**ORIGINAL RESEARCH ARTICLE**

# Influence of households' socio-economic factors on maternal and under-five survival in Nigeria: Implication for the sustainable development goal 3

DOI: 10.29063/ajrh2023/v27i11.9

*Xin Gao[1*] Timothy A. Aderemi[2] Bin Zhou[3] Wahid D. Olanipekun[4] and Rowland Bassey[5]*

College of Marxism, Xi'an University of Science and Technology Shaanxi Xi'an, 710000, China[1]; Department of economics, Accounting and Finance, Bells University of Technology, Ota, Ogun State Nigeria and Research Fellow, University of Religions and Denominations (URD), Qom, Iran[2]; College of Marxism, Xi'an University of Science and Technology, Shaanxi Xi'an, 710000, China[3]; College of Management and Information Technology, American International University, West Africa, Brusubi, The Gambia[4]; Department of economics, Accounting and Finance, Bells University of Technology, Ota, Ogun State Nigeria[5]

***For Correspondence:** Email: *xingao5669@sina.com*

## Abstract

The objective of this study was to examine the influence of household socio-economic factors on maternal mortality and under-five survival in Nigeria. Consequently, data from 2005 to 2021 were collected from the World Development Indicators, and fully modified least squares and canonical cointegrating regression were utilised to implement the study. The results showed that for every 100,000 live births, at least 1097 mothers die in Nigeria. GDP per capita showed a positive but insignificant impact on maternal mortality, while adjusted net national income had a significant negative relationship with maternal mortality. Broad money supply reduced under-five survival in Nigeria, while social inclusion causes a reduction in under-5 mortality with 32 deaths per 1,000 live births in Nigeria. Hence, to reduce the high rate of maternal mortality in Nigeria, policy and programmes that will be socially inclusive for women and children should be implemented in the country *(Afr J Reprod Health 2023; 27 [11]: 83-90).*

**Keywords:** GDP per capita, social inclusion, mother, children

## Résumé

L'objectif de cette étude était d'examiner l'influence des facteurs socio-économiques des ménages sur la mortalité maternelle et la survie des moins de cinq ans au Nigeria. Par conséquent, les données de 2005 à 2021 ont été collectées à partir des indicateurs de développement dans le monde, et les moindres carrés entièrement modifiés et la régression canonique de cointégration ont été utilisés pour mettre en œuvre l'étude. Les résultats ont montré que pour 100 000 naissances vivantes, au moins 1 097 mères meurent au Nigeria. Le PIB par habitant a montré un impact positif mais insignifiant sur la mortalité maternelle, tandis que le revenu national net ajusté avait une relation négative significative avec la mortalité maternelle. Une masse monétaire importante a réduit la survie des moins de cinq ans au Nigeria, tandis que l'inclusion sociale entraîne une réduction de la mortalité des moins de cinq ans avec 32 décès pour 1 000 naissances vivantes au Nigeria. Par conséquent, pour réduire le taux élevé de mortalité maternelle au Nigeria, des politiques et des programmes socialement inclusifs pour les femmes et les enfants doivent être mis en œuvre dans le pays. *(Afr J Reprod Health 2023; 27 [11]: 83-90).*

**Mots-clés**: PIB par habitant, inclusion sociale, mère, enfants

## Introduction

Maternal mortality and under-five mortality are critical indicators of the overall health and well-being of a nation's population, reflecting the effectiveness of healthcare systems and the impact of socio-economic factors on vulnerable populations. Over time, extensive research has highlighted the multifaceted nature of these mortality rates, particularly in developing countries. Nigeria, as one of the most populous nations in Africa, grapples with significant challenges in reducing maternal mortality and enhancing under-five survival. This paper endeavours to delve into the complex interplay between household socio-economic factors and the persistent issues of

maternal mortality and under-five survival in Nigeria. Studies conducted over the years have consistently underscored the influence of socio-economic factors on maternal and child mortality. This influence is evident through various dimensions, including access to quality healthcare, nutritional status, educational attainment, and income disparities[1-5]. The socio-economic determinants of health have been recognized as critical in shaping the maternal and child health landscape. Consequently, understanding these factors is paramount in formulating effective interventions and policies to mitigate maternal and child mortality.

