Economic Determinants of Maternal Mortality in Nigeria: 1980 - 2016

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Abstract

The study assessed the economic determinants of Maternal Mortality in Nigeria for the period between1980-2016. It relied on secondary data from the Central Bank of Nigeria and the Federal Bureau of Statistics and the World Bank. The data was subjected to two stage single equation co-integration procedure and the co-integration tests based on error correction model (ECM). The study found that an increase in real wage leads to decrease in maternal mortality rate. Inflation and unemployment rate have positive relationship with maternal mortality rate. But it was found that real wage and unemployment rate contribute significantly to maternal health status in Nigeria and therefore addressing the challenge of low income and high unemployment rate would pay off in terms of reducing maternal mortality rate in Nigeria.

Keywords: Real Wage, Unemployment, Inflation, Maternal Mortality Rate
JEL Codes: I12

1. Introduction

The state of maternal health in a society is one of the major indicators of its development. It is also an indicator of the performance of the health care delivery system. Reduction in maternal mortality is a major development priority of many governments and it has remained a serious intervention agenda of many global initiatives including the erstwhile Millennium Development Goals (MDGs) and the Sustainable Development Goals (SDGs).

Maternal health is a common health challenge that affects both developed and underdeveloped countries almost everywhere. Despite the advancement in reproductive health and technology, high income countries still contend with the problem of maternal health because maternal health is such an important component of general health and a prerequisite for economic and human development. Maternal mortality is an important indicator of maternal health and a significant pointer of nation's welfare (Herfon, 2006).

Countries have evolved several strategies to reduce its rates to the barest minimum. At the turn of the Millennium, Nigeria signed onto the MDG along with other countries of the world. Given her circumstance, Nigeria's reduction of maternal mortality burden to 75% by 2015 was one of her health policy goals. By 2010 World Bank report showed that Nigeria was still among the countries with very high Maternal Mortality Rate (MMR) figures in the world. This shows that women's health still faces serious challenges in Nigeria. Nigeria accounts for 14% maternal death. Records also show that Nigeria is 1 of the 10 most dangerous countries to give birth. It is also estimated

that 630 of every 100,000 live birth in Nigeria result in maternal death. This means that as a nation we are not just losing vital human capital through avoidable deaths but equally decapitating the few remaining women and denying them of helping to build the economy.

During recession economic indicators such as real GDP, income, employment, manufacturing, and retail sales are low. These low levels of economic indicators affect the livelihoods of virtually everyone in one-way or the other. Reduced income during period of economic recession leads to reduced feeding and even lower attention to health care. Economic recessions are characterized by a dull in economics activities, reduction in the flow of money resulting to low earnings by the households. This ultimately reduces households' social and economic well-being especially the low income households.

Since high maternal mortality rate deteriorates the productivity of a nation, the economic determinants of maternal mortality are of considerable importance. Many possible causes of maternal mortality have been suggested in the literature and this paper critically fills the gap in literature by examining the economic determinants of maternal mortality. The rest of this paper is constructed as follows. In section 2 we review literature on the determinants of maternal mortality. In section 3 we present the theoretical background and methodology, while in section 4 we present our results and discussions of our results. The last section offers some concluding comments and recommendations

2. Literature Review and theoretical framework

Empirical Literature
Ujah (2005) made use of a seventeen-year review of factors contributing to maternal mortality in North-central Nigeria. The study found a bimodal pattern of maternal deaths occurring at both extremes of the reproductive age range. The study found that the greatest risk of maternal mortality was among early teenagers and older women. The study also found that the ethnic groups of women were also an important risk factor for maternal mortality.

Shiffman and Okonofua, (2007) examined ''the state of political priority for maternal mortality reduction in Nigeria''. Their study showed that the priority was in its infancy and that advocates the need to coalesce into a potent political force which will push the government to take appropriate action to reduce maternal mortality.

Abe and Omo-Aghoja, (2008) in a ten year retrospective study of maternal mortality at the Central hospital in Benin City, Nigeria identified leading causes of maternal deaths. The leading direct causes were sepsis, hemorrhage, obstructed labor and pre-eclampsia, while the major indirect causes were institutional difficulties and anemia. The study found that low literacy, high poverty rate, extremes of parity and non-utilization of maternity services were associated with maternal mortality. The overall maternal death ratio was 518/100,000. The maternal mortality ratio was accessed to be 30 times higher in un-booked as compared to the booked patients, while 60% of maternal deaths were discovered to occur within 24 hours of admission.

