Maternal Mortality and the Role of Quality Education

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Abstract

Today, the issue of high maternal mortality is a topical problem in developing countries, in particular, Nigeria. The African Population and Health Research Centre put the incidence of maternal mortality in Nigeria at approximately 40,000 annually, accounting for roughly 20 per cent of the global maternal mortality. With the present situation of a high maternal mortality rate amidst different initiative or programme interventions in Nigeria, how vital is the role of quality education? The leading objective of this research is to pursue to a logical conclusion the policy feasibility of improved quality education towards maternal mortality reduction in Nigeria. Adopting the Autoregressive Distributed Lag method of estimation, the study, among others, suggested enormous evidence of a percentage increment in quality education leading to a maternal mortality rate reduction of up to 0.31 per cent in the short run and 1.45 per cent in the long run per annum.

Keywords: Maternal mortality, quality education, Nigeria, ARDL
JEL Classification Codes: O1, I1, I21

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1.1   Introduction

Though health and non-health related factors including a preference for home delivery to maternity or hospital visitation by pregnant mothers, inefficient health personnel, diseases outbreak such as Covid-19, overwhelming health facilities, illiteracy, poverty and income inequality lead to a high rate of maternal deaths, Cutler and Lleras-Muney (2006) have argued that education determines the health of individuals. A well-educated person is more likely to be undergoing regulated exercise, have access to and be willing to get preventive medical care like mammograms, flu vaccines, and colonoscopies. They also have a good understanding of their health and live longer. Education empowers individuals to be health-wise. The observed circumstance in the under-developing economies as showed by Zimmerman and Woolf (2014) suggest that educational attainment or status help to achieve a prolonged life expectancy or a situation of a reduced under-aged and maternal mortality rate among the people. Therefore, if education is developed the incidence of mortality gets reduced. This will be more if improvement in the quality of education that people receive is capitalized on in such environment.

The quality of education is gradually on an increasing track in Nigeria. As a matter of fact, the proliferations of private school in Nigeria has helped to bring in competition between the private and public schools leading to an increase in the quality of teachers employed, improvement in pupil-teacher ratio, and good access to internet service in the school which have contributed to the quality of education. But maternal mortality rate in the country is still worrisome. This is not without the efforts from the government and non-governmental bodies at national and international levels towards getting maternal mortality rate reduced in the country. Project initiatives or programs such as the Nigeria National Safe Motherhood project, the WHO and World Bank in collaboration with UNICEF Maternal Health Thematic Fund initiative, the creation of the Midwives Service Scheme in 2009, and the approval of the policy of free child and maternal healthcare in the 2000s were put in place to redress the high rate of maternal deaths in Nigeria (Eto, 2016). Yet, a case in point in the aftermath of these programmes or initiatives is the attendant growing figure of the incidence of maternal mortality recorded annually in Nigeria. African Population and Health Research Centre (2017) reported that after India, Nigeria is the major contributor to global maternal mortality. According to the report, an estimate of about 40,000 incidences of maternal mortality is recorded annually in Nigeria. Based on the World Health Organization's estimates, between 2005 and 2015, more than 600,000 maternal deaths and not few than 900,000 "maternal near-miss" cases were recorded in Nigeria.

With barely 10 years ahead of 2030 stipulated deadline of the Sustainable Development Goal (SDG) to achieve a maternal mortality ratio not higher than 70 per 100,000 live births worldwide, it is a reasonable claim that there is no substantial progress made in Nigeria. As estimated in 2015, the maternal mortality ratio in Nigeria is higher than 800 per 100,000 live births. In this, roughly 58,000 maternal deaths occurred in that year compared to 1700 maternal deaths observed in the 46 most advanced countries resulting in a mortality ratio of about 12 maternal deaths per 100,000 live births. Almost 20% of global maternal mortality occurs in Nigeria (WHO, 2019). The World Bank estimates indicate that in 2015, 2016 and 2017, the maternal mortality ratio in Nigeria stood at 931, 925 and 917 per 100,000 live births which are excessively higher than the global average ratio of 219, 214 and 211 per 100,000 live births respectively. Furthermore, "one Nigerian woman dies in every minute – that is 109 women dying each day from preventable causes related to pregnancy and childbirth" (African Population and Health Research Centre, 2017; p.1).