Under-five mortality, a key metric of child health, captures the number of children who tragically lose their lives before reaching the age of 59 months. It is not merely a statistical measure; rather, it reflects a nation's values, priorities, and the overall state of its healthcare system[6]. The first month of a child's life is the most vulnerable, a period when infants face the highest risk of mortality[7]. While there has been a gradual decline in under-five mortality rates in many developing countries, Nigeria continues to grapple with a substantial under-five mortality rate, with a reported rate of 72.2 per 1,000 live births as of 2020[5,8]. This persistent high rate is a cause for concern, emphasizing the need for targeted interventions and an exploration of the socio-economic factors exacerbating this issue. In stark contrast to the declining trend in under-five mortality, maternal mortality rates in Nigeria have exhibited a concerning upward trajectory. As of 2018, a staggering 99% of the 830 maternal deaths that could have been prevented occurred in developing countries, with Nigeria bearing a significant burden[9, 10]. The rising trend in maternal mortality underscores the urgent need to address the underlying factors that contribute to this alarming statistic.

Despite progress made in some areas of child health, under-five mortality remains high in Nigeria, while maternal mortality is on the rise. These grim realities reflect a deep-rooted issue that extends beyond the realm of healthcare delivery. To effectively tackle these challenges, we must recognize the intricate web of socio-economic factors that perpetuate these health disparities within the country. This research paper aims to dissect and analyze the influence of household socio-economic factors on maternal mortality and under-five survival in Nigeria. By shedding light on these determinants, the study aspires to inform evidence-based policies and interventions that can catalyze positive change and contribute to the well-being of mothers and children in Nigeria.

## *Literature review*

Ogunjimi *et al.*[11] examined maternal and child mortality in Nigeria from 2010 to 2011, and reported that despite that Nigerian population constitutes 1% of the world's population, yet it accounted for 10% to world`s maternal and under-five mortality rates.

Adewusi and Nwokocha[12] utilized data from the 2013 Demographic Health Survey to investigate the association between maternal education and child mortality in Nigeria. The results showed that mothers who had no formal education particularly had high child mortality as compared to those with higher educational level after controlling for some pertinent variables such as family size, wealth index, religious affiliation and sex of household head.

Meanwhile, Akinyemi *et al.*[13] argued that there is an interlink between the mother`s age when delivering a baby and the child mortality, due to the fact that a correlation existed between maternal age and birth order. Morakinyo and Fagbamigbe[14] investigated the relationship between neonatal, infant and under-five mortality in Nigeria from 2003 to 2013 using Probit regression model and found that children whose mother lived in rural areas had a consistent neonatal mortality rate, infant mortality rate and under-five mortality. Chigozie *et al.*[15] examined how maternal and child health could be improved in Nigeria from the perspectives of equity-focused interventions. The authors conducted EQUIST situation and scenario analysis and concluded that the poorest and rural population in Nigeria had higher number of under-five deaths, with the situation highest in North-West region. It is important to state that the factors that caused most of the under-five deaths were malaria and diarrhea. However, the factors that caused highest maternal deaths were ante-partum, postpartum, intrapartum hemorrhages and hypertensive disorder. Whereas, EQUIST scenario analysis posited that if an intervention package such as insecticide treated net is introduced, it could eliminate more than 20,000 under-five deaths. In the same vein, not less than 3,370 maternal deaths could be averted through the

deployment of competent professionals to conduct deliveries in the country.

In summary, the above literature review shows that maternal health practices and child mortality is an issue of concern in Nigeria which requires comprehensive research to deal with.

# Methods

## *Research design*

This study uses an expo-facto research design as the best research design, due to the technicality involved in achieving the study's objective. In the same vein, the study provided information about households' socio-economic factors to examine the variation in maternal mortality and under-five survival in Nigeria.

