

Trends and Patterns of Maternal Mortality in Nigeria: Any link with Economic Growth?

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ABSTRACT

By recent WHO records, Nigeria is the third most unsafe place in the world to procreate as it's one of the leading countries with the worst maternal mortality rates after South Sudan and Chad. This study was conducted to assess the trends and patterns of maternal mortality in Nigeria and to determine if it has any association with economic growth. Ordinary least squares regression was employed in the study and findings showed that a significant increase in female life expectancy ($p < 0.01$) and economic growth ($p < 0.05$) leads to a reduction in maternal mortality. However, increase in female fertility rate ($p < 0.01$), life time risk of maternal death ($p < 0.01$) and neonatal mortality rates ($p < 0.01$) significantly leads to an increase in maternal mortality in Nigeria. Policies that will encourage economic growth effectively are recommended. Adequate funding should be granted the health sector to provide facilities for quality health care delivery. More education on family planning should be made available to women of reproductive ages in Nigeria.

Keywords: Maternal mortality; economic growth; regional variations; global records; Nigeria.

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Introduction

Maternal mortality happens to be one of the leading causes of death among women between ages 15 and 49 all around the world. “It refers to the death of a woman due to pregnancy related causes or within 42 days of termination of pregnancy or resulting from pregnancy management but not from other causes of deaths” (Akaba et al., 2021; Oringene and Morgan, 2020; Fasina et al., 2020; Meh et al., 2019). According to recent literature and global reports, several women die daily from pregnancy induced complications in many developing countries; though, many of the deaths are avoidable (UNICEF, 2023; UNICEF, 2022; Adesina and Adegboye, 2020; NDHS,2018). “Maternal mortality is a threat that continues to claim the lives of women of child bearing age all around the world and many countries of the world are struggling to overcome this challenge. Today it has become a global priority such that drastic measures have been initiated against it” (Oreh, 2022; Shikuku et al., 2020).

Despite mitigating measures by some countries, recent statistics revealed that on an everyday basis, about “800 women die globally from preventable causes related to pregnancy and child birth and more than 50% of these deaths occur in low and lower middle income countries” (Okonji et al., 2023; Oreh, 2022; Adesina and Adegboye, 2020). Corroborating this fact, Barross et al., (2020) noted that “Africa has the highest problem of maternal deaths in the globe and Sub-Saharan Africa contributes more than 60% of the maternal deaths to the region.” Similarly, WHO, (2023) report revealed that Sub-Saharan Africa and Southern Asia accounted for around 87% (253 000) of the estimated global maternal deaths in 2020. Sub-Saharan Africa alone accounted for around 70% of maternal deaths (202 000), while Southern Asia accounted for around 16% (47 000).

The high number of maternal deaths in some areas of the world reflects inequalities in access to quality health services and highlights the gap between the rich and poor (Okonji et al., 2023; UNICEF, 2023). Maternal Mortality Ratio (MMR) in low-income countries in 2020 was 430 per 100,000 live births versus 12 per 100,000 live births in high income countries (WHO, 2023). At the same time, Eastern Europe and Southern Asia achieved the greatest overall reduction in maternal mortality ratio (MMR) between 2000 and 2020, a decline of 70% (from an MMR of 38 to 11) and 67% (from an MMR of 408 down to 134), respectively. Despite its very high MMR in 2020, Sub-Saharan Africa also achieved a substantial reduction in MMR of 34% between 2000 and 2020. Five Sustainable Development Goals sub-regions roughly halved their MMRs during this period: Eastern Africa, Central Asia, Eastern Asia, and Northern Africa and Western Europe reduced their MMR by around one third. In all, the maternal mortality ratio (MMR) in less developed countries declined by just under 50% (UNICEF, 2023; WHO, 2023).

Developing countries of the world was revealed to have been accountable for “about 95% of the global maternal deaths which occurred in 2020, with low income countries alone making up approximately 60% of the overall deaths” (WHO, 2023). Nevertheless, global maternal mortality reduced between 2000 and 2020 by 34% but the challenge is still eminent in specific regions of the world (Premium Times, 2023; WHO, 2023). There is therefore need for more concerted efforts at reducing the rate in these areas.

In Nigeria, pregnancy period is a risky time for many women and girls who become pregnant each year. “Women in Nigeria are confronted with high risk of maternal death as about 1 in 13 women die from complications relating with child birth as

compared to 1 in 31 women in the whole of Sub-Saharan Africa” (Oreh, 2022; Adesina and Adegboye, 2020; Ogu and Ephraim - Emmanuel, 2018; WHO Factsheet 2017). In 2017, “Nigeria’s maternal mortality rate was estimated at 917 per 100,000 live births; but it increased by nearly 14% in 2020 to reach about 1047 deaths per 100,000 live births (WHO, 2022; World Development Indicators, 2021). The country has been revealed to be one of the largest contributors to maternal mortality worldwide.” In every 2 minutes, one Nigerian woman dies and for each casualty,” there are several women who will experience life-long conditions and infirmities such as obstetric fistula in the process of child birth” (WHO, 2023; Azuh et al. 2017). Since one of the important social indicators used in measuring a nations’s development is maternal and infant mortality rates, the situation in Nigeria is of great concern (Olonade et al., 2019; Okeke et al., 2019; Kassebaum et al. 2014).

Maternal death is prevalent in Nigeria within localities where pregnant women are malnourished, having poor hygiene conditions and lacking access to medical treatment. It is now a known fact that adequate medical attention through ante natal care is one means that can adequately ensure safe delivery among pregnant women in all spheres of life (Okonji et al., 2023; Oreh, 2022; UNICEF, 2022; Red Care 2018). One of the key antidotes to maternal mortality is adequate and timely medical attention when needed.

