1}$ | 0.6526 | 5.0123*** | - | - |
| $\Delta MMR_{t-2}$ | 0.3693 | 2.3485** | - | - |
| $\Delta LEXP_{t-1}$ | - | - | 4.8180 | 5.0143*** |
| $\Delta LEXP_{t-2}$ | - | - | 5.7588 | 5.8165*** |
| $\Delta COR_t$ | - | - | -0.4263 | -4.8570*** |
| $\Delta COR_{t-1}$ | - | - | 0.7043 | 5.8853*** |
| $\Delta COR_{t-2}$ | - | - | 0.3251 | 3.9675*** |
| $\Delta ROL_t$ | -10.2426 | -1.4939 | 0.0954 | 2.3681** |
| $\Delta ROL_{t-1}$ | - | - | -0.1378 | -3.8830*** |
| $\Delta GOV_t$ | 36.0018 | 2.3367** | 0.2773 | 5.3350*** |
| $\Delta GOV_{t-1}$ | - | - | -0.3057 | -4.7267*** |
| $\Delta GOV_{t-2}$ | - | - | -0.1095 | -2.5801*** |
| $\Delta POL_{t-1}$ | -50.0056 | -4.9404*** | - | - |
| $\Delta POL_{t-2}$ | -23.2436 | -2.6026** | - | - |
| $\Delta ECT_t$ | -0.5423 | -6.0951*** | -0.4154 | -13.410*** |
| **Long-run** | | | | |
| $COR_t$ | -34.7825 | -0.7762 | -6.7886 | -8.7209*** |
| $ROL_t$ | 48.3138 | 2.8126** | 0.3212 | 0.7481 |
| $GOV_t$ | 179.8843 | 3.3694*** | 1.7766 | 5.4519*** |
| $POL_t$ | 91.3190 | 5.5181*** | 3.4370 | 3.5348*** |

Table 7 indicates that previous values of MMR and LEXP both exert a significant positive influence on their current values. For instance, an increase of one unit in the one and two-period lags of MMR typically results in current MMR increasing by 0.6526 and 0.3693 units respectively. Similarly, a one unit increase in the one and two-period lag of LEXP leads to an average increase in current LEXP by 4.8180 and 5.7588 units respectively. Both the one and two-period lags of COR exhibit a significant positive impact on LEXP, with an increase of one unit in both leading to a 0.7043 and 0.3251 unit increase in LEXP respectively. However, the current value

has a significant negative impact on LEXP, with a one unit increase causing a 0.4263 unit decrease in LEXP.

Although ROL shows a negative impact on MMR in the short run, it is statistically insignificant, with a one unit increase causing a 10.2426 unit decrease in MMR. However, its impact on LEXP is positive and statistically significant at 5%, with a one unit increase causing a 0.0954 unit increase in LEXP. It's one period lag is negative and significant on LEXP, resulting in a 0.1378 unit increase for every unit decrease in its value. The current value of GOV has a positive and significant impact on both MMR and LEXP, with a one unit increase causing an average increase of 36.0018 units in MMR and 0.2773 units in LEXP respectively. Additionally, a one and two-period lag of GOV has a negative and significant impact on LEXP, with a one unit increase in their values resulting in an average decrease of 0.305676 and 0.109466 units in LEXP respectively.

Furthermore, the current value of POL negatively impacts MMR, but it is not statistically significant based on the p-value. However, the one and two-period lags of POL have a negative and significant impact on MMR. For instance, a one unit increase in the one-period and two-period lag of POL results in a decrease of 50.0056 and 23.2437 units in MMR respectively. Finally, the coefficients of the error correction term (-0.5423 and -0.4154 for model one and two respectively) suggest that approximately 54% and 42% of the deviations in the short run will be corrected in the long run. The negative coefficient of ECT indicates correct alignment, and the p-values also suggest statistical significance at 1%.

In the long run, Table 7 reveals that ROL, GOV, and POL demonstrate a positive and significant impact on MMR and LEXP, except for ROL, which shows an insignificant impact on LEXP. For instance, a one unit increase in ROL, GOV, and POL leads to an average increase of 48.3138, 179.8843, and 91.3190 units in MMR respectively. However, these increases only result in a 0.3212, 1.7766, and 3.4370 unit increase in LEXP respectively. Conversely, COR exhibits a negative and insignificant impact on MMR in the long run, with a one unit increase resulting in a decrease of 34.7825 units in MMR. However, its impact on LEXP over the long run is statistically significant at 5%, with a one unit increase resulting in a 6.7886 unit increase in LEXP.

**Model Diagnostic Test**

This section helps to check for model diagnostics to know if our model is good for prediction. It helps to check for the reliability of our estimates.