As a result, what impact does quality education has on maternal mortality in Nigeria? The primary concern of this paper is to empirically determine whether improvement in the quality of education could be used as a policy tool to minify maternal mortality in Nigeria. This study is important since most of the past studies focused extensively on education (school enrolment, educational attainment status and schooling leaving age) and health behaviour with no attention to the quality of the education that the people receive overtime.

The rest of this research is grouped under the following sub-sections. Section two deals with the literature review, methodology in section three, section four and five are the empirical findings and conclusion.

2.0   Review of Literature
2.1   Review of Theoretical Literature
Education had long been envisaged in the economic literature as one among the dominant determinants of health of an individual. Accordingly, health and education are related (Cutler & Lleras-Muney, 2006). Groot and Maassen van den Brink (2006) opined that there is a positive relationship between education and health. In this, Groot and Maassen van den Brink (2006) suggested three (3) possible reasons why health and education are positively related. The reasons raised are that: firstly, a better or quality education brings about improved health. Secondly, quality health permits a long term investment in education. Thirdly, there are some common factors like time preference, genetic endowment or social background that affect both education and health in a much similar manner. In the same spirit, Wolfe and Zuvekas (1997) highlighted five (5) health or health-related impacts of education. The first instance is the possibility of positive relations between an individual's education on one hand and on the other hand, the individual's own health status. The second point is that of a positive relationship between the health status of individual members of the family especially the children and the schooling. Thirdly is the positive relationship between an individual's personal schooling and the education that the children of such individuals received.

Fourthly, there is "a positive contribution of schooling to the efficiency of (consumer) choices". Lastly is the relation among schooling of an owned child, fertility choices of owned child schooling and personal fertility choices. Cesur, Dursun and Mocan (2014) argued that although a positive relationship between health outcomes and education is well documented in the literature irrespective of whether emphases were placed on the individual, using a data set on sick days or self-reported cases of health, or perhaps aggregation of units was used in the analyses, it is certain that the relationship between health outcomes and education raises with the age of the people. That is, the connection between health outcomes and education is much stronger and robust among older or aged segments of the populations compared to younger ones. Grossman (1972) provides a theoretical foundation that connects education and health outcomes together. According to the Grossman model, the demand for health is essentially a derived demand. In the model, that people want to be healthy and as a result of that, they demand health care.

Consequently, health care demand is a rising function of health variables like the quantity of medicine that people consumed, healthy habits in the form of regular exercise and good feeding among others. Factors of production through which the health care service are being produced are not exempted. Moreover, Grossman's model of healthcare demand presumes health (capital) to depreciate over time of which may be resuscitated by investment in health.   In the model,

"investment in people's health is produced by the individual economic agent's production function that utilizes the people's own time or inputs which include the medical care, diet, and alcohol and cigarette consumption. Here, education affects health since education is a booster of efficiency of health production. That is, educated persons are in a better position to produce enhanced health output with a given array of health inputs. Asides the efficiency of the productive channel of education, education could also exert impact directly on health outcomes via the so-called an allocative efficiency.

Under this system, an educated person is capable of producing outstanding health outcomes as a result of the fact that they select different combinations of input allocations when likened to their counterparts who are not so educated as they are. Precisely, education permits people to get hold of more information regarding the impacts or the effect of health inputs like exercise, medical care and so on that "alters the consumption of these inputs, health behaviours, and affects health outcomes". The impact of the quality of education that people received on health has vital implication for economic policy, especially in low and middle income or the developing countries like Nigeria. Education increases worker productivity and hence, the wage rate. With the growth in the wage rate, the worker would receive more income and therefore at an advantage to increase the household's consumption of both durable and non-durable health goods that could promote better health and assist to reduce preventable diseases that endanger life. Mccarthy and Maine (1992) framework of maternal mortality determinants suggests access to and use of health services (intermediate factors) and socioeconomic factors like income and education (distance determinants) as the causes of maternal mortality or complication.