Nigeria has continually experienced a high maternal mortality ratio (MMR), with significant dissimilarities across its regions (Emelonye et al., 2019). Past studies revealed that the Northern part of Nigeria happens to be host to the “largest number of maternal mortality cases”. In 2013, one third of global maternal deaths was recorded in Nigeria and this occurrence was highest in

Northern Nigeria and among rural people where women have many babies in short time durations (Orjingene et al., 2022; Doctor et al. 2012 and Fawole et al. 2012). By 2018, average highest MM rate was recorded in the North Central and South South regions of Nigeria (NDHS, 2018). The North Central region recorded (1287 MMR) while the South South recorded (1,949 MMR) (NDHS, 2018). The geographical regions of Nigeria are different in terms of cultural and religious influences such as the prevalence of polygamy, access to education at all levels and the utilization of facilities with respect to health. All these variables are linked with one another and has implications on maternal mortality (Willey et al., 2022; Bhattacharya et al., 2019; NDHS, 2018

Today, there's a global effort against maternal mortality levels which has equally contributed to a global reduction of maternal deaths (Meh et al. 2019). But in Sub Saharan Africa, mortality rates are still very high in some countries despite interventions. Statistics reveal that by the close of the end of the implementation of programmes with respect to the achievement of the 2015 Millenium Development Goals, some countries in Sub Saharan Africa experienced no significant change or witnessed a reduction in MMR. By the end of 2020, South Sudan had the highest MMR of 1223 globally, followed by Chad (1063), Nigeria (1047) and then Guinea Bissau with 725 MMR (World development Indicators, 2021). However, by the end of 2021, WHO records show some significant reduction in maternal deaths globally (WHO, 2023). The emphasis is that there is need for further decrease to the level recommended by the United Nation's Sustainable Development Goals which is 70 maternal deaths per 100,000 live births (WHO, 2023; United Nations, 2015).

“Though substantial progress has been made towards reduction in maternal mortality since the late 1980s, such as the International

Safe Motherhood Initiative (SMI), United Nations Millennium Development Goals (MDGs) 2000 UN (2000) and Sustainable Development Goals (SDGs) 2015 UN (2015), it is worrisome to know that there has been relatively little changes for the better in many low income countries with respect to reductions in maternal mortality up till now” (UNICEF, 2023; Azuh et al. 2017). Facts remain that many expectant mothers and newborns still die during gravidness and delivery in these countries.

“Trends in maternal mortality ratios (which is the number of maternal deaths per 100,000 live-births) has also been lowered around the world after some reforms were put into place causing maternal mortality ratios to fall as low as 6 deaths per 100,000 live-births recorded in Australia”. However, despite the achieved reduction in maternal mortality ratios, the number of maternal deaths remains stubbornly high with maternal mortality ratios of 1047 deaths per 100,000 live-births in Nigeria, 523 per 100,000 live-births in Benin Republic and 438 per 100,000 live-births in Cameroun (World development Indicators, 2021; Ogu and Ephraim- Emmanuel, 2018).

This paper seeks to highlight the current trends and patterns of maternal mortality in Nigeria and also assess its relationship with economic growth in the country. It also proffered policy recommendations from findings.

Literature Review

Review of Background Information

Today, high records of maternal death are still prevalent in many low-income countries including Nigeria (WHO, 2023; World Development Indicators, 2021). Women constantly experience high risk at pregnancy and child birth, though concerted efforts

have been made in the past to forestall the rapid occurrence of this event but there is need for more interventions in these regions (WHO, 2022; Smith et al. 2015; Agan et al. 2010 and Nwagha et al. 2010).

“The Millenium Development Goals which were focused at reducing maternal mortality by three quarters between 2000 and 2015 was achieved by only sixteen nations throughout the whole world (WHO, 2015). Nevertheless, more recent records show that there has been a tremendous improvement in the reduction of maternal deaths globally” (World Development Indicators, 2021; UNICEF, 2023). There hasn’t been consistency in the improvement in maternal mortality rates in many regions “due to inadequate financing for execution of maternal health programs. Thus, the varying degrees of the enactment of maternal health intercessions have led to the variable trends across the nation” (UNICEF, 2023; Macrotrends, 2023; Rai et al., 2012; Iliyasu et al., 2010 and Ijadunola et al., 2010).

There are regional variations in maternal death in Nigeria. “Rural women and women from the Northern Central and South South regions of Nigeria are at higher risk of maternal death compared to women in urban areas. Substantiating this statistic, the 2018 National Demographic Health Survey in Nigeria revealed that levels of maternal mortality vary within Nigeria. There are states with higher levels of maternal mortality compared to the national mean values. For example, “In 2018 within the North Central region, Kogi State had 2308 deaths per 100,000 live births at 14% Maternal Mortality rate while Niger State had a Maternal Mortality Ratio of 2464 deaths per 100,000 live births within the same region the same year” On the other hand, within the South South region, Edo State and Cross River State had MMR of 3719 and 1872 respectively (NDHS, 2018).

Table 1 below reveals model-based estimate of maternal mortality rates (MMRates) and maternal mortality ratio (MMRatio) in Geopolitical Areas of Nigeria.