**Table 8 Summary of Diagnostics Test Results**

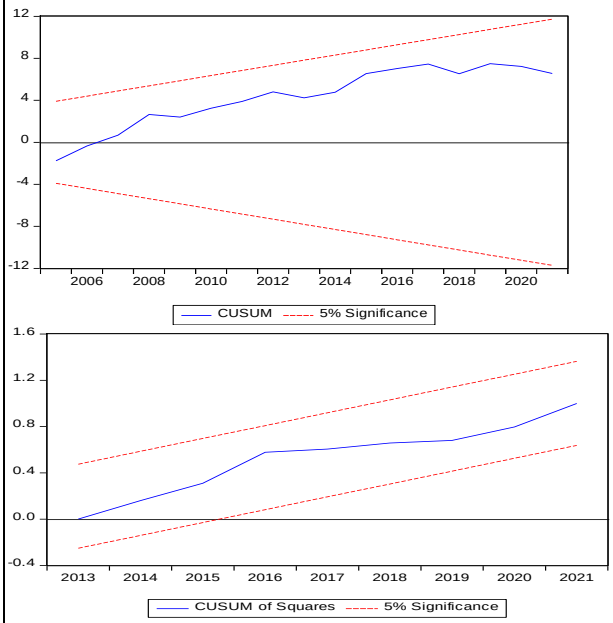
| Test | Model 1 | Model 2 |
|---|---|---|
| $R^2$ | 0.9983 | 0.9925 |
| Adjusted $R^2$ | 0.9970 | 0.9868 |
| D.W Statistic | 2.3030 | 2.2445 |
| Prob (f-statistic) | 0.0000 | 0.0000 |
| Prob (Jaque-Bera) | 0.7309 | 0.4542 |
| Breusch-Godfrey (LM serial correlation) | 0.07 | 0.2399 |
| Breusch-Pagan Godfrey (Heteroscedasticity) | 0.6743 | 0.7749 |
| Ramsey Reset Test (Linearity) | 0.3431 | 0.0987 |

**Source: Authors compilation from E-views 10**

Different diagnostics and stability tests are performed to check the perfectness of the model. Among them, serial correlation, residuals distribution and heteroscedasticity are important. The stability of the coefficients can be checked through CUSUM and CUSUMSQ given by Brown et al. (1975). The plot graphs of CUSUM and CUSMSQ statistic remains within the bounds at 5% significance level, then we can say that the coefficients in the model are stable. These diagnostic tests (Table 8) confirm the perfectness of our model. The D.W statistics of 2.30 and 2.24 show that there is no evidence of auto-correlation in models 1 and 2 respectively. The probability of F-statistics of 0.0000 for both models show that the overall model is statistically significant. The Breusch-Godfrey probability of 0.07 and 0.2399 shows no evidence of serial-correlation in the model at 5% level of significance. The Jarque-bera probability of 0.7390 and 0.4542 show that both models are normally distributed at 5% level of significance. The Breusch-Pagan-Godfrey probability of 0.6743 and 0.7749 shows no evidence of heteroscedasticity, and the Ramsey reset probability of 0.3431 and 0.0987 revealed that both models are linear and correctly specified at 5% level of significance. The CUSUM (Fig. 1 models 1 and 2) and CUSUMSQ (Fig. 1 models 1 and 2) under consideration fall within the five percent critical bound. All lines remain between the upper and lower bounds suggesting that the parameter estimates do not exhibit any structural breaks or instability over the study period. This show that all coefficients in the model are stable.

## Stability test

### Model 1




### Mode 2

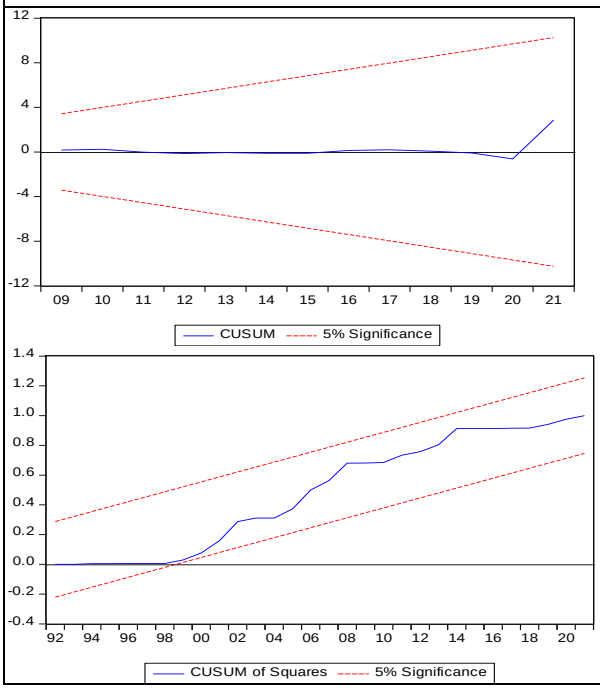



**Figure 1 CUSUM and CUSUM of Squares**

**Source: E-views 10**

## Discussion of Findings and Policy Implications

This study examined the dynamic relationship between institutional quality and health outcomes in Nigeria. The ARDL bound test showed an evidence of a long-run relationship between institutional quality and health outcomes in Nigeria. The short-run and long-run impact of the institutional quality indicators on health outcomes are discussed below with their policy implications.

