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Macro-economic variables and mortality rate nexus: focus on Nigeria

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Abstract

Purpose – The purpose of this paper is to investigate the impact of critical macroeconomic drivers like economic growth (gross domestic product (GDP)/capita), inflation and population size on the mortality rate of Nigeria. The general lockdown imposed by the government to curb the spread of coronavirus disease 2019 (COVID-19) has had so many effects like loss of jobs, insecurity, businesses collapsing, salary cuts, unemployment and increased prices of commodities in the market.

Design/methodology/approach – The paper focused on secondary data for the period 1991–2019 for GDP/capita, inflation, population size and mortality rate which were obtained from World Development Indicators (WDI). Time series analysis tests like augmented Dickey–Fuller (ADF), Bounds co-integration and autoregressive distributed lag (ARDL) were used to determine the stationarity conditions of the variables, co-integration presence among the variables and to determine the short-run and long-run relationships between the endogenous and exogenous variables.

Findings – The study shows that the variables are stationary at different orders i.e. I (0) and I (1) and the presence of co-integration among the variables. There exists a positive relationship between GDP/capita and mortality rate on the short-run which means increase in GDP/capita does not reduce the mortality rate in the country, there is also a positive short-run relationship between inflation and mortality rate but there are no long-run relationships among the variables.

Originality/value – The paper clearly examines the impact of GDP/capita, inflation and population growth on mortality rate in Nigeria.

Keywords Mortality rate, GDP (capita), Inflation, Population growth, Time-series analysis

Paper type Research paper



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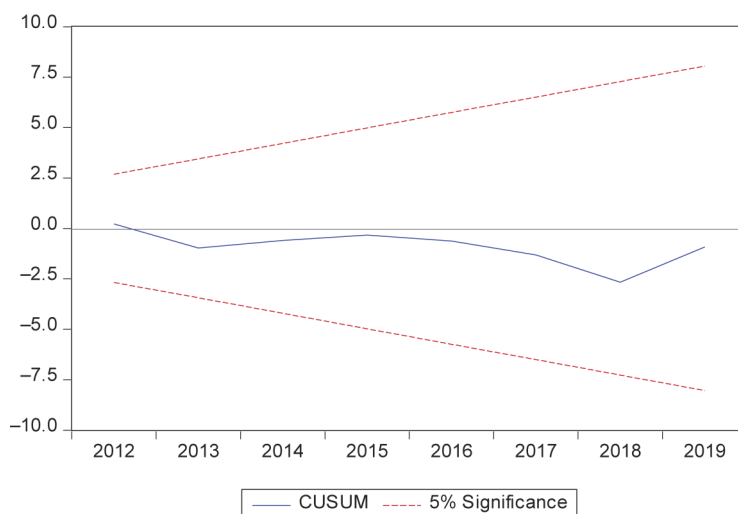
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1. Introduction

During the 20th century, growth in macroeconomic variables like gross domestic product (GDP), inflation, unemployment etc. is said to be connected with a rise in mortality rate in some countries (Bilal *et al.*, 2017), and the reasons for this are not well understood, but some proofs have shown that the existence of some social policies has caused this. Furthermore, this positive relationship between short-term economic growth and mortality rate was found to result from major effects on population and adverse effects of unemployment on the populace in some countries (Gafaar and Osinubi, 2005). There are so many models on the relationship between economic growth and health that have been proposed in the past centuries, and many are still coming up in this century. For example, Dhrifi (2019) investigated the impacts of expenditures in healthcare on child mortality rates in some developed and developing countries using a simultaneous equation model; the study revealed that growth in healthcare expenditure only reduce the child mortality rate in developed countries but does not reduce it in developing countries in which Nigeria was one of the developing counties used. In another related study by Adeosun and Faboya (2020) on the effects of expenditure in healthcare on child mortality in Nigeria, the study also revealed a negative correlation between the two which indicates spending on healthcare does not reduce the mortality rate in the country (see Figure 1).