Table 1: Model-based Estimate of maternal mortality rates (MMRates) and maternal mortality ratio (MMRatio) in Geopolitical Areas in Nigeria

Region	Mmrate	Mmratio
North Central	0.13	1287
North East	0.11	563
North West	0.09	388
South East	0.11	807
South South	0.15	1949
South West	0.13	630

Source: National Demographic Health Survey, 2018

There is a great difference between the number of occurrences of maternal deaths within the geopolitical zones in Nigeria. “The North Central and South South geopolitical zones recorded the highest record of 1,287 and 1949 deaths per 100,000 live births respectively (Abimbola et al., 2012; NDHS, 2018). Some of the factors contributing to these high mortality rates include; illiteracy, religious inclinations, socio-cultural inclinations and lack of access to healthcare and professional health workers. The incidence of high rate of maternal deaths also depends on factors such as living in urban or rural area, socio – economic status and geo - political zone (WHO, 2022; Okonji et al., 2023; WHO 2014). Furthermore, an MMR of 563 per 100,000 live births and 630 per 100,000 live births was recorded in the North East and South- West of Nigeria in 2018 (NDHS, 2018).

Despite the high records of maternal death in Nigeria, less than 40% percent of births happen in hospitals with professional care

givers. Health experts have related major common cases of the deaths to hypertensive disorders and hemorrhage. Access to quality medical treatment, improved health infrastructure and efficient, skilled health professionals will do justice to maternal deaths in Nigeria (Oreh, 2022; Vanguard 2018). There is a problem of poor access to maternal health in Nigeria, this problem of access to quality health services is not only dominant among women in Nigeria but it pervades the entire health system in the country. A recent study reported that the Nigerian health system as a whole has been beleaguered by problems of service quality, brain drain, hostile staff attitudes to patients, inadequate skills, and the likes. The Nigerian health sector as a whole is in a miserable state as electricity and water supply are not regular. The World Health Organization ranked the performance of Nigeria's healthcare system 187th among 191 United Nations member states in the year 2000" (Mojekwu, 2012). The dwindling quality of the healthcare system and the persistent problem of poverty in Nigeria is now a major cause for alarm.

Table 2 reveals the situation of maternal mortality in Nigeria within the year 2000 to 2020. In 2000, the maternal mortality ratio recorded was about 1148 per 100,000 live births. However, the last research update carried out in 2020 recorded an MMR of 1047 per 100,000 live births. Countries of the world, especially those in Europe such as the United States of America, UK, Canada and France have very low MMR. The reverse is the case with many countries in Sub Saharan Africa with records of very high maternal mortality rates.

Table 2; Trends and Estimates of Maternal Mortality Ratio in Nigeria compared with some selected countries of the World (MMR; maternal deaths per 100,000 live births) 2000-2020

Country	Benin	Cameroon	China	Canada	Australia	France	Ghana	UK	US	Nigeria
2000	469	651	58	9	7	9	499	11	12	1148
2001	483	629	55	10	6	9	470	11	13	1127
2002	505	611	54	10	6	9	443	11	13	1112
2003	505	574	43	11	6	9	424	11	13	1084
2004	520	556	49	11	5	9	420	11	13	1088
2005	509	573	46	11	5	9	390	11	13	1073
2006	503	558	43	11	5	10	365	11	13	1071
2007	488	529	39	11	5	8	354	11	13	1081
2008	504	532	38	13	5	10	354	11	14	1099
2009	584	534	34	13	5	10	337	10	15	1101
2010	598	527	33	12	5	9	337	10	14	1123
2011	615	519	32	12	6	9	317	9	15	1070
2012	625	487	28	12	6	9	305	8	16	1087
2013	608	491	28	11	6	9	305	8	16	1109
2014	612	478	26	12	5	9	286	8	17	1135
2015	591	447	26	12	5	8	286	8	17	1113
2016	590	437	23	13	5	8	258	9	18	1129
2017	569	443	22	13	5	8	274	9	19	1127
2018	542	424	20	11	4	8	273	9	19	1135
2019	522	440	20	11	5	8	244	9	20	1122
2020	523	438	23	11	3	8	263	10	21	1047

Source: World Development Indicators (2021) & WHO (2023)

Records also show that about two-thirds of Nigerian women deliver outside of health facilities and without medically skilled attendants present. One major reason for the weak performance of the health system is its long-standing problems with governance. Corruption in the political system has become the order of the day while social development, including the promotion of the health of Nigerian citizens, has been more a pretentious than a real aim of the state ((Omo-Aghoja et al. 2010); Mojekwu 2012; Piane 2019). Oreh, (2022) and Harrison (2009) rightly noted that only about 4.2 percent of health facilities in Nigeria meet internationally accepted standards for gynaecology and obstetrics care. Adequate healthcare financing is very critical in addressing the lack of medical infrastructure that typifies the delicate nature of maternal health system in Nigeria. Timely and sufficient funding will enhance maternal healthcare services

being offered to the women both in the rural and urban areas of the country. It will be difficult to implement and successfully carry out health care reforms without adequate funding. “A 2020 WHO record reveals that the Nigerian budget for the health sector was about 3.83%, which is a drastic fall from the 4.16% and 4.23% previous allocations in 2016 and 2017 respectively” (WHO, 2020; Redcare 2018; Vanguard 2018; WHO, 2017). Healthcare funding in Nigeria require a quick redress.

In the same vein,” further studies show that factors such as age, education, antenatal care, domestic violence and social autonomy are determinants of maternal mortality”. In the same vein, Orgingene et al. (2022) and Akaba et al. (2021) noted that determinants of maternal mortality in Nigeria are sepsis, eclampsia and other complications from unsafe abortions and obstetric hemorrhage.

Review of Existing Literature

Orgingene et al. (2022) investigated factors affecting maternal and neonatal mortality in Northern Nigeria. The authors employed the use of time series data from 2012 to 2021. Multiple Linear Regression and Multivariate Logistic Regression analysis were used to estimate predictor variables that determine maternal and neonatal mortalities in the region. Results from the study revealed a negative relationship between antenatal care and neonatal mortality implying that an increase in the number of women attending antenatal care will lead to a reduction in neonatal mortality by about 43%. Furthermore, regression results indicated a positive relationship between low birth weight and neonatal mortality implying that an increase in the number of live births with low birth weight will lead to an increase in neonatal mortality by 94%. Regression results were statistically significant at 5%.