Firstly, previous values of MMR and LEXP both exert a positive and significant influence on their current values which implies that policies that attempt to improve maternal mortality rate and life expectancy will to a great extent influence the variables in the future. Both the one and two-period lags of COR exhibit a significant positive impact on LEXP suggesting the need for policy makers to address corruption cases within the healthcare system so as to improve the overall life expectancy. Policies focusing on enhancing transparency, reducing embezzlement, and promoting ethical practices in healthcare can contribute to better health outcomes. ROL shows a negative impact on MMR in the short run, but the impact is statistically insignificant, however, its impact on LEXP is positive and statistically significant suggesting the need for the government to ensure that legal frameworks and institutions are effectively implemented and enforced to reduce maternal mortality rates and improve the life expectancy of the people. The current value of GOV has a positive and significant impact on both MMR and LEXP suggesting that policies focused in improving government effectiveness will go a long way in improving maternal mortality rate and life expectancy in Nigeria. The insignificant negative impact of rule of law on MMR is in contrast to what Sharma et al. (2022) found in their study. The significant positive impact of GOV on LEXP is in tandem to the works of Naher et al. (2020) and Ouedraogo et al. (2020).

One and two-period lags of POL have a negative and significant impact on MMR suggesting the need to ensure political stability and absence of violence and terrorism. Policies should focus on promoting stability through measures such as promoting democratic governance, peaceful political transition as well as investing in security measures, implementing strategies to prevent and responds to violence, protecting women's rights and ensuring a safe environment for maternal healthcare provision. This findings is in line with the findings of Ouedraogo et al. (2020). The coefficients of the error correction term suggests that about 54% and 42% of the short-run deviation in MMR and LEXP respectively will be corrected in the long-run suggesting a high speed of adjustment from the short-run disequilibrium to long-run equilibrium. The negative coefficient of ECT conform to economic theory, and the p-values also suggest statistical significance at 1%.

In the long run, ROL, GOV, and POL demonstrate a positive and significant impact on MMR and LEXP, except for ROL, which shows an insignificant impact on LEXP implying that policies aimed at improving rule of law, government effectiveness and enhancing political stability will to a large extent improve the health outcomes in the long-run. In addition, COR was negative but insignificant on MMR in the long-run. The insignificant negative impact of COR is in line with studies by Ouedraogo, et al. (2020) and Kibra and Toufique (2023). Finally, the post-estimation carried out shows that the two models are a good fit with the explanatory variables explaining 99.83% and 99.25% of the changes in MMR and LEXP respectively. The two models are also free from autocorrelation. In addition, they are linearly specified and free from heteroscedasticity.

## Conclusion and Policy Recommendations

This study examined the impact of institutional quality on health outcomes in Nigeria, specifically focusing on maternal mortality rate (MMR) and life expectancy (LEXP). The analysis utilized the ARDL model to investigate both the short-run and long-run relationship between institutional quality variables (Control of Corruption, Rule of Law, Political Stability, Absence of Violence and Terrorism, and Government Effectiveness) and the health outcome variables. The study highlights the need for targeted interventions to improve institutional quality in Nigeria's healthcare system. Efforts should focus on enhancing control of corruption, strengthening the rule of law, promoting political stability, combating violence and terrorism, and improving government effectiveness. These policy measures can positively impact maternal health outcomes and overall life expectancy by ensuring transparent and accountable healthcare systems, equal access to justice, peaceful environments, and effective governance of healthcare resources. By implementing appropriate policies and interventions to improve institutional quality, the country can strive towards better maternal health and increased life expectancy, ultimately leading to improved well-being and quality of life for its population.

Based on the findings, the study recommended that anti-corruption measures like promoting transparency, and enforcing accountability can help reduce corruption levels. This could positively impact maternal mortality rates and life expectancy. Also, policies and initiatives should focus on strengthening the rule of law in Nigeria. This includes ensuring equal access to justice, promoting legal reforms, and enhancing the efficiency and effectiveness of the judicial system. In addition, there should be improvement in public service delivery, optimizing resource allocation, and promoting efficient governance structures. This can help to improve government effectiveness and hence improve health outcomes. Government should also promote peaceful political transitions, address conflicts, and maintain social stability.

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