### *Model Specification*

In assessing the impact of households' socio-economic factors on maternal mortality and under-five survival, we specify the appropriate model for this study by utilizing the idea enunciated in similar studies by Zhou *et al*[16] and Olowookere *et al*[17] as follows

$$DE_{MandU} = F \text{ (Households' Socio-Economic Factors)} \quad (1)$$

Where $DE_{MandU}$ represents both maternal mortality and under five survival which are dependent variables respectively in this study. It is instructive to state that social inclusion is used to represent households` social factor, while both GDP per capita and adjusted net national income per capita are used for household economic factors respectively. Therefore,

$$DE_{MandU} = f \text{ (Social Inclusion, GDP per capita, National Income per Capita)} \quad (2)$$

Following the Okoh *et al*[18], Olanipekun *et al*[19], Lucas *et al*[20] and Hao *et al*[21]control variables such as broad money supply and trade openness were added to the model to enhance its robustness. Hence, the model is restated as this;

$$DE_{ME} = f\,(SI, GDPCA, NICA, BMS, TOP)$$

iables. Also, in providing detailed information about how the variables of the study were defined operationally, efforts have been made to summarize how these variables have been proxied in Table 2.

## *Source of data and scope of the study*

To assess the influence of households' socio-economic factors on maternal mortality and under-five survival in Nigeria, this study used annual time series data within the periods of 2005 and 2021. These data were collected from the World Development Indicators (WDI) published by the World Bank[8]. As the data are fully available without restrictions in the website of the World Development Indicators, we sought no permission to use the data[8].

## *Ethical consideration*

The data in the WDI were obtained using appropriate ethical procedures and guidelines. Consequently, further ethical issues were minimal. The data were completely anonymized, while the data was already freely available to the general public. Hence, further ethical clearance was not obtained for this study.

## *Data analysis*

### Descriptive Statistics

These were used to describe the main characteristics of data in a study, and they provide succinct summaries of the sample. The statistics provide comprehensive information regarding the characteristics, distribution, and behaviour of the variables under consideration by presenting statistics such as the mean, median, kurtosis, skewness, standard deviation, maximum and minimum value among others. It is important to stress that Eviews 10 software was employed to run the analysis.

### Estimation Technique

The preferred methods of estimation for the study are fully modified least squares and canonical cointegrating regression. These are the analytical techniques used to estimate unknown parameters in the study. This is a regression that includes deterministic variables, integrated processes and their powers as regressors. The errors are allowed to be correlated across equations, over time and with the regressors. Also, the regression is constructed in such a way that the usual least squares procedure yields asymptotically efficient estimators.

**Table 1:** A priori expectations and meaning of model`s abbreviations

| Abbreviation | Variables | Parameters | Expected Value |
|---|---|---|---|
| $DE_{MandU}$ | Dependent variables | | |
| SI | Social inclusion | $\alpha_2$ | Negative (-/+) |
| GDPCA | GDP per capita. | $A_3$ | Positive (-/+) |
| NICA | Adjusted net national income per capita. | $A_4$ | Positive (-/+) |
| BMS | Broad money supply | $\alpha_5$ | Positive (-/+) |
| TOP | Trade openness | $\alpha_6$ | Positive (-/+) |

Source: Authors` computation

**Table 2:** Measurement and operation definitions of variables

| Abbreviations | Description of Variables |
|---|---|
| SI | Social inclusion is measured by CPIA policies for social inclusion and equity cluster average (1 =low to 6 = high). |
| $DE_{MandU}$ | This stands for both maternal mortality (per 100,000 live births) and under-five survival (mortality rate, under-5 per 1,000 live births) |
| GDPCA | GDP per capita growth (annual percentage). |
| NICA | Adjusted net national income per capita (annual % growth). |
| BMS | Broad money supply |
| TOP | Trade openness measured as addition of imports and exports as percentage of GDP |

Source: Authors' computation

# Results

In Table 3, all the indicators employed to proxy the variables of the study have been summarised with the aid of the descriptive statistics of as thus; firstly, from 2005 to 2021, on the average basis, GDP per capita growth is 4.2%. Within the period of 17 years, GDP per capita grew between -1.7% and 8.03%. Similarly, adjusted
net national income per capita growth has a mean value of 0.9%. Within the period of analysis, adjusted net national income per capita growth ranges between 12.8% and -8.2%. However, maternal mortality has a mean value of 1097 per 100,000 live births. Then, within the period of the study, the least maternal mortality is 1134 deaths and the highest maternal mortality is 1035 deaths per 100,000 live births respectively. Social inclusion has an average value of 3.35, in which both its biggest value and least value are 3.5 and 3.1 simultaneously. In addition, under-5 mortality possesses a mean value of 130 per 1000 births. Whereas, 155 and 110 under-5 deaths per 1000 births were recorded as the largest and smallest values respectively in Nigeria.