Similarly, Oreh (2022) carried out a study on maternal health in Nigeria as it relates with biosocial theories, history and implications of the COVID–19. The study which was based on the Nigerian context identified historical antecedents, metrics and biosocial theories relevant to maternal health, and the impact of

the COVID-19 pandemic. It also describes the potential of policy for rights-based interventions that address inequity in access to safe basic and emergency obstetric care, disenfranchisement and disempowerment of women, and women's rights and respectful maternal care in health care settings. The article also describes how innovative strategies can help accelerate the response towards ending preventable maternal deaths for a more balanced and prosperous world.

In the same vein, Willey et al., (2021) carried out a study on improving maternal and newborn health services in Northeast Nigeria through a government-led partnership of stakeholders. The study aimed to quantify change in the coverage, quality and equity of essential maternal and newborn healthcare interventions in Gombe State, Northeast Nigeria, following a four-year, government-led, maternal and newborn health intervention. The design of the study was a Quasi-experimental plausibility model and repeat cross-sectional households surveys were linked with health facility surveys which were implemented in intervention and comparison areas. Results revealed that between 2016 and 2019, the coverage of all indicators improved in intervention areas, with the exception of postnatal and postpartum contacts, which remained below 15%. Greater improvements were observed in intervention than comparison areas for eight indicators, including coverage of at least one antenatal visit. The study concluded that the intervention achieved success in saving lives of mothers and newborns in the study area.

Correspondingly, Akaba et al., (2021) carried out a retrospective analysis from 1st January 2014 to 31st December, 2018 and applied the WHO ICD – MM classification system to maternal deaths in a tertiary hospital in Nigeria. The type, group and specific underlying cause of identified maternal deaths were classified based on the method. Descriptive analysis and Categorical and continuous variables were summarized respectively as proportions and means. Results revealed that the

institutional maternal mortality ratio was 831 per 100,000 live births and maternal deaths occurred mainly amongst women aged 25–34 years. These women were without formal education and were about 57.7% of the total sampled population. The study concluded that hypertensive disorders during pregnancy and puerperium and obstetric haemorrhage are the leading causes of maternal deaths in Nigeria. They further suggested that implementation of evidence-based interventions both at the hospital and community levels may help in tackling the identified underlying causes of maternal mortality in Nigeria.

Likewise, Adesina and Adegboye (2020) carried out a study on maternal mortality in Nigeria, while placing emphasis on its trends, triggers and implication for sustainable development. The study employed the use of secondary data obtained from the World Bank's World Development Indicators for the study and multiple regression analysis was used to forecast maternal mortality ratio to 2025. Results of the forecast of MMR to 2025 showed that maternal deaths would be about 893 deaths per 100,000 live births by that year. They noted that this statistic is still very high and will likely impair sustainable development in Nigeria. The research also indicated the existence of high maternal mortality in Nigeria, in spite of various government interventions in the health sector. The reasons ascribed for this situation include: poverty, poor access to health facilities, poor health management, unemployment, high illiteracy level, pathological causes, corruption, poor gender relations, and dearth of project management expertise. The implication of the results from the study is that time is of essence in combating maternal mortality in Nigeria and government needs to overhaul her strategies with a view to drastically minimizing MMR.

In the same vein, Olonade et al. (2019) reviewed literature on maternal mortality and maternal health care in Nigeria. The paper placed emphasis on cogent issues affecting maternal mortality by unpacking its precipitating factors and examining the maternal health care system in Nigeria. Contemporary works of literature

were reviewed, and the functionalist perspective served as a theoretical guide to examine the interrelated functions of several sectors of the society to the outcome of maternal mortality. It was noted that apart from the medical related causes (direct and indirect) of maternal mortality, certain socio-cultural and socioeconomic factors influence the outcome of pregnancy. The study concluded that maternal mortality has debilitating effects. It is therefore pertinent for the government to improve maternal health and eradicate poverty to ensure sustainable development

Ogu and Ephraim – Emmanuel, (2018) conducted a study review on Prevention of Maternal Mortality in Nigeria and the need for public health to come to the rescue. They concluded their study by asserting that the prevention of maternal mortality is essential in ensuring sustainability of the human race through preservation of those whose role it is to procreate. They also noted that the need for the protection of maternal health can never be overemphasized. All stakeholders were then called upon to advocate and implement these time honed public health strategies for protecting maternal health and preventing maternal deaths.

Azuh et al. (2017) carried out a study on factors influencing maternal mortality among rural communities in South Western Nigeria. The study was carried out in Ado-Odo/Ota Local Government Area of Ogun State and a multistage sampling technique and an informant survey approach were used in the study. A total sample of 360 eligible respondents were selected randomly from 11 out of 16 political wards in the study area and interviewed through the administration of questionnaires. The data were processed using descriptive statistics and regression analyses. Results revealed that place of consultation, awareness of pregnancy complications, who pays the treatment costs and knowledge of the place of antenatal care treatment significantly influenced maternal mortality. Study findings suggest that in a rural community setting with a depleted health care system, health education tailored toward community culture, subsidized maternal health care services by the government and operators of

private clinics and improving the status of women may reduce maternal mortality and promptly better utilization and survival chances of women in the study area as well as in all of Nigeria.