Mairiga (2008) carried out a population-based qualitative study in two rural and urban communities in Borno state, Nigeria. The aim of the study was to find out the community's knowledge and perceived implications of maternal mortality and morbidity as well as the community members' view on the ways to prevent the scourge. This study was carried out through focus group discussion. The study showed that maternal mortality and morbidity is common and well known in the communities studied and that the implications are well appreciated. The study also found that the communities had the perception that the causes of maternal deaths were medicinal, cultural and socio-economic.

Shah and Say (2007), produced a paper on Maternal Mortality and maternity care. The two authors showed that the gains in maternal mortality reduction between 1990 and 2005 have been modest and uneven. They also showed that countries with high maternal mortality rates shared problems of unplanned pregnancies and high fertility, low availability of health personnel and poor health infrastructure.

Harrison, (2009) showed that attempts to reduce the high maternal mortality ratio in Nigeria have failed. He argues that the uniqueness of Nigeria's situation calls for a fundamental remedy based on stamping out the chaos in the country. This could be done by the country getting its politics and governance structures right.

Benedict et'al, (2011) assessed the "Distribution of causes of maternal mortality among different socio-demographic groups in Ghana". The maternal mortality ratio of Ghana was assessed to be very high. The aim of the study was to analyze the causes of maternal mortality according to socio-demographic factors in Ghana. The causes of maternal deaths were assessed with respect to educational level, age, residence status, and marital status. The results of this study showed that the highest cause of maternal death was Hemorrhage (22.8%). The study shows evidence of variations in the causes of maternal death among different socio-demographic subgroups in Ghana that should not be overlooked.

Meghnae'tal, (2013) examined "An analysis of Pregnancy-Related Mortality in Health and Demographic Surveillance System in Western Kenya''. This group of scholars evaluated deaths that occurred between 2003 and 2008 among women of childbearing age using Health and Demographic Surveillance system data in rural western Kenya. Deaths were categorized as either obstetric or non-obstetric. Their study indicated low uptake of maternal health interventions in women dying during pregnancy and postpartum, suggesting improved access to obstetric care.

3. Methodology

Theoretical Framework

The theoretical framework for this study is based on Grossman, (1972) cited in Sede (2014) Health demand model. He specified the utility of time (t) given some choice set as:

$$U_t = (_t, H_t, Z_t) \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots 3.1$$

Where:

H_t= the total stock of health at t, $_t$= fraction of H_t consumed at time t and Z_t = these are bundles of goods consumed for utility at t. They are choice or control variables. It should be noted that Z_t can be any good, service or habit consumed any time from which the consumer derives utility, the moral judgment notwithstanding.

Thus equation (1) states that the amount of utility available to an individual at time t is a function of the total stock of health (H_t) and the total stock of other goods (Z_t) consumed. Implied in equation (1) is that $_t$ is a measure of service flow per unit of health stock. Thus total consumption of health services is given as:

$$H_t = h_t\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots 3.2$$

(h_t) is also Grossman 'good health'. Another point to note is that the time path of life ranges from zero to death time (T).

$$\text{Hence; } t \ (0, T)\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots 3.3$$

From (3) above Grossman, (1972) derived the death function as $T = f(H_t) \ldots\ldots$ (3.4)

Grossman 1972 also asserted that if the current total stock of health (H_t) available for an individual is less than the minimum stock of health required for survival then death will occur. Thus; $H_t H_{min}$ = Death (T). Further to this assertion Grossman, (1972) postulated that every individual is born with some initial stock of health (H_0). Thus to him (H_0) is exogenously given and it depends on genetics and start up environment of the individual. He asserted that without good health, optimal amount cannot be produced according the level of education, even though education is crucial to the enhancement of a virile human capital because it relates directly to the productive

capacity of individuals and thus becomes a major determinant of earning. From (4) above, it follows that death is a direct function of H_t. This therefore necessitates the derivation of H_t function.

Grossman (1972) reasoned that health is not demanded to be consumed on its own. To him, 'good health' is the actual good that is consumed and cannot be directly observed. Thus demand for health is a derived demand. It is demanded for the purpose of obtaining 'good health'. It can also be seen as both inputs to the utility function and output from the endogenous production of human capital. Hence good health is an input to the process of producing human capital that will enable the individual produce healthy time that can then be spent on effective labor output which also helps in budget optimization. On the other hand, 'good health' as an output, is a product produced for utility maximization by the consumers. This study adopts the output orientation of "good health" since it focuses on maternal mortality rate as a dependent variable. Grossman, (1972) and Jaana-Maija, (1982) had a contemporaneous conceptualization of future health as a sum of current health and the investment on health minus depreciation. Thus:

$$H_{t+1} = H_t + I_t - {}_tH_0 \dots\dots\dots\dots\dots\dots 3.5$$

Where:

H_0 = exogenous endowment of health. It is a function of genetics and environment, H_t= total stock of health at current time, H_{t+1} = future stock of health, I_t = Grossman investment on health, and $_t$ is the depreciation rate, it is a function of age and it declines to zero at death. From the foregoing the following holds: = f(age). That is, Lim_0. Thus given Grossman (1972), Donald (1991) health investment function of
$I_t = f(Y, E)$ then,

$$H_{t+1} = H_t + Y + E - H_t + Z_t \dots\dots\dots\dots 3.6$$

Equation 6 states that future health depends on current health stock (H), income (Y), Stock of education (E), the proportion of depreciated health (H_t) and other

consumption stocks (Z_t). From (6) above H_t can be derived as:

$$H_t = H_{t+1} - Y - E + H - Z \dots\dots\dots\dots 3.7$$

Noting that at death $_t$ becomes zero and that at death and H_{t+1} ceases to function in the life model of the individual, they thus reduce to zero. From the foregoing it is deduced that:

$Lim0$ and $limH_{t-1}0$. Thus the value of H_t that will satisfy H_tH_{min} = Death (T) will be;

$$H_t = -Y - E - Z \dots\dots\dots\dots\dots\dots 3.8$$

Substituting for T, to get the death model then:

$$T = -Y - E - Z \dots\dots\dots\dots\dots\dots 3.9$$

Equation 9 shows that income, education and other assets or good enter the death (mortality) model as negatives, showing that they are inversely related to mortality. Equation 9 above can be linearized to yield an econometric model of the sort:

$$T = {}_0 - {}_1Y - {}_2E - {}_3Z + \dots\dots\dots\dots 3.10$$

Equation 10 states that mortality is a function of income (Y), education (E), amount of other utility creating goods consumed (Z).

Model Specification
Following the theoretical framework above, equation 10 can be modified and adapted for estimation. Therefore, we specify the economic determinants of maternal mortality as:

$$MMR_t = f (RWGR_t, PHEXP_t, INF_t, UNEMPR_t) \dots\dots\dots\dots\dots 3.11$$

Where: MMR = Maternal Mortality Rate, RWGR = Real wage rate, PHEXP = Private Health expenditure, INF = Inflation rate, and UNEMPR = Unemployment rate

Following from equation 11 stated above, an econometric form of the equation in log-linear form is specified in equation 12 as:

$$LMMR_t = \beta_0 + \beta_1 LRWGR_t + \beta_2 LPHEXP_t + \beta_3 LINFR_t + \beta_4 LUNEMPR_t + \mu_t \dots\dots\dots 3.12$$

μt is a random error term representing all other variables not specified in the model.

A-priori expectations are as follows: $\beta_1, < 0$ while $\beta_2, \beta_3, \beta_4 > 0$

Estimation Technique

The study employs cointegration and error correction modelling techniques to investigate the economic determinants of corruption in Nigeria, using data from 1980 to 2016. The choice of methodology draws from the need to identify the short run effects of the economic determinants of maternal mortality in Nigeria within the period covered by the study. The methodology involves three steps. The first step is the test for stationarity using the Augmented Dickey Fuller (ADF) to determine the order of integration of each variable series. This is followed by the test for cointegration using the Engle and Granger technique, which entails investigating the existence or otherwise of long run relationship(s) among the variables, and thirdly, if cointegration is detected, an error correction model is estimated to represent the short run relationship between the dependent variable and explanatory variables. Accordingly, Asteriou and Hall, (2007) noted that if variables are cointegrated, they move together over time so that any disturbances in

the short-run are corrected. This indicates that if two or more variables are cointegrated, they may drift at random from each other in the short run, but will return simultaneously to equilibrium in the long run.

Sources of Data

This study employs annual time series data on Maternal Mortality Rate, Real wage rate, Private Health expenditure, Inflation rate, and Unemployment rate. The dataset were sourced from various issues of the Statistical Bulletin of the Central Bank of Nigeria and World development indicators.

4. Presentation of Result and Analysis

This section deals with the presentation and analysis of the empirical results obtained from the estimation. The study examined the economic determinants of maternal mortality in Nigeria.

The Unit Root Test

Stationarity test was conducted on the variables using the Augmented Dickey-Fuller test. The results of the unit root test are presented below in table 4.1.

Table 4.1: Unit Root Test Results.