In general, education is likely to improve health outcome via one of the following mediums: productive efficiency, that is, increasing efficiency in health production (Grossman, 1972), allocative efficiency in the form of varying input in health production (Grossman, 2005), in terms of time preference changing (Fuchs, 1982), behavioural pattern changing, such as preventive care, obesity and smoking (Huisman, et al. 2005); and lastly, earning bigger resources, like more income, higher occupational rank, better food, improved or quality of care, good housing as well as the outstanding living environment (see Case and Deaton, 2005: Cutler, et al., 2008).

2.0   Empirical Review of Literature
Empirically, Cesur et al (2014) assessed the effect of education on health as well as the health behaviour in the Middle-income Country on one hand, and the Low-Education Country on the other hand. The study adopted microdata on Turkish residents based on the nationwide surveys that were carried out by the Statistical Institute of Turkish in the years 2008, 2010 and 2012. The basic information gathered and analyzed are those of information relating to self-reported health, weight, height, as well as various indicators of smoking. Health behaviours such as consumption of vegetables, consumption of fruit, and flu vaccinations, even though their primary concerns were on smoking and obesity, were also considered.

The study finds that in the Middle-income Country, education level has no statistically significant effect on self-reported health, smoking, BMI, consumption of vegetables, consumption of fruits, or flu vaccination for women categorized under the age range of 18 to30. Also, for the men, education was found to have no statistically significant effect on these health outcomes as well as health behaviour, although with the exclusion of BMI. Lastly, better education owing to the

educational reform had a positive effect on the BMI coupled with the propensity to be obese in terms of men.

Huang (2015) examined the impacts response of health to education among the working segment of the population using China as a case study. The study establishes that an extra schooling year reduces "2-percentage points in reporting fair or poor health, 1-percentage points for underweight and 1.5-percentage points for smoking, and increases cognition by about 0.16 standard deviation". Additionally, the research suggests that income, nutrition, peer and cognition effects are vital channels in the health – educational nexus and that all of these factors account for roughly half of the impact of education.

Fonseca and Zheng (2011) conducted a cross-country study on the causal impact of Education on Health. The study combines SHARE, HRS and ELSA survey that incorporate a nationally representative sample of a person of 50 years of age and above from thirteen (13) OECD economies. The research employs IV-Probit models as the basic instrument of its analysis. The key findings of the study are that greater years of education bring about a lower probability of reporting a lower prevalence of diabetes poor health and hypertension. These casual effects are larger when compare to those obtained from the Probit for which endogeneity of education is controlled. Furthermore, the link between cancer and education is positive in both the Probit and IV-Probit techniques. Additionally, the causal effect of education on functional status and other chronic conditions could not be established in the model.

Albouy and Lequien (2009), adopting a longitudinal dataset in French, employed two (2) increases on minimum schooling age in France as an instrument for education. The study failed to establish a statistically significant impact of educational attainment on the mortality. Also, using the Danish school reform policy as an instrument (that is, instrumental variable) for education, Arendt (2005) found that the instrumental variable (IV) estimates of education on body mass index (BMI) was not statistically significant.

Jürges, et al. (2009) studied the causal link between health and education by employing two (2) nation-wide changes in the minimum age of leaving school in Britain as a variation in exogenous for education. The health outcomes are not limited to SRH and two blood fibrinogen, biomarkers, as well as the blood C-reactive protein. However, the study could not establish the impact of education on the two biomarkers. Also, the effect of educational attainment or level on SRH was found to be positively and statistically significant although only among the associates of older women but it was negative among women of the younger group and not significant for men irrespective of their age.