Adetoro (2017) indicated that more attention should be focused on women in poor communities, noting that these areas record the highest rates of maternal mortality compared to other areas. Better health infrastructure, primary healthcare centers with skilled professionals should be provided from the grassroot areas to urban cities. Private health care stakeholders, the government and policy makers need to invest purposefully in preserving maternal health in Nigeria. Although skilled maternity centers are increasing, unequipped traditional birth centers are more than the properly equipped maternities. Records reveal that more than 60% of all child delivery centers in Nigeria are made up of the low cost traditional or religious birth homes. Obstacles to seeking optimum maternity care include high cost of medical care, inadequate skilled professional care givers and lack of adequate drugs and equipment for health care delivery (Ogu et al., 2018; WHO Factsheet, 2018).

Corroborating these facts from a medical perspective, Adetoro (2017) revealed that about 4 major factors are responsible for maternal mortality. These factors are namely; “reproductive factors, Obstetric complications, health service factors, socio-cultural factors and economic factors”. Under the reproductive factors, causes of maternal mortality are due to maternal under age of mothers (i.e., pregnancy and childbirth among underage mothers). Unwanted pregnancy and unsafe abortion are other leading causes. This includes hemorrhage due to spontaneous abortion; ectopic, antepartum, postpartum multiple pregnancy, puerperal infection, toxemia, obstructed labour and induced abortion. According to this study, “health service factors leading to maternal death are lack of access to maternity services, poor medical care, inadequate trained personnel and lack of essential supplies such as drugs and medical instruments. Socio-cultural factors contribute majorly to high maternal mortality rate in

Nigeria. These factors relate to the low status of women, gender discrimination and unequal opportunity for nutrition, health and education among women”. Other factors he mentioned are unwanted teenage pregnancy and religion. In Nigeria, some religions do not accept blood transfusion or any medical care whatsoever, the practice of purdah in the North of Nigeria may isolate women and encourage subjugation and over dependence on the men. The cultural acceptance of large family, the traditional preference for male children and traditional taboos forbidding the consumption of protein rich foods such as meat and eggs among pregnant women are other causes (Adetoro, 2017).

Oyedepo (2016) and Ogu et al. (2016) revealed that other barriers to receiving quality health care includes harmful sociocultural practices, female poverty, illiteracy and poor-quality services. There is also the problem of frail implementation of effective health policies and services. The percentage of pregnancies handled by the unskilled faith based and traditional health providers is high, leading to high maternal mortality in Nigeria (Osunu, Ofili and Nwose, 2021; Uzoigwe 2016; Ibrahim et al., 2012; Lanre-Abass, 2008). Delay in getting to hospitals quickly due to bad roads, poor communication network and inadequate supplies to cater for patients are major problems. There is thus the need to focus on prevention of maternal deaths in Nigeria by tackling these problems affecting the ability of pregnant women to access good medical health care” (Ogu et al., 2016; Ogu et al., 2018).

Adetoro (2017) and Oyedepo (2016) also revealed that “maternal mortality in Nigeria is linked with economic status of women. Many women in Nigeria lack access to wealth and resources, they also have difficulty in securing gainful employment, the money they make is spent on family rather than themselves. The recent global economic downturn due to COVID–19 compounded the plight of the masses and cost of medical services has escalated and most times unavoidable for the common man. The government under funding of the health sector has also compounded issues”.

Archibong et al. (2014) reviewed existing maternal health policies in Nigeria and identified factors that significantly impact on maternal mortality status in Nigeria. They noted financial constraints as one major challenge to floating effective policies in affected regions of Nigeria. Abimbola et al. (2012) carried out a study on the Midwives Service Schemes in Nigeria. Their findings reveal a need for enhanced improvement in health service delivery in Nigeria. They also noted that the Nigerian government need to strategically improve and redistribute the skill set of health workers in the country, noting that this initiative will serve as a model for other developing countries of the world.

Similarly, Ibrahim et al. (2012) examined the burden of maternal mortality in a semi urban Nigerian town within a five years' experience. Findings reveal that major causes of maternal deaths include sepsis and eclampsia. They noted that maternal deaths was more likely to occur in unregistered pregnant women between ages 19 to 23, women of high parity and the unemployed. This section specifically reviewed background information with respect to maternal mortality in Nigeria. It also reviewed existing literature on the subject matter.

Methodology

Secondary data from World Development Indicator Data (2021) on annual time series variables spanning 2000 – 2020 was utilized for this paper. Our dependent variable is maternal mortality ratio while explanatory variables are fertility rate (FERATE), Annual GDP growth rate (GDPgr), Female life expectancy at birth (FELEXP), Life time risk of maternal death (LTRMDT), and neonatal mortality rate per 1,000 live births (NEOMORT).

Model Specification

The Ordinary Least Squares Multiple regression analysis was used in this study because it presented better results than the Fully Modified Ordinary Least Squares (FMOLS) model and the Dynamic Ordinary Least Squares model (DOLS). It clearly gave a better understanding of the relationship between the dependent

variable and explanatory variables. Adesina and Adegboye (2020) and Orgingene et al. (2022) equally used the Ordinary Least Squares for similar purpose.

Based on these reasons, Ordinary Least Squares Multiple regression analysis was used to specify the relationship between maternal mortality and explanatory variables as follows;

$$\text{MMR} = \gamma_0 + \gamma_1 \text{FERATE} + \gamma_2 \text{FELEXP} + \gamma_3 \text{LTRMDT} + \gamma_4 \text{GDPgr} + \gamma_5 \text{NEOMORT} + \epsilon t$$

Where **MMR** = Maternal mortality ratio (number of deaths per 100,000 live births).