In evaluating the power of the model, it is instructive to state that deduction from the R-squared establishes that all the explanatory variables explained about 64% variation in the dependent variable, maternal mortality. This is an indication that the model is relatively robust in addressing the objective of the study. Consequently, household economic factor like GDP per capita has a positive impact on maternal mortality, though, the impact is not significant. Meanwhile, adjusted net national income has a significant negative impact on maternal mortality. On the other hand, social factor denoted by social inclusion has an insignificant positive impact on maternal mortality.

In addition, trade openness has a direct impact on maternal mortality, on the contrary, broad money supply has an inverse relationship with maternal mortality. The impact of these control variables on maternal mortality is not significant.

Table 4 accounts for the estimating results of the impact of households` socio economic factors such as GDP per capita, adjusted net national income and social inclusion on under-five survival in Nigeria. Firstly, evaluating the power of the model, it could be deduced from the R-squared that all the explanatory variables explained about 72% variation in the dependent variable, under five survival. This is an indication that the model is relatively robust in

**Table 3:** Descriptive statistics of household's socio-economic factors, maternal mortality and under-five survival in Nigeria from 2005 to 2021

| Descriptive Statistics | GDPCA (%) | NICA (%) | M (births) | SI (1 to 6) | U (births) |
|---|---|---|---|---|---|
| Mean | 4.249471 | 0.992739 | 1097.412 | 3.358824 | 130.8294 |
| Median | 5.307924 | -0.273556 | 1101.000 | 3.400000 | 129.6000 |
| Maximum | 8.036925 | 12.85185 | 1135.000 | 3.500000 | 155.1000 |
| Minimum | -1.794253 | -8.258717 | 1034.000 | 3.100000 | 110.8000 |
| Std. Deviation | 3.110985 | 6.979056 | 30.95977 | 0.158346 | 12.63011 |
| Skewness | -0.668085 | 0.362243 | -0.524423 | -0.458493 | 0.280404 |
| Kurtosis | 2.321610 | 1.842629 | 2.222172 | 1.554420 | 2.253938 |
| Jargue-Bera | 1.590605 | 1.320608 | 1.207774 | 2.075817 | 0.617039 |
| Probability | 0.451445 | 0.516694 | 0.546683 | 0.354195 | 0.734534 |
| Sum | 72.24100 | 16.87656 | 18656.00 | 57.10000 | 2224.100 |
| Sum Sq. Dev. | 154.8517 | 779.3155 | 15336.12 | 0.401176 | 2552.315 |
| Observations | 17 | 17 | 17 | 17 | 17 |

**Table 4:** Results of fully modified least squares of household's socio-economic factors and maternal mortality in Nigeria

| **Dependent Variable:** M | | | | |
|---|---|---|---|---|
| **Variable** | **Coefficient** | **Std. Error** | **t-Statistic** | **Prob.** |
| GDPCA | 1.894800 | 2.744143 | 0.690489 | 0.5056 |
| SI | 58.77124 | 70.30797 | 0.835912 | 0.4227 |
| TOP | 0.009089 | 0.920056 | 0.009879 | 0.9923 |
| BMS | -1.365543 | 2.277477 | 0.599586 | 0.5621 |
| NICA | -3.232902** | 0.915174 | 3.532555 | 0.0054 |
| C | 928.4401** | 236.3459 | 3.928311 | 0.0028 |
| R-squared | 0.640441 | | | |
| Adjusted R-squared | 0.506212 | | | |

