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The Effect of Disaggregated Female and Male Adult Mortality on Economic Growth in Nigeria

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Abstract **Original Research Articles**

This study assessed the effect of adult male and female mortality on economic growth in Nigeria. The objectives are to identify the determinant of adult mortality in Nigeria; investigate the disaggregated effect of adult male mortality and adult female mortality on economic growth in Nigeria. Descriptive analysis with Secondary data on the Nigerian economy from 1982 to 2023 and the Auto Regressive Distributed Lag technique was used to carry out the study. We found that the determinants of adult mortality in Nigeria include Income per capita; Government Spending on Health; Insurgency; Agricultural output; Education and Labour Force Participation Rate. Our results show that men and women mortality have a negative and significant effect on economic growth both in the short and long run, but the effect of men's mortality is higher than that of the women. We recommend increased public and private funding of the education of the girl child, especially in the northern part of Nigeria, restructuring and strengthening of the armed forces and increased government spending on health.

Keywords: Adult male mortality, Adult female mortality, Economic growth and Insurgency.

1.0 Introduction

The mortality rate of adult male and female could play a key role in the achievement of macroeconomic goals including economic growth. Reduction in mortality brings about investment and income stream (Lehmijoki and Palokangas, 2011). In all regions and virtually all countries, mortality rate is recorded to be higher for males than for females. The ratio is highest in World Health Organization European Region, where male mortality rate is more than twice that of female (WHO, 2020). In Nigeria, women appear to live longer than men in all the states and among reported cases of diseases (NBS, 2021).

The trending observation in the Nigerian economy is that there is high level of mortality among the working population, men and women through insurgency, restiveness, and terrorism (Ogbonnaya and Ehigiamuose, 2013). Health infrastructure and facilities that would have supported livelihood have been rudely destroyed in many communities, leading to a very ineffective health care provision to subvert the deteriorating mortality in Nigeria. Many Nigerians have been displaced from their traditional activities, especially agriculture which boosted food supply. The root causes of high adult male and female mortality rate in Nigeria may therefore be significantly inclusive of other factors outside health factors. It is therefore interesting to note for assessment what the

decimation of the population indicates or mean for a country that needs this population, especially the working population, to generate and build its economic production capacity. The emphasis on only health factors has also made government policies on mortality to solely target the health sector, but increased spending on health alone may not address the upward trend of adult mortality in Nigeria. Therefore, Nigeria could still be experiencing avoidable loss in GDP resulting from increase in adult male and female mortality. This is one of the motivation for this study.

Every human life man or woman is important and increase in the loss of these lives could have effect on the growth of the economy. Increase in adult mortality rate could reduce the labour force, therefore the number of people involved in production. This reduction in labour input could lead to decrease in output, income, and economic growth. Economic growth occurs when provision is made for the future through savings and investment. The growth that would have resulted from such savings and investment could be forfeited when there is no longevity, because people who expect to die young will see no reason to save or invest. This work therefore seeks to investigate and bring to the fore the effect of increasing or decreasing in adult male and female mortality rate on economic growth in Nigeria.

The objectives of this paper therefore are to identify the determinant of adult mortality in Nigeria and to investigate the disaggregated effect of adult male mortality and adult female mortality on economic growth in Nigeria.

2.0 Literature Review

2.1 Conceptual Literature

Channels through which Adult Mortality Affects Economic Growth (Transmission Mechanism):

Mortality effect is delivered through several mechanisms including: -

Labour Supply: Labour supply, affects production output. During the peak working years of 20 to 54, this effect is especially strong. When there is reduction in adult mortality, the number of people who are willing and able to work increases. Therefore, the number of workers per production and output increases (Bloom, *et al.*,2003).

Savings, Capital, and Wealth Accumulation: Working-age population earns more and can save. This tends to favour greater personal and national savings. The ability to save money is even greater when these working individuals are appropriately educated and trained. Increased savings serve as a partial resource for industrial investments that fuel economic growth. It can also serve as resources that households and governments can invest to boost productivity. Additionally, private household savings can provide the capital accumulation needed to finance growth, as seen in East Asia (Young, 1994, 2005; Kelley and Schmidt, 1995; Higgins, 1998).