Persistent increase in the following factors like inflation, unemployment, underemployment, absence of job security, non-friendly economic policies for businesses to thrive, un-even share of natural resources and most importantly, corruption in any country are some factors that increase the rate of mortality. Under normal circumstances, it should be that increase in economic growth should reduce the mortality rate due to the effects of this growth on people through the policies put in place by governments, thriving businesses, clear abilities for people to access health facilities easily, hence, there is a need to study this inverse effects of growth on mortality rate in the country. Many social-economic policies have been made and put in place by previous and present Nigerian governments to promote economic growth and improve the quality of life people live in the country. It is an established fact that the country is blessed with



Source: Author's computation, 2021

Figure 1.
Cumulative sum
(CUSUM) chart

so many natural resources such as crude oil, bitumen, gold, bitumen etc. and possesses large areas of land for agriculture. Also, the country is blessed with a vast population that will be advantageous to the growth of the country like China and the United States of America if well annexed properly. It is also a known fact that the persistent increase in the prices of foods and essential commodities needed for a living can be a major threat to food supplies, thereby undermining the health of people who cannot afford it or causing mortality. This continuous increase in the prices of food continue to have adverse effects on people economically, especially those in developing countries like Nigeria where a lot of people have had to reduce the number of meals they take in a day, some have reduced from taking three square meals into two while some take a meal per day in the country due to their unaffordability and social status. Due to these mentioned factors the country has, it becomes important to study the effect of economic growth (GDP/capita), inflation and population growth on the country's mortality rate. There is a need to know if these exogenous variables affect mortality rate positively or negatively in the short-run and long-run as this will help government and policy-makers to know areas where to channel their effort to in order to reduce the mortality rate in the country and besides the outbreaks of so many diseases in the world calls for urgent attention for every reasonable government to look for ways of reducing their mortality rate and improve the quality of lives of their citizens. The remainder of this paper is arranged as follows: section two presents the theoretical and empirical review. Section three discusses the methodology used, while the result discussions are presented in section four. Section five provides the conclusion and recommendations from the study.

2. Literature review

2.1 Theoretical review

One of the theories that used to show the link between human capital variables and economic growth is the augmented Solow human-capital-growth model by [Mankiw *et al.* \(1992\)](#). In the Solow model, the contribution of human capital to growth was not explicitly stated leaving a loophole for improvements. To justify the incorporation of human capital, they opined that within or across varying economies, labor-possession non-homogeneity traits which are observable either due to their possession of diverse levels of health, education, skills, experiences, training and developments. Mortality rate is a key variable that is part of human capital. Sustained economic growth is known to be associated with human capital levels that get increase through good education, improved health, and impacts of learning and re-learning ([Lopez *et al.*, 2005](#)). The mortality rate determines the health conditions of any nation due to its effect on the entire population. Considering the target fertility model, which means for N children to survive, N/q children must be given birth given the survival rate is q , but this does not consider humans to be economic goods.

According to [Becker and Barro \(1988\)](#), who include mortality rate in their model of fertility and proved that mortality rate decline would reduce the cost of having a survivor, which then raises the demand for having surviving children, the disparity between the poor and rich is clearly obvious to all demographers and decision-makers as it shows the patterns explained by the second demographic transition theory. The theory summarized that no stationary or stable population in any country as the ultimate driver and cause of these changes is inevitable, powerful and irreversible ways in which people live their lives. In societies where these structural changes are in later phases, lesser economic growth is observed. In summary, when the mortality rate declines and people life expectancy rate increases, this directly lowers fertility rate and population growth. There will be a high investment in human capital, which contributes immensely to the GDP/capita increase.

2.2 Empirical review

Growth in the economy is a fundamental prerequisite for development in the health sector, and economic growth is always linked with policies that truly transform the economic sector and impact been felt in other sectors as well. The clear ability to understand policies that promote economic growth on health gives the opportunity to measure the impacts of macro-economic variables on health as social policies have greater influences on the entire population. It is a known fact that the population health of any country is determined by three essential factors, which are economic, environmental and social factors, and this explains the reason why health decision-makers like government, insurance companies and health consultants have a keen interest in understanding how economic growth affects key health indicators like life expectancy, mortality rate, crude death rate etc. According to [Dutton *et al.* \(2019\)](#), in their study on the influence of economic growth on mortality modeling, some selected countries discovered a strong but negative connection between mortality rate and economic growth.