Notes: *Significant at1% **Significant at 5% ***Significant at 10%

**Table 5:** Results of canonical cointegrating regression of household's socio-economic factors and under-five survival in Nigeria

| **Dependent Variable: U** | | | | |
|---|---|---|---|---|
| **Variable** | **Coefficient** | **Std. Error** | **t-Statistic** | **Prob.** |
| GDPCA | 1.194180 | 0.669069 | 1.784839 | 0.1046 |
| BMS | -1.479830** | 0.497360 | 2.975369 | 0.0139 |
| NICA | -0.608790*** | 0.330289 | 1.843206 | 0.0951 |
| SI | -32.93477*** | 16.71601 | 1.970253 | 0.0771 |
| TOP | 0.060382 | 0.220766 | 0.273509 | 0.7900 |
| C | 267.4561* | 52.78799 | 5.066608 | 0.0005 |
| R-squared | 0.722295 | | | |
| Adjusted R-squared | 0.583443 | | | |

*Significant at 1% **Significant at 5 % ***Significant at 10%

addressing the objective of the study. GDP capita exerts a non-significant positive impact on under-five mortality. But the impact of adjusted net national income on under-five mortality is negative and significant at 10 percent level of significance. Similarly, social inclusion has a negative influence on under-five mortality, but the influence is significant at 10 percent level of significance. Furthermore, broad money supply has a significant negative impact on under-five mortality. But trade openness has an insignificant positive relationship with under-five mortality in Nigeria.

## Discussion

Discussing these findings within the context of the research question and objective of this study, on the average basis, households` economic factors; GDP per capita growth and adjusted net national income per capita growth are 4.2% and 0.9% respectively. This implies that the rate at which micro economic factors are growing is far bigger than the rate at which macro-economic factor grows in Nigeria. Social factors denoted by social inclusion has a value of 3.35. This shows that in every household of 6 members, not more than 3 members of the household will have meaningful voice and can live prosperous lives in Nigeria.

However, maternal mortality had a mean value of 1097 per 100,000 live births. This means that in the case of every 100,000 live births, at least 1097 mothers die in Nigeria, which is similar to the situation reports of 1223 maternal deaths in Sudan and 1063 maternal deaths in Chad respectively World Bank[8]. Therefore, the current level of maternal mortality in Nigeria is far off the global SDGs target of reducing maternal mortality less than 70 deaths per 100,000 live births in developing countries.

In addition, under-five mortality possesses a mean value of 130 per 1000 births in Nigeria. In other words, in every 1000 births in Nigeria, it is expected that 870 children will survive under five years. This figure is far below the SDGs goal targeting survival of at least 975 children in every 1000 births in developing countries. This is a wakeup call for the Nigerian policymakers to pursue policies and programmes that would bring a drastic reduction in maternal mortality to at most 70 deaths per 100,000 live births, and at same time increase under-five survival to at least 975 children in every 1000 births in the country.

Consequently, household economic factors like GDP per capita has a positive impact on maternal mortality, though, the impact is not significant. Consequently, a unit change in GDP per capita will increase maternal mortality rate by 1.8%. This result is contrary to the expectation of the study, this is probably due to the persistent dwindling in country`s GDP per capita growth, which could negatively affect economic strength of household in accessing and affording good maternal health care facilities during child births, since developing country like Nigeria usually has problem with huge out-pocket expenditure. Meanwhile, in line with the study expectation, adjusted net national income has a significant negative relationship with maternal mortality. As such, a unit change in this variable brings about a reduction in maternal mortality rate by 2.8%. This implies that household economic factor on the aggregate influences a reduction in maternal mortality in Nigeria despite the fact that reverse is the case of individual household. This shows that there is a wide level of inequality in economic power of households in accessing maternal health care in Nigeria. Similarly, social factor denoted by social inclusion has an insignificant direct relationship with maternal mortality, which is contrary to the a-priori expectation of the study. As a unit change in social inclusion occurs, it leads to a rise in maternal mortality by 58 deaths in Nigeria. This reverberates that there is a high level of deficiency in including women of reproductive ages in social programmes of the country. Furthermore, in discussing the nexus between households` socio economic factors and under-five survival, firstly, GDP capita exerts a non-significant positive impact on under-five mortality. By this scenario, a unit change in GDP capita leads to a rise in under-five mortality by1.2%. This implies that household economic factor is reducing under-five survival in Nigeria as against the expectation of the study. The reason for this unpleasant result might be stimulated by inadequacy of economic strength of household in accessing and affording good health care facilities or vaccines that could mitigate vulnerability of under five children to diseases such as malaria, poliomyelitis and among others, which are the leading killers of under five children in Nigeria.