One of the most important productivity-enhancing investments that can be made is investing in education. Education and training are required to help people become better-skilled workers, also to help workers learn new skills and to adapt to new businesses in a rapidly changing industrial environment. This increase in productivity will lead to increase in output that will eventually result in economic growth. As people realize that they will live longer, they are more motivated to accumulate wealth that they can use to support themselves in old age (Ross, 2004; IPPF, 2013). Also, people between ages 40 and 65 tend to save more since they probably spend less on children and need to prepare for retirement (Bloom, *et al.*, 2003).

The accumulation- driven productivity gain of the East Asia development has been explained in literature over the years to be partly because of demographic factors. Saving and investment rates can both be influenced by demography. Some of the earliest works that investigated the East Asian experience found that falling mortality had a profound impact on East Asian saving rates and investment rates which led to their economic growth (Higgins, 1998; Higgins and Williamson, 1997).

Adult mortality has significant effects on investments in human capital. This effect may appear to be the least tangible but may be far-reaching. As adult mortality rate reduces, parents will probably decide to educate their children to more advanced levels. These children, in turn, tend to experience greater cognitive development. The parents also, knowing that there is a good chance that each child will benefit from schooling investments over a long working life will invest more money and time to each

child. The result of this educational investment is that the labour force becomes more productive, promoting higher wages and a better standard of living. Women and men therefore tend to enter the workforce later, since they are being educated for longer, and they are likely to be more productive once they start working. A more productive labour will produce more output that will lead to economic growth (Jamison *et al.*, 1996; Bloom, Canning, and Sevilla, 2001). A major source of growth in several endogenous growth models as well as one of the key extensions of the neoclassical growth model is human capital. Thus, many studies find evidence suggesting that educated population is a key determinant of economic growth (Mankiw *et al.*, 1992; Barro and Sala-i-Martin, 1995; Brunetti *et al.*, 1998; Hanushek and Kimko, 2000; Fayissa and Nsiah, 2010).

Domestic Demand and Consumption: When there is decrease in adult mortality, there will be increase in working population and this will lead to greater domestic demand, especially if they are gainfully employed, because their income will afford them the purchasing power for effective demand. Increase in effective demand could imply increase in aggregate demand that eventually leads to economic growth.

Productivity**:** There is a boost in economic productivity that occurs when there are growing numbers of people in the workforce (as a result of reduced adult mortality) relative to the number of dependents, although this has to be accompanied by sustained investments in education, skills development, health, job creation and good governance. This boost in economic productivity will certainly lead to economic growth, ceteris paribus (Bloom *et al*, 2001).

2.2 Theoretical Literature

Epidemiological Transition Theory: There are health related theories that examined the determinants of adult mortality, but the most relevant to this study due to the fact that it did not only consider health issues is the epidemiological transition theory which states that as countries modernize, they increase their standards of living and improve their public health and medical technology, all of which result in declines in overall mortality and changes in causes of adult mortality (Omran 1971). Consistent increase in national income brings about improvement in public health as the nations will be able to afford better medical technology which can induce adult mortality decline. Other authors have followed this theory to show that income has a strong effect on adult mortality (Cutler, et al, 2006; Preston, 2007). Cutler et al (2006) added that income or education may facilitate the adoption and effectiveness of public health measures that can facilitate mortality decline.

Although this theory holds true in many countries, it has failed to capture all the key determinants of adult mortality in many developing nations. In consonant with this, other works have shown that it is not only income and health issues that determine adult mortality. There are also geographical, physiological, human and environmental factors (Saikia and Ram, 2010; Walter et al, 2013).

Human Capital Accumulation and Physical Investment Theory**:** This theory presented an elementary logic on how mortality affects investment and growth in the economy as follows:

In a situation where instantaneous utility function is given as $U(ct)$, a probability of survival of p, and a discount factor β, in a two-period model, agents optimize $U(ct) + p\beta u(ct + 1)$.

When the survival probability p reduces, there will be a reduction in investment and savings, which will result in lower growth. This framework was also applied to accumulation in human capital. This theory explains that adult mortality will affect accumulation more than infant mortality since these decisions are made on the returns it will bring about in adulthood Kalemli-Ozcan 2002).

3.0 Methodology

3.1 Theoretical Framework

The theoretical framework applicable to our objective is the Neoclassical Growth Theory

$Y = K^{\alpha}(AL)^{1-\alpha}$

Equation 1.1

Y = the GDP, K = capital, L= the labour force A = labour productivity, α = output elasticity with respect to capital (Todaro & Smith, 2011). As represented in equation 1.1, the function has constant returns to

scale, so that a rise in input will yield the same proportion of increase in output, while holding one constant and increasing the other will yield less proportionate increase. (Gould and Ruffin, 1993). By extension, a reduction in, say labour (as a result of increased mortality), while holding capital constant will bring about less output.