A lot of studies have looked at the association between income inequality and mortality over the years, but due to their causes which cannot be totally measured, it becomes a problem to determine how income inequality affects mortality ([Leigh and Jencks, 2007](#)). [Shin *et al.* \(2018\)](#) explored the effects of households with low income and diabetes on mortality in Korea using secondary data and Cox's regression analysis to estimate the mortality hazard ratio. The results clearly revealed that households with lower income are the major cause of the high mortality rate in the country and that both low-income households and diabetes independently increase the rate of mortality. [Edeme and Olisakwe \(2019\)](#) argued that increasing the budget on health and social services in Nigeria is desirable but does not really transcend into an improved health outcome. Income truly determines the condition of life people live and remains one of the major determinants of health ([Miladinov, 2020](#); [Bayati *et al.*, 2013](#)). According to [Miladinov \(2020\)](#), people's living standard in a country determines the kind of demographic changes that will occur. When living standards are high, there will be aspirations to consume more, enhancing economic growth. And on income inequality, [Deaton \(2003\)](#) and [Lynch *et al.* \(2004\)](#) did a thorough survey on the past literature of economic inequality and mortality, though the two studies summarized that there are tenable reasons to show that relationships exist between income inequality and mortality. However, according to [Leigh and Jencks \(2007\)](#), the evidence provided for this relationship is weak and found that there are only five studies who embrace time series data to analyze the relationship between income and mortality.

Health development generates growth in the economy and another major sector of a nation, resulting from effects on people and the abilities of people to carry out normal duties in a good frame of mind and health ([Adeosun and Faboya, 2020](#)). There has been total neglect on mortality caused as a result of inflation, i.e. incessant hikes in the prices of foods, especially infant mortality rate. Inflation in the prices of foods could result in malnutrition for children who are still within critical periods of their lives, particularly 1000 days after delivery and younger years. Inflation is a consistent increase in prices of goods that destroys or depletes people's socio-economic preferences. It increases the prices of goods and increases the price of services, including healthcare cost. According to the Nigerian Bureau of Statistics (NBS), the inflation rate in Nigeria for March 2020 increased from 17.33% to 18.17%, which was recorded in February 2021. This means it is 0.82% greater than that of February values. Also, the consumer price index shows an increment of 1.56% in March 2021 for the month on month value, which indicated a 0.02% increment to the value gotten in February, 2021. This increase has almost 1.89% increase on food sub-index which result by the rise in the prices of foods like cereals, bread, meats, rice, yam etc., this increment has

made almost everyone in the country to adjust or reduce the number of meals they take in a day and because of this, it is important at this point to determine the impact of this rise in inflation on the mortality rate of the country.

Over the years, no significant progress has been made in Nigeria to reduce the increasing rate of mortality in the country, especially under-five mortality and maternal mortality (Agbatogun and Opeloyeru, 2020). The authors explored the macroeconomic variables that cause under-five mortality using secondary data from 1980 to 2017 in Nigeria, the autoregressive distributed lag model was used. The results revealed that improvement in government expenditure on health in the country would go a long way to reducing under-five mortality in the country. According to the Multiple Indicator Cluster Survey reported National Bureau of Statistics shows that the mortality rate of under-five children rose from 138 per 1,000 live birth to 158 per 1,000 live births as of 2011 and this also got increased to 203 per 1,000 live births in 2017. All these revealed statistics are indicative proof of an increase in the mortality rate trend from 2011 to date in the country.

3. Methodology

Estimation of the model was actually carried out using autoregressive distributed lag (ARDL) which is mainly used to estimate the relationship between variables that are stationary at different orders. Data were obtained on GDP/Capita, inflation and population growth, which are exogenous or independent variables, while dependent variable (mortality rate) was equally obtained for Nigeria from 1990 to 2019. Though GDP describes the growth and size of a country's economy but to really connect GDP to people's standard of living, GDP/Capita is used as it provides an excellent measure of people's standard of living within a given economy. The study employs augmented Dickey-Fuller (ADF) unit root testing procedures, bound co-integration test, autoregressive distributed lag, result diagnostic and stability testing to determine the relationship between the dependent variable and the independent variables.