However, adjusted net national income has a negative and significant relationship with under-five mortality. A unit change in this variable brings about a reduction in under five children by 0.6%. This interprets in other words that adjusted net national income contributes to a rise in under-five survival in Nigeria. In the same vein, social inclusion has a negative influence on under-five mortality. Based on this finding, a unit change in social inclusion initiates a reduction in under-five mortality by 32 deaths in Nigeria. Therefore, since there is a reduction in under-five mortality, it automatically translates to a rise in under-five survival in the

country. In view of the above findings, this study makes the following policy recommendations for the Nigerian policymakers. In order to reduce the current worrisome level of maternal mortality in Nigeria, policy and programmes that will be social inclusive for women of reproductive should be implemented in the country. Also, to increase the level of under-five survival to a significant level in Nigeria, the policy and programme that will improve the household economic factor, especially income to an acceptable level should be embarked upon by the Nigerian policymakers. This will enable the household to have a strong financial capacity to meet up with overwhelming cost of combating diseases such as malaria, poliomyelitis and among others, which are the leading killers of under five children in Nigeria.

The strength of this study lies in its high level of novelty in terms of its contribution to the body of knowledge. High level of rigorous quantitative analysis was employed in providing a clear answer to the research question. This study is limited and serves as a future direction for other researchers. The study focused on only Nigeria. Studies therefore could be carried out on the entire African continent in one hand, sub regional studies could also be carried out to cater for peculiar nature of each of the African sub regions. Further study could also investigate how socio-economic factors influence incident of malaria and HIV/aids among under five in Nigeria.

## Conclusion

This study therefore concludes that the rate at which micro economic factor is growing is far bigger than the rate at which macro-economic factor grows in Nigeria. Whereas, in every household of 6 members, not more than 3 members of the household will have meaningful voice and can live prosperous lives in Nigeria. Then, in the case of every 100,000 live births, at least 1097 mothers die in Nigeria, and in every 1000 births in Nigeria, it is expected that 870 children will survive under five years. Meanwhile, household economic factor like GDP per capita has a positive but insignificant impact on maternal mortality, and adjusted net national income has a significant negative relationship with maternal mortality. However, household economic factor is reducing under-five survival in Nigeria and social inclusion initiates a reduction in under-five mortality by 32 deaths in Nigeria. This is a strong confirmation that households' socio-economic factors are the prominent variables in determining the level of maternal mortality and under-five survival in Nigeria.

## Acknowledgement

This project is funded by the National Social Science Foundation's "Empirical Study on Ecological Poverty Alleviation in the Shaan Gan Ning Revolutionary Old Area from the Perspective of Rural Revitalization" (No. 18XKS014)

## Contribution of authors

Xin Gao conceived and designed the study
Timothy Ayomitunde Aderemi collected and analysed the data
Bin Zhou reviewed empirical studies
Wahid Damilola Olanipekun designed the methodology
Rowland Bassey wrote the introduction and edited the paper.