$\boldsymbol{\alpha}$ = the elasticity of output with respect to capital (the % rise in GDP resulting from a 1% rise in human or physical capital). (Peter and Bakari, 2018). Traditional neoclassical growth theory opines that growth in output will results from one or more of three factors: (i) growth in labour input (reduced mortality can bring about growth in labour) and quality (via education and training), (ii) capital increase and (iii) technological improvement (Todaro and Smith, 2011).

3.2 Model Specification

Model 1

AMGR = f (FPI, YPC, SE, GSH, LFP)..... (3.1)

Where,

AMGR = Adult Mortality Growth Rate; FPI = Food Production Index; YPC=Income per capita; SE = Secondary School Enrolment (% gross) for education; GSH = Government Spending on Health (% of GDP);LFP = Labour Force Participation Rate

This work extends the model by including adult mortality arising from insurgency, terrorism, communal and religious conflicts; captured as insurgency (INS).

The functional relationship now becomes:

AMGR = f (FPI, YPC, SE, GSH, LFP, INS)..... (3.2)

The econometric specification of the function in (ii) thus becomes:

$AMGR=\boldsymbol{\beta}_0+ \boldsymbol{\beta}_1FPI + \boldsymbol{\beta}_2YPC +\boldsymbol{\beta}_3SE + \boldsymbol{\beta}_4GSH + \boldsymbol{\beta}_5LFP + \boldsymbol{\beta}_6INS + \varepsilon_t$ ..... (3.3)

apriori expectation: $\boldsymbol{\beta}_1, \boldsymbol{\beta}_2, \boldsymbol{\beta}_3, \boldsymbol{\beta}_4$ & $\boldsymbol{\beta}_5<0$; $\boldsymbol{\beta}_6>0$

Recasting equation (iii) in a log-linear form, we have;

$AMGR_t=\boldsymbol{\beta}_0+ \boldsymbol{\beta}_1FPI_t + \boldsymbol{\beta}_2InYPC_t +\boldsymbol{\beta}_3SE_t + \boldsymbol{\beta}_4GSH_t + \boldsymbol{\beta}_5LFP_t + \boldsymbol{\beta}_6INS_t+\varepsilon_t$... (3.4)

To estimate the econometric model in (iv), this work will adopt the ARDL technique in order to avoid spurious results that may be easily occasioned by using OLS if the variables under study have different orders of integration,

We therefore recast equation (iv) as an autoregressive distributed lag (ARDL) model of the form:

$AMGR_t =\delta_0+\delta_1\sum\Delta FPI_{t-1} +\delta_2\sum\Delta InYPC_{t-1} +\delta_3\sum\Delta SE_{t-1} +\delta_4\sum\Delta GSH_{t-1} +\delta_5\sum\Delta LFP_{t-1} +\delta_6\sum\Delta INS_{t-1} + ECM_{t-1}+U_t$..... (3.5)

Model 2

Our second specific objective of this study is to determine the disaggregated effect of female and male adult mortality on economic growth in Nigeria. That is the effect of men and women mortality on economic growth respectively. To achieve this, we adapted the model of Lorentzen, *et al.*, (2008), which used the baseline growth specifications in Pamuk, *et al.*, 1998 and Alesina *et.al.*, (2000) in accordance with the neoclassical growth model of Solow (1956), to estimate the effect of mortality on economic growth. We also included other control variables to have the following model (Equation 3.6).

RGDPG=f (MAM, YPC, FERT, GFCF, SE, GEGDP, OPN. INF, LFP) Equation 3.14a(3.6)

RGDPG= f (FAM, YPC, FERT, GFCF, SE, GEGDP, OPN. INF, LFP) Equation 3.14b (3.7)

Where,

MAM = Male Adult Mortality (total male deaths between ages 15 and 60 per 1000 total population).

FAM = Female Adult Mortality (total female deaths between ages 15 and 60 per 1000 total population).