3.1 Augmented Dickey-Fuller test (ADF)

To avoid spurious regression, it is essential to perform a stationarity test. A stationarity test is a test that determines whether a series contains constant mean and variance in order to avoid or prevent shocks from your data. Data which are not stationary in their level, i.e. $I(0)$ are always differenced to make them stationary, and one of the popular tests used to check stationarity is the ADF test. This is an auto-regression with the generalized equation proposed by Dickey and Fuller (1981):

$$\Delta y_t = \beta_0 + \theta y_{t-1} + \alpha_1 \Delta y_{t-1} + \alpha_2 \Delta y_{t-2} + \dots + \alpha_p \Delta y_{t-p} + \varepsilon_t \quad (1)$$

where lag number (p) is being determined by minimizing the Akaike information criterion and Schwartz criterion or minimizing the lags can even be dropped until significance is gotten.

3.2 Autoregressive distributed lag bound co-integration test

The ARDL bound test developed by Pesaran *et al.* (2001) is a test to the relationship among variables of different integration order, particularly $I(0)$ and $I(1)$. It can also be used to determine the co-integration equation whether long-run equation exist among variables though there is already the presence of short-run relationship. The first procedure is to determine whether there exists a long-run relationship among the variables, estimate short-run relationship coefficients, estimate long-run coefficients among the variables and lastly

perform the required diagnostic on the fitted model to see if it conforms to the needed requirements. The general ARDL equation for this study is given below:

$$\Delta LMR_t = \beta_{01} + \sum_{i=1}^p \beta_{1i} \Delta LMR_{t-1} + \sum_{i=1}^q \beta_{2i} \Delta GDP_{t-1} + \sum_{i=1}^q \beta_{3i} \Delta INF_{t-1} + \sum_{i=1}^q \beta_{4i} \Delta POPG_{t-1} + \varphi ECT_{t-1} + \varepsilon_t \quad (2)$$

Impact of
critical
macroeconomic
drivers

where:

- LMR = Log of Mortality rate;
- GDP_k = Gross Domestic Product;
- INF = Inflation;
- POPG = Population Growth; and
- ECT = Error Correction Technique

4. Data analysis and results interpretation

Table 1 above shows the result of the unit root test. It is evident that the variables are stationary for different orders, which necessitate adopting ARDL to further test the short-run relationships between the variables. The bound co-integration test will be used to confirm the availability of long-run relationships among the variables:

H0. There is no long-run relationships among the variables

Table 2 shows the result of the bound co-integration test. Since the test statistic (14.2632) is greater than the values of I (0) and I (1) at all significance, we reject the null hypothesis and conclude that there exists long-run relationships among the variables considering the case of Nigeria. This long-run relationship may be as a result of the increased inflation rate that

Variables	<i>t</i> -statistic	<i>p</i> -value	Differencing order
GDP/Capita	-5.6032	0.0006	I(1)
Inflation	-5.0216	0.0021	I(1)
Log Mortality Rate	-6.8569	0.0000	I(0)
Population Growth	-5.2879	0.0015	I(0)

Source: Author's computation, 2021

Table 1.
Unit root test

Model 1 (DV = life expectancy)				
Test statistic	Value	Significance (%)	I(0)	I(1)
<i>F</i> -statistic = 14.2632	<i>K</i> = 3	10	2.37	3.20
		5	2.79	3.67
		2.5	3.15	4.08
		1	3.65	4.06

Source: Author's computation, 2021

Table 2.
Bound co-integration
test

Nigeria has been experiencing since the last three decades which continues to affect other macroeconomic growth of the country. The effect of this is not farfetched on the citizen's living status and continues to have a heavy effect on their health conditions due to the rise in population in which government cannot cater for. Though every successive government has made several efforts in the country to fix this problem but their efforts seem minute, and as evidently seen in Table 2, these variables continue to affect one another even on the long run. One of the goals of every good government remains to have sustainable economic growth connected with low inflation and has the capability to improve people's living standards.