Variables	ADF statistics at level	Critical value (5%)	Remark	ADF statistics at 1st difference	Critical value (5%)	Remark	Order of integration
LMMR	-3.794	-3.548	Stationary	-6.789	-3.564	Stationary	1(0)
LINF	-3.782	-3.544	Stationary	-6.574	-3.548	Stationary	1(0)
LPHEX	-2.605	-3.552	Not Stationary	-5.066	-3.562	Stationary	1(1)
LRWAGE	-1.542	-3.562	Not Stationary	-6.752	-3.562	Stationary	1(1)
LUNEMP	-2.041	-3.544	Not Stationary	-5.932	-3.548	Stationary	1(1)

Source: Author's Computation (2018)

From the unit root test presented in table 4.1 above, it is observed that the maternal mortality rate variable is stationary at level because its ADF statistic is greater than the critical value at 5% level in absolute values.

The Engle-Granger Co-integration Results

From the results below, it can be observed that there is one co-integrating equation as one of the variables is found to be statistically significant.

Table 4.2: The Engle-Granger Co-integration Results.

Variables	tau-statistics	Prob.*	z-statistic	Prob.*
LMMR	-2.098180	0.9266	-5.768832	0.9811
LINF	-4.902710	0.0495	-50.09544	0.0000
LPHEX	-3.178434	0.5371	-14.69290	0.5897
LRWAGE	-2.182298	0.9102	-7.995177	0.9379
LUNEMP	-3.113582	0.5674	-14.83518	0.5802

Source: Author's Computation (2018)

Inflation rate (inf) is co-integrated under the tau-statistics and the z-statistics with probability of 0.0495 and 0.0000. This leads us to state that the series are co-integrated since at least there is a co-integrating equation.

Error Correction Representation for the model

Table4.3. Error Correction Representation for the model based on the Akaike and Schwarz information criterion

Explanatory variables	Coefficient	Standard error	t-statistic
D(LMMR(-1))	-3.747245	2.346892	-1.596684
LINF	-0.014605	0.011738	-1.244224
D(LINF(-1))	0.000457	0.008539	0.053556
LPHEX	0.023011	0.014652	1.570436
D(LPHEX(-1))	-0.020111	0.018853	-1.066763
LRWAGE	-0.055851	0.018678	-2.990130
D(LRWAGE(-1))	-0.000506	0.000278	1.820537
LUNEMP	-0.087079	0.031476	-2.766536
D(LUNEMP(-1))	0.001246	0.023411	0.053214
ECM(-1)	-0.738724	0.276143	-2.674514

R-Squared = 0.983929
R-Bar-Squared = 0.972449
F-Stat = 85.71121
D.W = 2.014553

Source: Author's Computation (2018)

An examination of the econometric result shows that the overall goodness of fit is very satisfactory with the R-squared of 0.983929 and the adjusted coefficient of determination, R-bar-squared of 0.972449 which are the coefficient of determination.

The R-squared of 0.983929 indicates that about 98.39% variation in maternal mortality rate is explained by the variation in inflation rate, real wage rate, private health expenditure and unemployment rate. The F-Statistic of 85.71 is significant at 5 percent level of significance since it calculated f-value is greater than the tabulated f-value 2.60. The D.W statistic is 2.014 which is significantly close to 2. This means that the model is free from autocorrelation and the model is reliable in explaining the economic determinants of maternal mortality in Nigeria.

Using the Akaike and schwarz Information criterion based on parsimonious error correction model presented in the table 4.3 above, it is observed that the coefficient of real wage well behave since its coefficients have a sign of -0.055851 which conforms to theoretical expectation. An increase in real wage will lead to decrease in maternal mortality rate. This means that a 10 percent increase in real wage would lead to 0.559 percent decrease in maternal mortality rate.

It is also observed that the coefficient of private health expenditure well behave since its coefficients have a sign of 0.023011 which conforms to theoretical expectation. An increase in private health expenditure will lead to increase in maternal mortality rate. This means that a 10 percent increase in private health expenditure would lead to 0.230 percent increase in maternal mortality rate.