RGDPG = Real GDP growth (%)

YPC=Income per capita (Gross domestic product divided by midyear population; in naira)

SE = Secondary School Enrolment (% gross) for education; GEGDP = Government Expenditure (% of GDP), LFP = Labour Force Participation Rate (%); FERT= Fertility (%)

GFCF= Gross Fixed Capital Formation (% of GDP); OPN=Trade Openness (% of GDP)

INF = Inflation

The econometric specification of the functions in Equations (3.14a and 3.14b) thus becomes:

$$RGDPG_t=\alpha_0+\alpha_1MAM_t+\alpha_2YPC_t+\alpha_3FERT_t+\alpha_4GFFC_t+\alpha_5SE_t+\alpha_6GEGDP_t+\alpha_7OPN_t+\alpha_8INF_t+\alpha_9LFP_t+\varepsilon_t$$

Equation 3.15a(3.8)

$$RGDPG_t=\alpha_0+\alpha_1FAM_t+\alpha_2YPC_t+\alpha_3FERT_t+\alpha_4GFCF_t+\alpha_5SE_t+\alpha_6GEGDP_t+\alpha_7OPN_t+\alpha_8INF_t+\alpha_9LFP_t+\varepsilon_t$$

Equation 3.15b(3.9)

Recasting Equations (3.15a and 3.15b) in a log-linear form, we have:

$$RGDPG_t=\alpha_0+\alpha_1InMAM_t+\alpha_2InYPC_t+\alpha_3FERT_t+\alpha_4GFCF_t+\alpha_5SE_t+\alpha_6GEGDP_t+\alpha_7OPN_t+\alpha_8INF_t+\alpha_9LFP_t+\varepsilon_t$$

Equation 3.16a(3.10)

$$RGDPG_t=\alpha_0+\alpha_1InFAM_t+\alpha_2InYPC_t+\alpha_3FERT_t+\alpha_4GFCF_t+\alpha_5SE_t+\alpha_6GEGDP_t+\alpha_7OPN_t+\alpha_8INF_t+\alpha_9LFP_t+\varepsilon_t$$

Equation 3.16b(3.11)

a priori expectation: $\alpha_1, \alpha_3, \alpha_8<0$; $\alpha_2, \alpha_4, \alpha_5, \alpha_6, \alpha_7$ and $\alpha_9>0$

Also, recasting Equations (3.16a and 3.16b) as an autoregressive distributed lag (ARDL) model of the form:

$$\Delta RGDPG_t =\theta_0+ \theta_1\sum \Delta RGDPG_{t-1} +\theta_2\sum\Delta InMAM_{t-1} +\theta_3\sum\Delta InYPC_{t-1} +\theta_4\sum\Delta FERT_{t-1} +\theta_5\sum\Delta GFCF_{t-1} +\theta_6\sum\Delta SE_{t-1} +\theta_7\sum\Delta GEGDP_{t-1} +\theta_8\sum\Delta OPN_{t-1} +\theta_9\sum\Delta INF_{t-1} + \theta_{10}\sum\Delta LFP_{t-1} +ECM_{t-1}+U_t$$

Equation 3.17a(3.12)

$$\Delta RGDPG_t =\theta_0+ \theta_1\sum\Delta RGDPG_{t-1} + \theta_2\sum\Delta InFAM_{t-1} +\theta_3\sum\Delta InYPC_{t-1} +\theta_4\sum\Delta FERT_{t-1} +\theta_5\sum\Delta GFCF_{t-1} +\theta_6\sum\Delta SE_{t-1} +\theta_7\sum\Delta GEGDP_{t-1} +\theta_8\sum\Delta OPN_{t-1} +\theta_9\sum\Delta INF_{t-1} +\theta_{10}\sum\Delta LFP_{t-1} +ECM_{t-1}+U_t$$

Equation 3.17b(3.13)

3.2 Data Requirements and Sources

The data required for this study are values of the dependent and independent variables for the years, 1983 to 2023. Insurgency was used to capture the effect of terrorism, insurgence and conflicts on mortality (Niger Delta militancy, Boko Haram, Fulani Herdsmen, among others). Therefore, we used a threshold of 1000 adult death due to these factors to determine the years that will assume the value of 1 and 0. This means those years that we have up to 1000 deaths as a result of insurgency, terrorism and conflicts will assume the value of 1 while the other years will assume 0. The ARDL and descriptive statistics will be used to identify the determinants of mortality in Nigeria and to determine the disaggregated effects of adult male and adult female mortality on economic growth respectively and the cointegration among these variables.