Thornton (2002) examined the determinants of maternal mortality in USA using 2SLS. The research suggests income, education, cigarette consumption, married households and crime as significant determinants of maternal mortality. A research by Sede (2020) revealed that government health expenditure, numbers of nursing and mid wives and education adversely affect maternal mortality in Sub-Saharan Africa.

3.0 Methodology and Data

3.1 Empirical Model

Following Thornton (2002), an aggregate simple semi-logged health production function where health linearly depends on economic and health factors is specified in equation (1) for the purpose of capturing the potential impact of quality education on maternal mortality in Nigeria.

$$lnM_t = \alpha_0 + \alpha_E lnE_t + \alpha_P lnP_t + \alpha_U U_t + \alpha_G lnG_t + \alpha_Q lnQ_t + \mu_t \qquad (1)$$

In equation (1), M_t stands for maternal mortality, E_t means quality education, P_t stands for (number of) physicians. Increased number of physicians indicates the level of the quality of health. U_t is the urbanization, G_t represents government expenditure on health, and Q_t is the health output per worker, all at time t. μ_t is the disturbance term in the model. ln denotes logged variable. Ratio variables such as maternal mortality rate were logged to control for outliers in the model. $\alpha_E, \alpha_P, \alpha_U, \alpha_G$ and α_Q are the model's parameters. Expectantly, $\alpha_E, \alpha_G, \alpha_Q < 0$; $\alpha_U, \alpha_P \lessgtr 0$. Urbanization could be negative or positive depending on whether, for instance, the pollution generated increases maternal mortality more than or less of the high income associated with the urbanized areas. Also, maternal mortality rate may increase or decrease depending on the efficiency gain or loss associated with a rising number of physicians.

3.2 Method of Estimation.

This study applied the Autoregressive Distributed Lag (ARDL) method. A justification for the selection of this method is that ARDL performs well irrespective of the order of integration of the series used in the study (Narayan, 2004). ARDL allows the inclusion of the predetermined variable (lag value of the dependent variable) as one of the explanatory variables so as to account for the variation in the current value of the dependent variables.

3.3 Data and Variables Definitions

This study is a time series analysis. It covers the period between 1986 and 2019 owing to lack of data for some variables (such as quality education) prior to 1986. The data gathered are on the maternal mortality as the dependent variable. The maternal mortality is measured per 100,000 live births. The primary control variable is quality education. Pupil-teacher ratio is used as a proxy for quality education. The UNDP (2019) identified pupil-teacher ratio, among others, as a good indicator of quality education. Other regressors are the number of physicians (per 1,000 people) used to measure quality of health, urbanization (annual percentage urban population growth), health sector productivity (health output as a fraction of health worker), and government expenditure on health in billion naira. Except health productivity and government expenditure on health compiled from the CBN 2019 annual statistical bulletin and National Bureau of Statistic (NBS), all data were collected from the World Bank Development Indicator (WDI). Table 4.7 in the appendix gives a summarized description of the data.

4.0 Empirical Findings and Discussion

4.1 The Unit Root Test Analyses

The stationarity test results summarized in Table 4.1 suggest that maternal mortality rate (lnM), health productivity (lnQ) and urbanization (U) are first-difference stationary variables. But, quality education (lnE), physicians (lnP), and government expenditure on health (lnG) are level-stationary variables. As a result, the variables of study combine order zero and one.