FERATE = Fertility rate (Total birth per woman)

FELEXP = Female life expectancy at birth (years)

GDPgr = Annual GDP growth rate (%)

LTRMDT = Life time risk of maternal death (%)

NEOMORT = Neonatal mortality rate per 1,000 live births

Results and Discussion

Summary statistics shown on Table 3 reveal that mean maternal mortality rate over the period of study was 1031.83 deaths per 100,000 live births. Maximum maternal mortality ratio (MMR) was 1200 while minimum value was at 917 per 100,000 live births which was obtained in 2017. Average adolescent fertility rate (births per 1,000 women ages 15-19) was 121.01 births per 1,000 of women between ages 15 – 19. Average fertility rate (total births per woman) was 5.85 approximately 6 children per woman. Mean annual GDP growth rate over the period of study was 6.06%. Average female life expectancy at birth was 50.86 years. Average life time risk of maternal death was 5.78% while neonatal mortality rate was 39.88 per 1,000 live births and infant mortality rate per 1,000 live births was 89.71 deaths per 1,000 live births. This result is almost similar to what was reported by WHO findings that “Nigeria has a life time risk of maternal death of 4.62 percent, fertility rate of 5.71 and annual births of almost 7 percent.

Concluding that a woman’s chance of dying from pregnancy and child birth in Nigeria is high” (WHO, 2023; UNICEF, 2022; WHO Factsheet 2017).

Table 3: Descriptive Statistics

	MMR	ADO FER T	FERTR A	GDPg r	LEX P	LTRMD	INFMOR T	NEOMORT
Mean	1031.8	121.02	5.85	6.06	50.8 6	5.79	89.71	39.88
Median	991.50	121.34	5.89	6.37	50.9 1	5.61	86.80	38.75
Maximum	1200.0	132.82	6.11	15.32	54.8 4	6.92	109.80	46.40
Minimum	917.00	107.33	5.46	-1.62	47.1	4.86	77.10	36.70

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Results of the Ordinary Least Squares Regression Analysis

Table 4 reveals the results of the Ordinary Least Squares multiple regression analysis and the results show that an increase in the annual GDP growth rate will significantly reduce maternal mortality in Nigeria. Specifically, a unit increase in annual GDP growth rate will decrease maternal mortality by 61%. This implies that economic growth will help reduce maternal mortality in Nigeria. Similar results were obtained by Olonade et al. (2019) who asserted that maternal mortality contributes to sustainable development in Nigeria. Another variable having inverse relationship with maternal mortality is female life expectancy at birth. This also implies that a unit increase in female life expectancy at birth will reduce maternal mortality in the country by 8%. Neonatal mortality, Female fertility rate (number of births per woman) and life time risk of maternal death all have significant positive relationship with maternal mortality over the period under study. The implication is that increase in fertility rate, increased neonatal mortality rates and an increase in life time risk of maternal death will equally increase maternal mortality in Nigeria. In a similar study, Orgingene et al. (2022) asserted that a negative

relationship exist between antenatal care and neonatal mortality implying that an increase in the number of women attending antenatal care will lead to a reduction in neonatal mortality by about 43%.

The model was of good fit having an adjusted R square value of 99% and a probability of F statistic significant at 1 %. The residual statistics were also reliable, implying that the result was fit for policy implications.

Table 4: Results of Ordinary Least Squares Multiple regression analysis

Variable	Coefficient	Std. Error	t-Statistic	Prob.
Fertility_rate	220.63***	16.37	-13.48	0.0000
Annual GDP growth rate	-0.61***	0.20	-3.01	0.0108
Female life expectancy at birth	-7.76**	2.02	-3.84	0.0023
Life-time risk of maternal death	207.97***	7.59	27.39	0.0000
Neonatal mortality rate	5.81***	1.068	-5.44	0.0002
C	1749.19	210.96	8.29	0.0000
R-squared	0.999775			
Adjusted R-squared	0.999681			
Log likelihood	-			
	32.52038			
F-statistic	10668.72			
Prob(F-statistic)	0.000000			

***, ** and * indicates 1%, 5% and 10% levels of significance

Summary results of diagnostic tests on Table 5 reveal that there was evidence of stability (normality) in the data used for analysis. There was also no evidence of heteroskedasticity among variables used for analysis.

Table 5: Summary results of diagnostic tests

Specification	Statistic (P – values)	Remark
Breush -Godfrey (autocorrelation)	6.074 (0.314)	No Evidence of autocorrelation
Breush -Pagan (heteroskedasticity)	1.1148 (0.4029)	No heteroskedasticity
Jaque – Bera (normality)	2.23 (0.3277)	Evidence of normality (stability)
Cusum		Stable
Cusum Sum of squares		Stable