4.0 Results and Discussion

Descriptive Statistics of Variables: Table 4.1 shows that food production index and labour Participation Rate has the highest mean of 72.93 and 58.407 among the variables that affect adult mortality and economic growth, followed by fertility, domestic investment, education and trade openness with

mean of 42.757, 35.943, 32.389 and 32.078 respectively. These variables in conformity to theoretical expectations are very important to economic growth.

Table 4.1: Descriptive Statistics

Variable	Observation	Mean	Median	Standard Deviation
Real GDP growth	41	3.150	4.196	5.467
Fertility	41	42.757	43.156	2.355
Food Production Index	37	72.934	73.170	29.002
Mortality	41	16.546	17.895	2.459
Trade openness	41	32.078	33.720	12.450
Secondary enrolment (% Gross)	41	32.389	28.831	9.910
Adult Female Mortality	41	362.715	360.183	17.950
Adult Male Mortality	41	405.455	413.603	19.003
Government Expenditure (% GDP)	41	3.719	2.091	2.831
Gross Fixed Capital Formation (% GDP)	41	35.943	34.049	19.390
Government Spending on Health (% GDP)	41	1.515	0.400	1.617
Insurgency	41	0.513	1.000	0.506
Income Per Capita	41	1699.919	1529.404	416.850
Log of Income Per Capita	41	3.218	3.185	0.102
Adult Mortality	41	768.170	773.992	35.862
Labour Participation Rate	41	58.407	59.810	2.748
Agric. Contribution to GDP	41	8473.149	5024.540	5702.712
Log of Agric. Contribution to GDP	41	3.821	3.701	0.316
Adult female mortality in %	41	36.266	36.018	1.753
Adult male mortality in %	41	40.430	41.352	1.925
Adult mortality in %	41	76.696	77.367	3.543
Inflation	41	18.949	12.877	16.659

Source: Author's calculations, using estimation data, 2023.

Unit Root Test Results: As a result of the nature of the variables and data available, it has become imperative to begin our empirical analysis by examining the time-series properties of the variables. The results displayed in Table 4.2 show that real GDP growth, fertility, mortality, adult mortality, and adult female mortality are stationary at level; and the other variables at first difference using the Augmented Dickey-Fuller test.

However, the Phillips-Perron test reveals that real GDP growth, adult female mortality, adult male mortality, insurgency, and mortality are stationary at level while the other variables are stationary at first difference. This shows that the variables under study

have different orders of integration (I(0) and I(1). Therefore, the ARDL bounds testing approach is suitable to examine the long run relationship among the variables.

Table 4.2: Unit Root Test Results

Augmented Dickey-Fuller (ADF)Test				**Phillips-Perron (PP) test**		
Variable	Level	First Difference	Order of Integration	Level	First Difference	Order of Integration
Real GDP growth	-3.982*	-10.314**	I(0)	-3.982*	-12.114**	I(0)
Adult Mortality	-4.352*	-12.472**	I(0)	-1.598	-4.540*	I(1)
Income Per Capita	-2.600	-4.265**	I(1)	-3.032	-4.855**	I(1)
Contribution of Agriculture to GDP	-0.281	-6.012**	I(1)	-0.283	-6.011**	I(1)
Fertility	-5.19**	-2.673	I(0)	-0.334	-4.023*	I(1)
Mortality	-4.15**	1.690	I(0)	-5.598**	-3.494	I(0)
Adult Female Mortality	-10.79**	-1.701	I(0)	-5.079**	-2.786	I(0)
Trade openness	-2.176	-4.704***	I(1)	-2.053	-11.246**	I(1)
Secondary enrolment(%Gross)	-3.223	-4.458**	I(1)	-1.962	-6.659**	I(1)
Adult Male Mortality	-1.550	-14.436**	I(1)	-5.542**	-3.245	I(0)
Government Expenditure (% GDP)	-1.957	-5.707**	I(1)	-1.957	-5.707**	I(1)
Gross Fixed Capital Formation (% GDP)	-2.641	-5.134**	I(1)	-2.564	-5.134**	I(1)
Government Spending on Health (% GDP)	-2.378	-6.316**	I(1)	-2.479	-6.556**	I(1)
Labour Participation Rate	-1.836	-7.080**	I(1)	-2.014	-7.247**	I(1)
Insurgency	-2.044	-5.869**	I(1)	-6.272**	-19.680**	I(0)
Inflation	-3.009	-6.549**	I(1)	-2.877	-10.369**	I(1)

** denotes the rejection of the null hypothesis at the 1% significant level; * denotes the rejection of the null hypothesis at the 5% significant level. **Source:** Author's calculations, using estimation data.