Table 4.1: Stationarity Test

| Variables | ADF Stationarity Test t - statistic | | Order |
	Intercept	Intercept & trend	
lnE	-3.478 (0.012)*	-3.660 (0.042)*	I(0)
lnM	-0.577 (0.863)	-1.053 (0.923)	
d(*lnM*)	-5.170 (0.000)*	-5.130 (0.001)*	I(1)
lnP	-0.929 (0.766)	-4.690 (0.004)*	I(0)
lnG	-5.702 (0.000)*	-0.720 (0.961)	I(0)
lnQ	-1.027 (0.727)	-2.049 (0.548)	
d(*lnQ*)	-0.779 (0.001)*	-4.728 (0.005)*	I(1)
U	-2.176 (0.218)	-2.036 (0.561)	
d(U)	-5.252 (0.000)*	-5.245 (0.001)*	I(1)

*means significant at 10%, 5% and 1%. The values enclosed in the parentheses are the p-values. Source: Authors' Estimation

4.2   Correlation Report

Through a correlation method, a rudimentary nature of the relationship between quality education and maternal mortality is illustrated. As suggested in Table 4.2, the degree of association between quality education and maternal mortality is rather weak but negative. The negative sign of the coefficient means that quality education and maternal mortality are oppositely trended. Nonetheless, the coefficient is insignificant at any level. In the case of other regressors, strong negative correlation is found between maternal mortality and government health expenditure and physicians and maternal mortality. Urbanization has a weak positive correlation with maternal mortality.

Table 4.2 Correlation Table

Correlation (t-Statistic)	Maternal Mortality	Quality Education	Govt. Expenditure	Physicians	Urbanization
Quality Education	-0.115 (-0.656)				
Govt. Expenditure	-0.819 (-8.081)*	0.116 (0.661)			
Physicians	-0.843 (-8.872)*	0.299 (1.772)**	0.733 (6.101)*		
Urbanization	0.188 (1.084)	0.404 (2.496)*	-0.220 (-1.212)	-0.124 (-0.706)	
Health productivity	0.724 (5.942)*	0.234 (1.362)	-0.456 (-2.895)*	-0.543 (-3.657)*	0.659 (4.952)*

*means significant at 10%, 5% and 1%, and ** at 10% level. Values in the parentheses are the t-statistic
Source: Estimated by the Authors

4.3 Bound Co-integration Test

The result of the ARDL Bound co-integration test is given in Table 4.3. It showed that the value of the F-statistic of 20.122 is greater than the upper critical values of the test. This suggests a rejection of no co-integration among quality education, physicians, health productivity, government health spending, urbanization and maternal mortality in the period under review.

Table 4.3: ARDL Bound Co-integration Test

$F_{(.)}$: 20.122; K = 5		
Critical Level	I(0)	I(1)
1%	3.960	5.603
5%	2.826	4.049
10%	2.361	3.433

Note: Restricted intercept with no trend is assumed
Source: Critical values culled from Narayan (2004)

The result in Table 4.3 further suggests the importance of time horizon in the analysis of maternal mortality and quality education. Therefore, the next result presented is on the estimated short run and long run impact of quality education on maternal mortality in Nigeria.

4.4 The Impact of Quality Education on Maternal Mortality

The estimated long run and short run results on the relationship between maternal mortality and quality education are presented in Table 4.4a and 4.4b.

Table 4.4a Long run Impact of Quality Education on Maternal Mortality

Variable (ARDL(1 3 3 3 3))[a]	Coefficients	S.E	Prob.
Quality Education	-1.452	0.621	(0.044)*
Physicians	-0.116	0.122	(0.368)
Urbanization	-0.147	0.040	(0.005)*
Health productivity	-0.142	0.080	(0.110)
Government health Exp.	-0.141	0.043	(0.010)*
C	14.970	3.039	(0.001)

*significant at 10%, 5% and 1% level
[a] Based on Akaike Information Critrion lag order selection
Source: Authors' estimation

Table 4.4a highlights the long run impact of quality education on maternal mortality. The estimated long run coefficient of quality education is negative, highly elastic and statistically significant. Thus, holding the effect of other factors in the model constant, there is statistical evidence that fall in the quality of education increases maternal mortality rate in Nigeria in the long run. *Ceteris paribus*, with elasticity of -1.45, on average, only a percentage increment in the quality of education that the people receive is required to achieve a maternal mortality reduction of up to 1.45 per cent per annum in the long run. For other control variables incorporated in the estimated model, the coefficient of the number of physicians, as anticipated, is inversely related to maternal mortality in the long run. This means that increase in the number of the physicians contributes to maternal mortality rate reduction in the long run. Surprisingly, the coefficient does not significantly differ from zero.