While inflation and unemployment rate of -0.014605 and -0.087079 have negative relationship with maternal mortality rate, these do not conform to apriori expectation. However, the lag one period of inflation and unemployment rate of 0.000457 and 0.001246 has positive sign respectively and the explanation will be done base on lag one period. This means that a 10 percent decrease in inflation and unemployment rate would lead to 0.00457 and 0.0125 percent decrease in maternal mortality rate. A closer look at the t-statistics of the independent variables, give their levels of significance respectively. From table 4.4 presented above, it can be seen that real wage and unemployment rate are statistically significant at 95 percent and 90 percent level. This is because the t-statistic of -2.990130 and -2.766536 are greater than the critical t-values of 2.060 at 95 percent level and 1.708 at 90 percent level in absolute terms. While inflation rate and private health expenditure are insignificant at 95 percent and 90 percent level, since their t-statistic of 1.596684 and 1.570436 are less than their critical t-values of 2.060 at 95 percent level and 1.708 at 90 percent level.

From the table 4.3 above, the ECM(-1) has a coefficient of -0.738724 and its t-value of -2.674514 is significant at 95 percent confidence level since it is greater than the tabulated t-value which is 2.060. It is also significant at 90 percent level. -0.738724 percent of the long run deviation has been corrected by the ECM(-1). Hence, the model is stable in the long run.

Policy Implications
Based on the results from the table 4.3, the following implications were deduced from the study;

Inflation has a positive relationship with maternal mortality rate. An increase in inflation rate would reduce the purchasing power of household; this would in turn reduce the amount spent on maternal health care, thus, increasing maternal mortality rate.

Real wage rate have a negative relationship with maternal mortality rate, hence an increase in real wage rate have implication of increasing maternal health care, thereby reducing maternal mortality rate in the country. If real wage increases, people will have more to spend, therefore aggregate demand for maternal care would continue to increase.

Private health expenditure have a positive relationship with maternal mortality rate, hence an increase in private health expenditure have implication of decreasing maternal health care, thereby increasing maternal mortality rate in the country. If private health expenditure increases, people will have to spend more, therefore aggregate demand for maternal care would continue to decrease.

Unemployment rate have positive relationship with maternal mortality rate. This can be seen from the point of view of a country with high unemployment rate. High unemployment rate in a country leads to social and economic problems in the country as a whole. Economic problems result in less production of goods and services, less distribution of income, loss of tax revenues, fall in GDP rate and little or no demand for health care etc. Social problems cause's social ills and shows effect on individuals financially and psychologically. Individuals cannot meet their financial obligations on time and getting high stress which leads to problems like ill-health, maternal mortality, premature death, suicides etc.

Moreover, the effects of unemployment are social too, not just economic. Frequently, crime rates rise as people are unable to meet their needs through work. Divorce rates often rise because people cannot solve their financial problems. The rate of homelessness rises, as do the rates for mental and physical illness. Homes are foreclosed upon or abandoned, and neighborhoods deteriorate as a result. When there is high unemployment, people pay less in income taxes and also pay less in sales taxes because they purchase fewer goods and services.

The policy implications above show that a proper implementation of government

policies would surely be beneficial to the country if government recognizes the relationship between real wage, private health expenditure inflation, and unemployment which serve as key economic determinants of maternal health care in the country.

5.Conclusion and Recommendations

Based on the empirical evidence of the study, it was found out that recession and inflation contributes significantly to maternal health status in Nigeria. This by implication means that if Nigeria is to achieve increase in maternal care demand (reduction in maternal mortality), it is of utmost importance that a sound macroeconomic policy mix which will ensure stable real wage and low inflation and low unemployment rate should be implemented. Thus, the study recommends that:

• Inflation should be control through fiscal and monetary measures so as to maintain a general stable prices.

• Maternal health status can be improved by reducing the unit cost of health services and thus, all things being equal, greater health coverage will be achieve.

• Government should pursue policies and programmes aimed at ensuring stability in real wage which in turn will increase maternal health care.

• It is not only the responsibility of the government to take initiation in reducing the unemployment problem, every individuals has to take step to overcome this problem. Lot of adjustments is to be done by the individuals to come out of unemployment situation. This can be done by cutting down unnecessary expenditures and also encourage other family members to find jobs so that they can compensate in income generation. Government policy gear towards unemployment reduction like unemployment compensation, creation of more job, increase of government expenditure on small and medium scale enterprise (SME) and provision of entrepreneurship centers should be implemented as this will boost the employment level and living standard in the country. This in turn will increase private health expenditure on maternal health care. These involve Formulation of effective unemployment policies that would absorb the unemployed citizens especially into informally sectors of the economy.

Based on the findings in this study, inflation rate and unemployment rate have positive relationship with maternal mortality rate. Hence government policy aimed at reducing inflation and unemployment rate such as a mix of tight monetary policy which keeps inflation rate in check and an expansionary fiscal policy which would reduce unemployment rate while raising the real wage rate and private health expenditure would definitely reduce maternal mortality rate to a barest minimum.

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