Table 4.3: Long-Run and Short-Run ARDL Relationship between Adult Mortality Rate and its Determinants.

Variable	Coefficient	t-statistics
Short-Run Relationship		
ΔFood Production Index	-0.135	-2.064**
Δ Insurgency	0.001	1.948*
ΔGovernment spending on health	-2.973	-2.129**
ΔSecondary school enrolment	-0.440	-4.358***
Δ log of Income per capita	-0.004	-1.070
ΔLabourforce participation rate	-0.605	-2.806***
Error correction (ECM_{t-1}) (Speed of Adjustment)	-0.096	-2.484**
Long-Run Relationship		
Food Production Index	-0.844	-2.161**
Insurgency	0.027	1.166
Government spending on health	-24.680	-1.831*
Secondary school enrolment	-1.975	-1.741*
log of Income per capita	-0.117	-3.491***
Labour force participation rate	-5.500	-1.882*
R-squared	0.89	
Adjusted R-squared	0.85	
Durbin-Watson statistics	2.055	

***Source*: Author's calculations, using estimation data.**
*****, ** and * denote statistical significance at the 1%, 5% and 10% levels, respectively**

Table 4.3 results show that adult mortality is determined in the short run by food production index and government spending on health as their coefficients are negative and significant at the 5 percent significance level; secondary school enrolment and labour force participation rate as their coefficients are negative and significant at 1% level of significance; and Insurgency which has a positive and significant coefficient at 10 percent significance level. This means that increase in food production index, government spending on health, secondary school enrolment and labour force participation rate will reduce adult mortality significantly, even in the short run while the reduction in the insurgency will also bring down adult mortality.

In the long run, our result shows that income per capita is a significant determinant of adult mortality with a negative and significant coefficient at 1percent level of significance. This is in addition to the other short run determinants. This relationship is clear because the more money people have, ceteris paribus, the better the food, housing and medical services they can pay for.

The ARDL bounds testing approach is suitable to examine the long run relationship among the variables. The results of the ARDL bounds test indicate that the computed F-statistic (4.09) exceeds the upper critical value (3.61) at 5% level of significance, suggesting that a long run relationship exists between adult mortality and its determinant in Nigeria.

Table 4.4: ARDL Results Showing the Effect of Men and Women Mortality on Economic Growth.

Variable	Women	Men
Short-Run Relationship		
ΔMortality	-10.080 (-3.059) ***	-15.504 (-2.924) ***
Δ Fertility rate	-65.755(-4.897) ***	-56.313 (-4.619) ***
Δ Log of Income per capita	77.780 (2.633) ***	96.049(2.853) ***
ΔGovernment expenditure	1.512 (3.167) ***	1.746 (3.604) ***
ΔTrade openness	0.035 (0 658)	0.033(0.524)
ΔInflation	-0.118(-2.785) ***	-0.107(-2.581) *
Δlabour Participation Rate	1.334(2.244)**	1.207(1.795)
ΔGross Fixed Capital Formation (% GDP)	0.160(1.577)	0.294(2.140)**
ΔSecondary school enrolment (-1)	0.536(3.182)***	0.5 5(4.517)**
Long-Run Relationship		
Error correction (ECM_{t-1}) (Speed of Adjustment)	-0.967(10.073)***	-0.931(-5.180)***
Mortality	-1.423(-4.737)***	-2.679(-3.022)***
Fertility rate	-7.587(-2.512)***	-5.079 (-1.926)*
log of Income per capita	14.479 (0.436)	34.938 (1.211)
Government expenditure	0.936 (1.989)*	1.057 (1.777)*
Trade openness	0.036 (0.669)	0.103 (1.531)
Inflation	-0.109(-2.870) ***	-0.099(-2.654) ***
labour Participation Rate	0.398(0.974)	0.511(1.078)
Secondary school enrolment	0.032(0.111)	-0.005(-0.015)
Gross Fixed Capital Formation (% GDP)	0.001(0.005)	0.029(0.265)
R-squared	0.903	0.930
Adjusted R-squared	0.845	0.857
Durbin-Watson stat	2.004	2.000

Note: t-values are in parentheses; *= 1% significant level; **=5% significant level; *=10% significant level. Source:** Author's Estimations, using estimation data.