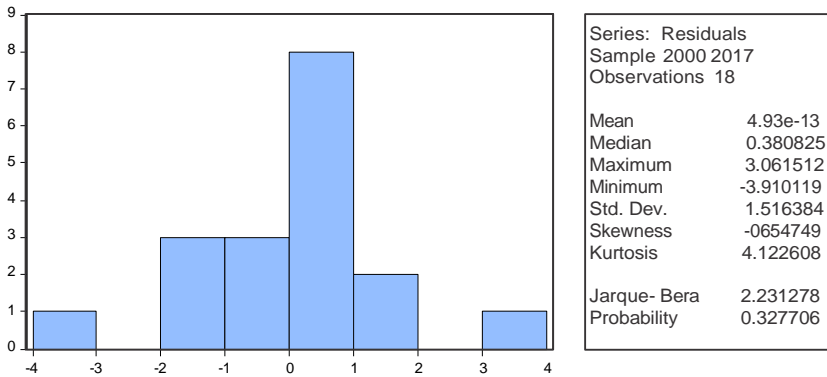
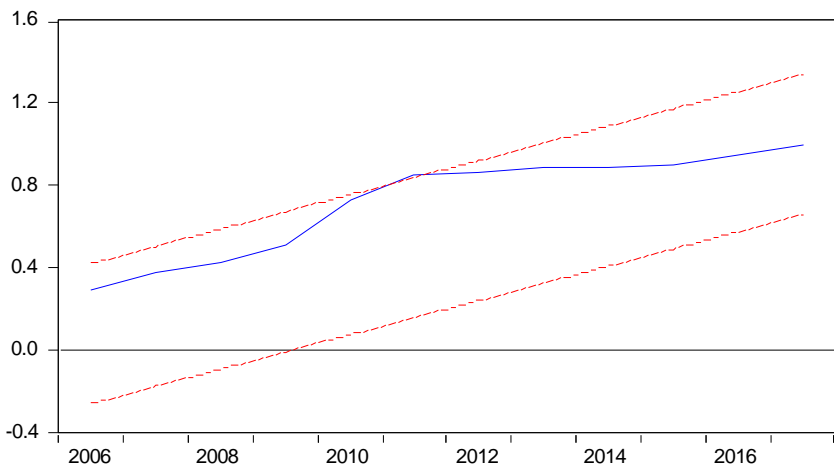
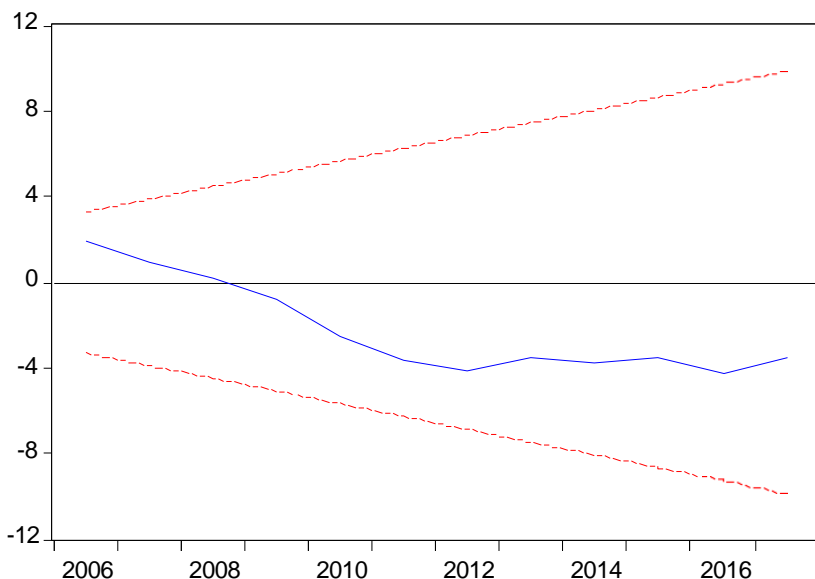


Figure 1: Jarque- Bera Normality graph





Conclusion

Maternal mortality in Nigeria is a precarious condition calling for immediate and adequate remedy. Current estimates reveal that globally Nigeria is the third largest contributor to global maternal mortality after South Sudan, and Chad with an MMR of 1047 per 100,000 live births. Regional variations in maternal mortality show very high maternal mortality ratio of about 1,949 and 1,287 deaths per 100,000 live births in the South and North Central regions of Nigeria respectively and a lower MMR of about 563 and 630 per 100,000 live births in the in the North East and South-West of Nigeria.

Conclusively, results of the Ordinary Least Squares regression analysis reveal that an increase in GDP growth rate and female life expectancy will decrease maternal mortality by 61% and 8% respectively. Other results show that an increase in neonatal mortality rate, fertility rates and life time risk of maternal deaths will increase maternal mortality ratio in Nigeria.

Recommendations

The way forward to solve the problem of maternal mortality in Nigeria is to provide more funding for the health sector, build more standard hospitals, improve and train more health workers, improve on the education of the girl child, provide more awareness and provide better family planning services. Better policies geared at ensuring poverty alleviation and improvement of the economy will reduce maternal mortality and encourage economic growth. There is need for more funding for the health sector so as to increase the adult female life expectancy in the country. Improved budget allocation for the health sector will help provide medical equipment and machinery, adequate drugs and skilled personnel that can aid health care delivery in Nigeria.

There is the need to build more hospitals and train more health workers. Many of our skilled health workers have travelled out of the country in search for greener pastures. More standard and referral hospitals need to be built to augment the already existing ones. There is also the need to organize trainings and workshops for health workers to improve their delivery ability. Education of the girl child should be encouraged in areas in Nigeria where there exists high maternal mortality such as the north eastern part of the country. Marriages of under aged girls should also be discouraged since research has proved that increased fertility will increase chances of maternal mortality in Nigeria. There is also the need to provide more awareness and improvement on family planning services so as to reduce the fertility rate (number of births per woman). There is also a need to provide good quality antenatal, postnatal and better child care services. Improvement should also be made on emergency obstetric care for ailing women. Poverty and the economic condition of women is an important factor leading to high rate of maternal mortality in Nigeria. There is the need for policy makers to put up better policies to alleviate poverty and better policies for the improvement of the health sector.