## References

1. Ng'anjo N. An evaluation of the Law on street vending in Zambia (Case study of Lusaka) (Doctoral dissertation), 2013.
2. United Nations International Children and Emergency Funds. Report on maternal mortality, 2015.
3. Kuuire VZ, Kangmennaang J, Atuoye KN, Antabe R, Boamah SA, Vercillo S and Luginaah, I. Timing and utilisation of antenatal care service in Nigeria and Malawi. Global public health, 2017, 12(6), 711-727.
4. Adewuyi EO, Auta A, Khanal V, Bamidele OD, Akuoko CP, Adefemi K and Zhao Y. Prevalence and factors associated with underutilization of antenatal care services in Nigeria: A comparative study of rural and urban residences based on the 2013 Nigeria demographic and health survey. PloS one, 2018, 13(5), e0197324.
5. Imo CK, Wet-Billings D and Isiugo-Abanihe UC. The impact of maternal health insurance coverage and adequate healthcare services utilisation on the risk of under-five mortality in Nigeria: a cross-sectional study. Archives of Public Health, 2022, 80(1), 1-12.
6. Khan GR, Baten A and Azad MAK. Influence of contraceptive use and other socio-demographic factors on under-five child mortality in Bangladesh: semi-parametric and parametric approaches. Contraception and Reproductive Medicine, 2023, 8(1), 22.
7. Fasina F, Oni G, Azuh D and Oduaran A. Impact of mothers' socio-demographic factors and antenatal clinic

attendance on neonatal mortality in Nigeria. Cogent Social Sciences, 2020, 6(1), 1747328.
8. World Bank. World Development Indicators. Retrieved From https://databank.wprldbank.org/source/world-development-indicators, 2023.
9. World Health Organization. Fact sheets, 2018.
10. Olonade O, Olawande TI, Alabi OJ and Imhonopi D. Maternal mortality and maternal health care in Nigeria: Implications for socio-economic development. Open access Macedonian journal of medical sciences, 2019, 7(5), 849.
11. Ogunjimi LO, Ibe RT and Ikorok MM. Curbing maternal and child mortality: The Nigerian experience. International Journal of Nursing and Midwifery, 2012, 4(3): 33-39. DOI: 10.5897/IJNM11.030.
12. Adewusi OA and Nwokocha EE. Maternal Education and Child Mortality in Nigeria. The Nigerian Journal of Sociology and Anthropology, 2018, 16(1): 111 – 130.
13. Akinyemi J, Bamgboye E and Ayeni O. New Trends in Under-five Mortality Determinants and their Effects on Child Survival in Nigeria: A Review of Childhood Mortality Data from 1990 – 2008. African Population Studies, 2013, 27(1): 25 – 42.
14. Morakinyo OM and Fagbamigbe AF. Neonatal, infant and under-five mortalities in Nigeria: An examination of trends and drivers (2003-2013). PLoS ONE, 2017, 12(8): e0182990. https://doi.org/10.1371/journal.pone.0182990
15. Chigozie JU, Issiaka S, Henry CU and Ermel J. Developing equity-focused interventions for maternal and child health in Nigeria: an evidence synthesis for policy, based on equitable impact sensitive tool (EQUIST). The Pan African Medical Journal. 2019, Doi:10.11604/pamj.
16. Zhou D, Bassey RA, Yan M and Aderemi TA. Do health expenditures affect under-five mortality and life expectancy in ECOWAS sub-Region? African Journal of Reproductive Health 2023: 27(8):105-113.
17. Olowookere JK, Olanipekun WD, Sokunbi GM, and Aderemi TA. Human Capital Development and Sustainable Development: Evidence from Nigeria. *Studia Universitatis Babes-Boyal,* 2022, 67(1), 63-76.
18. Olanipekun DO, Oloke E, Lateef T and Aderemi TA. Financial Sector Development and Industrial Performance in Nigeria: An Empirical Investigation, *Journal of Academic Research in Economics,* 2022, 14(3), 475-486.
19. Okoh JI, Olowo SO, Hassan AO, Aderemi TA, Olaoye OP and Alejo A. External Debt and Exchange Rate Fluctuations in Nigeria (1990-2017). African Journal of Business and Economic Research (AJBER), Special Edition: Perspectives on Demographic Dividend, and Economic Growth for Sustainable Development, 2021, 167-179.
20. Lucas B, Ojo AC, E Okoh JI and Aderemi TA. Political Corruption, Income Inequality and Poverty in Nigeria. AUDRI, 2020, 13(1): 7-19.
21. Hao S, Yang H, Bi R, Akinbode SO and Aderemi TA. Effects of remittances on life expectancy and under-five mortality in sub-Saharan Africa: Evidence using Generalized Method of Moments analysis. African Journal of Reproductive Health 2023; 27 (10); 87-98.