The long run coefficient of urbanization is negative and significantly differs from zero. The size of the long run negative impact of urbanization on maternal mortality is about -0.15 per cent per annum. Similarly, the effect of health productivity is negative in the long run but not significant. Thus, an increase in health productivity has no discernable impact on maternal mortality. Also, government expenditure on health has a negative impact on maternal mortality in the long run. If the influence of other factors in the model is zero, then, on average, a 10 per cent rise in government health expenditure reduces maternal mortality rate by roughly 1.4 per cent per annum. On the other hand, the short run estimates on the relationship between maternal mortality and educational quality is as in Table 4.4b.

Table 4.4b Short Run Impact of Quality Education on Maternal Mortality

Variable (ARDL(1 3 3 3 3))[a]	Coefficients	S.E	Prob.
Quality Education	-0.309	0.075	(0.003)*
Quality Education(-1)	-0.382	0.074	(0.001)*
Quality Education(-2)	0.616	0.129	(0.001)*
Physicians	-0.1236	0.042	(0.016)*
Physicians(-1)	0.034	0.011	(0.012)*
Physicians(-2)	-0.033	0.015	(0.062)**
Urbanization	-0.139	0.025	(0.000)*
Urbanization(-1)	0.003	0.023	(0.902)
Urbanization(-2)	0.028	0.019	(0.168)
Health Productivity	0.036	0.033	(0.313)
Health Productivity(-1)	-0.516	0.092	(0.000)*
Health Productivity(-2)	0.219	0.035	(0.000)*
Government health Exp.	-0.087	0.017	(0.001)*
Government health Exp.(-1)	0.017	0.004	(0.002)*
Government health Exp.(-2)	0.034	0.007	(0.001)*
ECM	-0.329	0.087	(0.004)
R-Square	0.9993		
Regression S.E.	0.009		
No. of Observation	34		

*significant at 10%, 5% and 1%; **significant at 10%
[a] Based on Akaike Information Critrion lag order selection
Source: Authors' estimation

It is clear from the result that the current value of quality education negatively affects maternal mortality. The coefficient is statistically different from zero as found in the long run but small than in the long run. The short run magnitude of impact of the current value of quality education on maternal mortality is roughly -0.31, improves to about -0.38 with a lag but the coefficient turns positive with the second lag meaning that a claim cannot be made that reduction in the maternal mortality in two years ago is as a result of an increase in the quality of education. Also, the result showed that an increase in the number of physicians contributes negatively to maternal mortality reduction in the short run. However, increased number of physicians appears not to reduce maternal mortality in the immediate past but did results in its decrement with the second lag. The result also suggests that the current rate of urbanization is negative and statistically different from zero in the short run.

The coefficient of urbanization is positive but not statistically significant with one lag although significant with a lag of 2. The current rate of health productivity in the short run is positive and statistically insignificant. However, a lag value of health productivity has a negative and significant impact on maternal mortality. Lastly, the estimated current value of government health expenditure negatively impact maternal mortality in short run. The coefficient is statistically significant at a 5 per cent level. Both the immediate and two lagged values of government expenditure on health are positive and significant in contrary to expectation. That is, in short run, government expenditure on health sector has probably not contributed to maternal mortality rate reduction in the past. The speed of adjustment from the short run to long run is approximately 0.34 which implies that about

34 per cent of the disequilibrium between the short run and long run in the maternal mortality growth rate is corrected in a year.

4.5   Diagnostic and Stability Tests
The summary of the test of validity of the estimates is in Table 4.5. The report showed that the estimated result passed the entire test, indicated by their respective p-values.