The results in table 4.4 indicate that the negative and significant effect of adult male mortality (men) on economic growth in Nigeria in the short and long run with the coefficients of 15.504 and 2.679 respectively is greater than the negative and significant effect of adult female mortality (women) with the coefficient of 10.080 in the short run and 1.423 in the long run, all at 1% level of significance.

The R^2 shows that 97.8% of the variation in adult mortality is explained by the combined effect of all the explanatory variables.

Discussion of results

The ARDL regression results of Equations (3.17a) and (3.17b) presented in table 4.4 shows that men's mortality has more effect on economic growth in Nigeria than women's mortality. This may not be unrelated to the fact that some of the working age females in Nigeria are denied the opportunity to engage in productive activity for cultural and religious reasons, especially in the Northern part of Nigeria. The lower level of education of the girl child in some part of the nation may also account for this

disparity as only 1 out of 3 African girls is enrolled in secondary school. Although, there has been improvement in female literacy rates over the past decades, drop-out rates from secondary level education and above remain persistently higher among girls in less developed countries (Brinda *et al*, 2015) and recent industrialization move in Nigeria reduces the employment opportunities of girls, who lack higher education. This disparity could also be as a result of women marginalization, powerlessness and exclusion in the Nigerian social structure and governance processes.

5.0 Conclusion, Policy Implications and Recommendations

5.1 Conclusion

This study has revealed the need to reduce men and women mortality rate. It has made it clear that all aspects of mortality have a significant effect on economic growth. Therefore, a holistic approach to solving the problem of mortality in Nigeria will mean addressing each of the components (adult male and female mortality) appropriately, especially as regard to how they affect economic growth.

5.2 Policy Implications and Recommendations

Adult male and female mortality has a negative and significant effect on economic growth. This is not surprising because it is the adults that are directly involved in production process. This is in consonant with the work of Brander and Dowrick, 1994; Kelley and Schmidt, 1995; Bloom and Williamson, 1998; Kalemli-Ozcan, 2002. This then presents the fact that government need to throw more weight on implementation of policies that will reduce adult mortality such as investing in well equipped hospitals and medical facilities and paying medical workers internationally competitive remuneration to reduce brain drain in the health sector . The government should supply the necessary ammunitions to the law enforcement agent, tighten and closely monitor the recruitment process to prevent the infiltration of some of these terrorists into the Nigerian armed forces. These will reduce adult male and female mortality and the economic losses resulting from it.

To address the disparity presented in the result of this study, governments should make the political and financial commitments, in education, health, and labour, needed to promote gender equality and empower women and girls. They should ensure access to free and quality education at all levels that prepare young people, especially girls to fully participate in the formal labour market. When women and girls have equal access to education, economic opportunities, and rights, Nigeria will benefit from increased economic growth. Every state of the federation must create a social and legal environment in which women are able to pursue education and to work.

Most of the Nigerian culture especially the north, reflects two worlds; the decision-making, superior and more mentally developed men's world and the deprived, depraved, inferior and low mentally created women's world, a near master servant social construct. This is a retardant to economic growth and government must ensure that it is eliminated.

One very important way to enhance women's empowerment and to create a more gender-equitable environment is to lower fertility rates through birth control methods, as this frees up time and money which women can use to pursue education, to enter the labour force and to participate in public life. Antidiscrimination legislation in the workplace and credit market will also help improve women's opportunities for employment and productivity. Government at all levels should enlighten traditional and religious leaders on the benefit of formal education to a girl child. Policy measures for the reabsorption of school dropped out girls due to premarital pregnancy should be put in place by government to provide another opportunity for them to go back to school. Policies should be put in place to levy heavy fines on parents who put out their children for child marriage that deprives them of good education and economic life.

5.3 Contribution to Knowledge

This research work has been able to make significant contribution to knowledge especially regarding the Nigerian economy and mortality studies. It has been able to bring to the fore, hitherto

ignored determinants of mortality in Nigeria, such as human/environmental factors especially the effect of insurgency. It has also been able to assess the disaggregated effects of men and women mortality in Nigeria, in contrast to the aggregative approach used by most mortality studies

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