Table 3 above displays the short-run coefficients. The table shows that there exists a short-run relationship between the dependent variable (log mortality rate) and GDP_k with a coefficient of 0.0002 and probability value of 0.0325. This means a 1% increase in GDP_k will result in a 0.02% increase in mortality rate and this clearly explains why mortality rates do increase during the upward cycle of the economy and decrease during downward cycles. The table also shows that though GDP_k is currently impacting log mortality rate positively i.e. increase in GDP_k causing increase in log mortality rate, it has previously impacted mortality rate negatively which means increase in GDP_k reducing log mortality rate in the country with GDP_k lag 3 and 4 having negative coefficients and probability values less than 0.05. This table also reveals that there exists a positive relationship between inflation and log mortality rate on the short run with a coefficient of 0.0002 and probability value of 0.0001. This means an increase in inflation increases the rate of mortality in the country. It is also evident that one of the previous lags of inflation also increases the log mortality rate. Also, the table reveals that population growth does not impact log mortality rate currently, but it has negatively impacted it in its previous periods. The model reliability test shows an adjusted R-squared of 99.9% with probability of F-statistic to be 0.0000 means the model is

Variable	Coefficient	Std. error	t-statistic	Prob
Log Mortality Rate (−1)	0.0543	0.2969	0.1828	0.8595
Log Mortality Rate (−2)	1.9324	0.3531	5.4731	0.0006
Log Mortality rate (−3)	0.4009	0.3630	1.1044	0.3015
Log Mortality Rate (−4)	−1.3753	0.2800	−4.9113	0.0012
GDP_k	0.0002	0.00009	2.5832	0.0325
GDP_k (−1)	0.0002	0.00008	3.4506	0.0087
GDP_k (−2)	0.0001	0.00009	1.4916	0.1741
GDP_k (−3)	−0.0004	0.0001	−3.2249	0.0121
GDP_k (−4)	−0.0003	0.0001	−2.9869	0.0174
Inflation	0.0002	0.00003	6.8788	0.0001
Inflation (−1)	0.00003	0.00003	1.0944	0.3056
Inflation (−2)	−0.00003	0.00003	−1.1521	0.2825
Inflation (−3)	−0.00008	0.00003	−2.8354	0.0220
Population Growth	0.0848	0.1618	0.5243	0.6143
Population Growth (−1)	0.5434	0.2597	2.0921	0.0698
Population Growth (−2)	−0.4454	0.1714	−2.5991	0.0317
C	−0.5319	0.1922	−2.7677	0.0244

Model Reliability
R- Squared = 0.9999
Adjusted R- Squared = 0.9999
F- statistic = 128937.0
Prob(F-statistic) = 0.0000
Durbin-Watson stat = 2.3785

Table 3.
Estimation of short-
run coefficients

Source: Author's computation, 2021

reliable and since the result of the adjusted R squared is lesser than that of the Durbin–Watson statistic, statistically the regression model is not spurious and can be used to make informed decisions.

4.1 Estimation of long-run coefficients

Table 4 above shows the long-run coefficients. The table shows the long-run relationship coefficient between the independent variables (GDP_k , inflation and population growth) and the dependent variable (Log mortality rate). It is evident from this table that there exists a negative relationship between inflation and log of mortality rate. This indicates that an increase in the inflation rate continues to worsen the country's mortality rate, which calls for urgent attention by major stakeholders. It is a known fact that this continuous increase in the inflation rate in the country continues to cause different problems that were not in existence before, like banditry, kidnapping, mal-nutrition, thereby directly increasing the number of mortality rate in the country. Also, Table 4 reveals a negative relationship between population growth and log of mortality rate. This clearly explains that the country's rise in population growth has not been annexed to benefit the country's economic growth, thereby causing improvement in the quality of life people live (see Table 5).

The first diagnostic test (Breusch–Godfrey LM test) is a test to check for serial correlation with a null hypothesis that there is no serial correlation. The result above shows no serial correlation in the model. The Jarque–Bera result also shows the model is normal while Breusch–Pagan (heteroscedasticity) test shows that there is no problem of heteroscedasticity.