Table 4.5 Diagnostic Test

Test	F-Statistic	Prob.
Heteroskedasticity (White)	0.578	0.856
Serial Correlation LM	2.249	0.176
Ramsey RESET	0.036	0.855
Normality (Jarque-Bera)	1.615 (0.446)	

Sources: Authors

Furthermore, the plotted CUSUM and CUSUM Square graphs (in the appendix) suggest that the model is stable. The residual plot in the appendix clearly suggests a good fit, similar to the gesture implied by the estimated R-square coefficient.

4.6   Variable Omission and Redundant Tests
Table 4.6a presents the variable omission test. The result suggests a joint significant of quality education and other variables in the estimated model.

Table 4.6a Test for Omitted Variable
H0: QE are jointly significant

	Value	Prob
t-stat.	0.186	0.854
F-stat.	0.035	0.854
Likelihood ratio	0.048	0.826

Table 4.6b Redundant Test
H0: QE are jointly insignificant

	Value	Prob
t-stat.	6.318	0.000
F-stat.	39.92	0.000

Source: Authors' estimation

Although quality education is shown to have a negative effect on maternal mortality, it may at the same time be redundant in the model. Table 4.6b presents the result of redundant test on quality education. It follows, from the table, that quality education played active role in the estimated model.

4.4   Discussion
Following the high rate of maternal mortality amidst the upward trend in the level of education recorded over the years in Nigeria, this paper focuses on identifying the potential effect of quality

education on maternal mortality. In the results estimated, quality education inversely link to maternal mortality both in the long run and short run. This suggests to a reasonable extent that a fall in the quality of education is a motivating factor for a high rate of maternal mortality in Nigeria in the past and could further hinder maternal mortality reduction in the future. Particularly in the long run, it is fortunate that the elasticity coefficient of quality education in the model is larger than one which implies that a small improvement in the quality of education will necessarily induce a large decrement in the maternal mortality rate. Therefore, quality education is a good policy tool to control maternal mortality. Equally, it is evident that maternal mortality rate gets reduced with the number of physicians in the short run. This point towards the importance of having additional professionals in the health sector to increase the quality of health in order to reduce the incidence of a high rate of maternal mortality in the country in the short run.

Indeed, more physicians may mean a rise in the quality of health that the people receive and a decline in maternal mortality rate. However, this may not continue in the future owing to a possibility of redundancy of some physicians as their number increases in the long run. Urbanization reduces maternal mortality rate in the short run and long run. The negative impact of urbanization stems from several factors. One, urbanization attracts more medical professionals. Two, modern maternity and hospitals – good health facilities are mostly found in the urban areas, and expand as the area become more urbanized. Three, income (owing to job availability, increased market demand etc) is usually high in urbanized areas. The economic benefits of these factors are higher than the cost of urbanization such as pollution and congestion. Hence, maternal mortality rate reduced with increasing urbanization. More so, government health expenditure reduces maternal mortality rate in the long run. Only in the current period will government health spending produces a desirable effect on maternal mortality in Nigeria in the short run.

4.6   Policy Suggestions
Based on the aforementioned findings, to reduce maternal mortality in Nigeria, it is obvious that:
   a) There is need for improvement in the quality of education.
   b) Urbanization of the less-developed areas must be encouraged.
   c) There should be an increase in the level of government expenditure on health sector.
   d) Output per worker in the health sector must be improved especially in the short run.

5.0   Summary and Conclusion
This paper assessed the impact of quality education on maternal mortality in Nigeria using the ARDL approach. Fundamental in the result obtained is the enormous statistical evidence that an increase in the maternal mortality rate in the long run and short run is closely associated with low quality education in Nigeria. For this reason, the study concluded that far greater reductions in the rate of maternal mortality are possible through improvement in quality education in Nigeria.