5. Conclusion and recommendation

This study investigated the impact of common macro-economic variables like gross domestic product (GDP_k), inflation and population growth on mortality in Nigeria. This is done to allow concern authorities to make decisions or policies that will enhance the life expectancy of inhabitants of Nigeria and decrease mortality rate in the country. The methodologies employed were ADF test which was used to determine the stationarity

Variable	Coefficient	Std. error	t -statistic	Prob
GDP_k	0.0071	0.0255	0.2801	0.7864
Inflation	−0.0093	0.0255	0.2802	0.7864
Population Growth	−14.7847	16.6095	−0.8901	0.3994
C	43.0237	42.1004	1.0219	0.3367

Source: Author's computation, 2021

Table 4.
ARDL long-run
coefficients

Test	t -statistic	Probability value
Breusch–Godfrey LM test	0.4799	0.5108
Jarque–Bera	0.5899	0.7446
Breusch–Pagan (Heteroscedasticity)	0.8952	0.5974
ARCH LM	0.8135	0.3769

Source: Author's computation, 2021

Table 5.
Result diagnostic and
stability test

conditions of the variables before applying autoregressive distributed lag bound co-integration test to determine whether there exist long-run relationship between the dependent variable (Log of mortality rate) and the independent variables (GDP_k , inflation and population growth) since they were integrated of different orders i.e. I (0) and I (1). Also, the ARDL test was used to determine the coefficients of the short-run equation.

The study findings reveal that there exists a short-run relationship between the dependent variable (Log of mortality rate) and the independent variables (GDP_k , inflation and population growth), which indicates all direct alterations on these independent variables have quick or immediate effects on mortality rate in Nigeria. This clearly juxtaposes the direct impact of inflation on food prices and other essential commodities like clothing and shelter on a population, according to Meerman and Aphane (2012), who said whenever there is inflation in the prices of foods as a result of economic recession or any other economic reasons, the power to purchase of consumers automatically comes down, and everyone in such an economy is pushed below or closer to poverty lines. This reduces the quality of meals people take and compromises children's growth. It also increases ailment among the population as well as increases the rate of maternal and infant mortality rate. The study shows that there is a short relationship between mortality rate and GDP_k , which means an increase in GDP_k is currently not reducing the mortality rate in the country; this is in accordance with the study of Asiedu *et al.* (2015) and Pritchett and Summer (1996). There is also a short-run relationship between mortality rate and inflation which also shows a rise in inflation is also causing a rise in mortality rate, but no relationship exists between mortality rate and population growth.

5.1 Policy implication and recommendation

Based on the conclusion of this study, it becomes imperative for decision-makers, government and policy-makers to resolve to make policies that will make Nigerians feel the impact of economic boom or growth and also reduce hikes in prices of essential commodities as these will greatly help to improve the quality of life people are living in the country thereby reducing the mortality rate. The study further recommends policies aimed at driving down the current high rate of inflation in the country as it affects the mortality rate in the country through the high cost of providing health infrastructures, medicine and the development of experts in the country's health sector. Population growth should be monitored and catered for.

This study only considers the impact of the used macro-economic independent variables on the general mortality rate only. Future studies can break it down to know the impacts of these macro-economic variables on health indicators like child or infant mortality rate and maternal mortality rate in Nigeria.

References

- Adeosun, O.T. and Faboya, O.M. (2020), "Health care expenditure and child mortality in Nigeria", *International Journal of Health Care Quality Assurance*, Vol. 33 No. 3, pp. 261-275, doi: [10.1108/IJHCQA-10-2019-0172](https://doi.org/10.1108/IJHCQA-10-2019-0172).
- Agbatogun, K.K. and Opeleyeru, O.K. (2020), "Macroeconomic determinants of under-five mortality rate in Nigeria", *Significant*, Vol. 9, pp. 177-186.
- Asiedu, E., Gaekwad, N.B., Nanivazo, M., Nkusu, M. and Jin, Y. (2015), "On the impact of income per capita on health outcomes: is Africa different?", available at: www.aeaweb.org/conference/2016/retrieve.php?pdfid=1019 (accessed 10 February 2020).
- Bayati, M., Akbarian, R. and Kavosi, Z. (2013), "Determinants of life expectancy in Eastern Mediterranean Region: a health production function", *International Journal of Health Policy and Management*, Vol. 1, pp. 1-7.

- Becker, G.S. and Barro, R.J. (1988), "A reformulation of the economic theory of fertility", *The Quarterly Journal of Economics*, Vol. 103 No. 1, pp. 1-25.
- Bilal, U., Cooper, R., Abreu, F., Nau, C., Franco, M. and Glass, T.A. (2017), "Economic growth and mortality: do social protection policies matter?", *International Journal of Epidemiology*, Vol. 46 No. 4, pp. 1147-1156.
- Deaton, A. (2003), "Health, inequality, and economic development", *Journal of Economic Literature*, Vol. 41, pp. 113-158.
- Dhrifi, A. (2019), "Health-care expenditures, economic growth and infant mortality: evidence from developed and developing countries", *CEPAL Review No. 125*, August 2018, p. 69.
- Dickey, D.A. and Fuller, W.A. (1981), "Likelihood ratio statistics for autoregressive time series with a unit root", *Econometrica: Journal of the Econometric Society*, pp. 1057-1072.
- Dutton, L., Pantelous, A.A. and Seklecka, M. (2019), *The Impact of Economic Growth in Mortality Modelling for Selected OECD Countries*. doi: [10.1002/for.2640](https://doi.org/10.1002/for.2640).
- Edeme, R.K. and Olisakwe, O. (2019), "Public health expenditure, economic growth and health outcomes in Nigeria", *International Journal of Public Policy and Administration Research*, Vol. 6 No. 1, pp. 23-32.
- Gafaar, Oluwatoyin Alade S. and Osinubi, Tokunbo Simbowale (2005), "Macroeconomic policies and pro-poor growth in Nigeria", *Proceedings of the German Development Economics Conference, Kiel 2005, No. 24, Verein für Socialpolitik, Ausschuss für Entwicklungsländer, Hannover*.
- Leigh, A. and Jencks, C. (2007), "Inequality and mortality: long-run evidence from a panel of countries", *Journal of Health Economics*, Vol. 26 No. 1, pp. 1-24, available at: www.sciencedirect.com/science/article/pii/S0167629606000750
- Lopez, C., Rivera, B. and Currais, L. (2005), *Health and Economic Growth, Findings and Policy Implication*, MIT Press Cambridge, London.
- Lynch, J., Smith, G.D., Harper, S.A., Hillemeier, M., Ross, N., Kaplan, G.A. and Wolfson, M. (2004), "Is income inequality a determinant of population health? Part 1. A systematic review", *Milbank Quarterly*, Vol. 82 No. 1, pp. 5-99.
- Mankiw, N.G., Romer, D. and Weil, D.N. (1992), "A contribution to the empirics of economic growth", *The Quarterly Journal of Economics*, Vol. 107 No. 2, pp. 407-437.
- Meerman, J. and Aphane, J. (2012), *Impact of High Food Prices on Nutrition*, FAO, Rome.
- Miladinov, G. (2020), "Socioeconomic development and life expectancy relationship: evidence from the EU accession candidate countries", *Genus*, Vol. 76, p. 2, doi: [10.1186/s41118-019-0071-0](https://doi.org/10.1186/s41118-019-0071-0).
- Pesaran, M.H., Shin, Y. and Smith, R.J. (2001), "Bounds testing approaches to the analysis of level relationships", *Journal of Applied Econometrics*, Vol. 16 No. 3, pp. 289-326.
- Pritchett, L. and Summers, L.H. (1996), "Wealthier is healthier", *The Journal of Human Resources*, Vol. 31 No. 4, pp. 841-868.
- Shin, W.Y., Kim, H.C., Lee, T., Jeon, D.H., Ha, K.H., Kim, D.J. and Chang, H.J. (2018), "Combined effects of diabetes and low household income on mortality: a 12-year follow-up study of 505 677 Korean adults", *Diabetic Medicine*, Vol. 35 No. 10, pp. 1345-1354.

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