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Appendix

Fig.1 CUSUM Plot
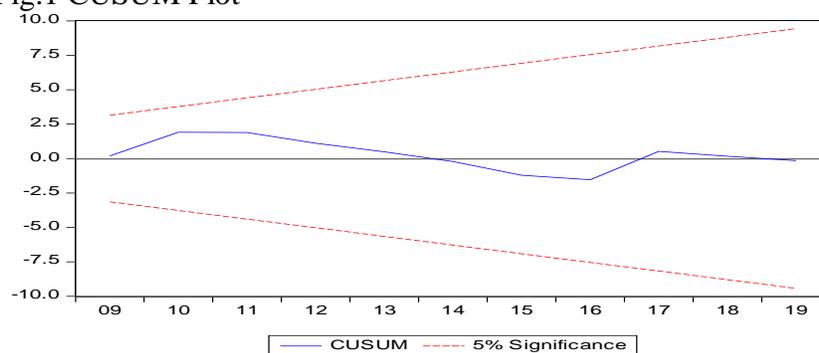
Fig.2 CUMSUM Square

Fig.3 Residual Plot
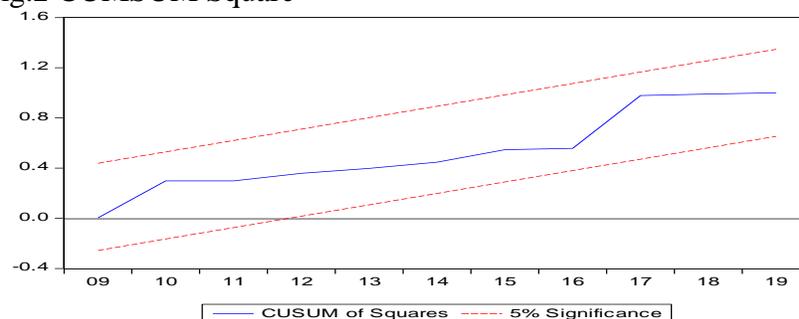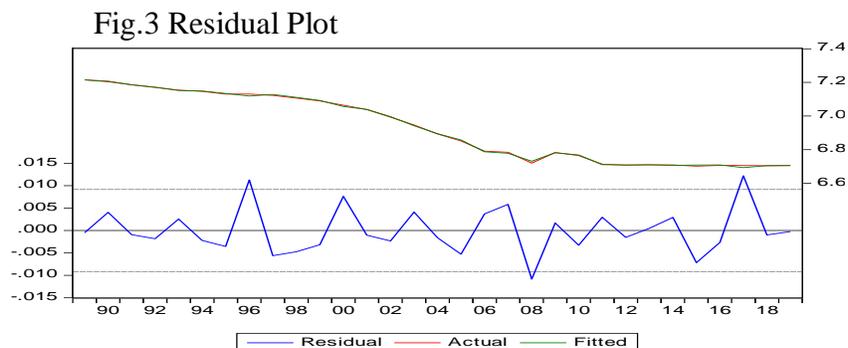
Table:4.7 Data Descriptions, sources and Descriptive statistic

Var.	Variable Descriptions	Source	Mean	Min	Max	S.Dev.
M	Maternal Mortality: Deaths related to pregnancy complications, and that which occurs within 42 hours after birth measured per 100,000 live births	WDI	1066	814	1380	218
E	Quality education, quantified by the level of pupil-teacher ratio, relates to the degree of soundness, value or originality of skills and knowledge acquired through schooling.	WDI	39.30	33.83	46.09	2.71
Q	Health productivity refers to health output as a fraction of heath workforce (in million), an index of health sector performance or efficiency	CBN Annual Statistical Bulletin, NBS	2230398	66808	12378487	3749011
P	Physicians, measured per 1,000 people, a proxy for health quality	WDI	0.27	0.18	0.45	0.08
G	Government expenditure on health sector. Measured in billion naira	CBN Annual Statistical Bulletin	84.4	0.04	388.4	106.39
U	Urbanization measured as annual percentage of urban population growth)	WDI	4.61	4.05	5.60	0.49