References

- Adesina, M.A & Adegboye, A (2020). Maternal Mortality in Nigeria: Trend, Triggers and implications for Sustainable Development. *American Journal of Life Sciences*. 8 (5): 135 - 143 . doi : 10.11648/j.ajls.20200805.18
- Adetoro, O.O (2017). Maternal Mortality: The Way Forward. A Power-Point Presentation at a World Health Organization Conference. Available at www.who.int/pmnch/activities/countries/nigeriapresentation.pdf
- Abimbola, S., Okoli, U., Olubajo, O., Abdullahi, M.J & Pate, M.A (2012). The Midwives Service Scheme in Nigeria. *Health in Action*. 9 (5): 1 – 5. Available at <http://www.plosmedicine.org>.
- Archibong, E. & Agan, U (2014). Review of Policies and Programs for Reducing Maternal Mortality and Promoting Maternal Health in Cross River State, Nigeria. *African Journal of Reproductive Health*. 14(3):37-42.
- Agan, T., Archibong, E., Ekabua, J., Ekanem, E., Abeshi, S., & Edentekhe, T., (2010). Trends in Maternal Mortality at the University of Calabar Teaching Hospital, Nigeria. 1999–2009. *International Journal of Women's Health*. 2:249. <https://doi.org/10.2147/IJWH.S11971> PMID:21151730 PMCID:PMC2990892
- Akaba, G.O, Nnodu, O.E, Ryan, N., Peprah, E., Agida, T.E, Anumba, D.O.C (2021). Applying the WHO ICD-MM Classification System to Maternal deaths in a Tertiary Hospital in Nigeria: A Retrospective Analysis from 2014–2018. *PLoS ONE* 16(1): e0244984. <https://doi.org/10.1371/journal.pone.0244984>
- Azuh, D.E, Azuh, A.E, Iweala, E.J, Adeloye, D., Akanbi, M. & Mordi, R.C (2017). Factors Influencing Maternal Mortality among Rural Communities in SouthWestern Nigeria', *International Journal of Women's Health*, 9(1):179-188. <https://doi.org/10.2147/IJWH.S120184>

- Barros, A. J. D, Wehrmeister, F.C, Ferreira, L.Z, et al., (2020). Are the poorest poor being left behind?. Estimating Global Inequalities in Reproductive, Maternal, Newborn and Child Health. *BMJ Global Health*. 2020;5:e002229.Pp 1- 9
- Bhattacharya, A.A, Allen E, & Umar N (2019). Monitoring Childbirth Care in Primary Health Facilities: A validity study in Gombe State, North-Eastern Nigeria. *Journal of Global Health*. 2019;9:020411.
- Doctor, H.V, Olatunji A, Findley SE, Afenyadu GY, Abdulwahab A, Jumare A (2012) Maternal mortality in northern Nigeria: findings of a health and demographic surveillance system in Zamfara State, Nigeria. *Tropical Doctor*. 2012;42(3):140-3. <https://doi.org/10.1258/td.2012.120062>
[PMid:22544044](https://pubmed.ncbi.nlm.nih.gov/22544044/)
- Emelonye, U., Emenlonye, A.U and Emelonye, U.P (2019). Preventing Maternal Mortality in Nigeria: A Human Rights Imperative. *US-China Law Review*, 16 (4): 166-178.
doi:10.17265/1548-6605/2019.04.004
- Fasina, F., Oni, G., Azuh, D., & Oduaran, A. (2020). Impact of mother's socio-demographic factors and ante-natal clinic attendance on neonatal mortality in Nigeria. *Cogent Social Sciences*, 6:1. 2020. 23.
- Fawole AO, Shah A, Fabanwo AO, Adegbola O, Adewunmi AA, Eniyewun AB (2012) Predictors of maternal mortality in institutional deliveries in Nigeria. *African Health Science*. 12:32–40.
- Harrison K A, (2009) The struggle to Reduce High Maternal Mortality in Nigeria. *African Journal of Reproductive Health* . 1 3 (3) : 9 - 2 0 .
<https://www.ajrh.info/index.php/ajrh/article/view/589>.
- Ibrahim I.A, Owoeye, G.I.O, Obilahi A (2012). The burden of Maternal Mortality in a Semi-urban Nigerian Town: Five Year experience. *International Journal of Medicine and Medical Sciences* 2(12): 301-306.
- Ijadunola, K.T, Ijadunola, M.Y, Esimai, O.A, Abiona, T.C (2010).

New paradigm old thinking: the case for emergency obstetric care in the prevention of maternal mortality in Nigeria. *BMC Women's Health*. 2010; 10(1):6. <https://doi.org/10.1186/1472-6874-10-6> PMID: 20163719
PMCID:PMC2836278

Iiyasu Z, Abubakar I.S, Galadanci H.S, Aliyu M.H (2010). Birth preparedness, complication readiness and fathers' participation in maternity care in a northern Nigerian community. *African Journal of Reproductive Health*. 2010; 14(1). PMID:20695136

Kassebaum, NJ, Bertozzi-Villa A, Coggeshall MS, Shackelford KA, Steiner C, Heuton KR, (2014) Global, regional, and national levels and causes of maternal mortality during 1990-2013: A systematic analysis for the Global Burden of Disease Study 2013. *Lancet*. 2014; 384(9947):980-1004. [https://doi.org/10.1016/S0140-6736\(14\)60696-6](https://doi.org/10.1016/S0140-6736(14)60696-6)

Lanre-Abass BA (2008) Poverty and Maternal Mortality in Nigeria: Towards A More Viable Ethics of Modern, Medical Practice. *International Journal of Equity Health*, 7: 11.

Macrotrends, (2023). World Maternal Mortality Rate, 2000 - 2023. <https://www.macrotrends.net/countries/WLD/world/maternal-mortality-rate>

Meh, C., Thind, A., Ryan, B., & Terry, A. (2019). Levels and determinants of maternal mortality in Northern and Southern Nigeria. *BMC Pregnancy & Childbirth*. (2019) 19, 417 (2019). <https://doi.org/10.1186/s12884-019-2471-8>.

Mojekwu JN (2012). Maternal Mortality in Nigeria: Examination of Intervention Methods. *International Journal of Humanities and Social Science*. 2 (20): 135 – 149.

NDHS, (2018). Demographic and Health Survey. Key Findings. P p 1 – 20 . <https://www.dhsprogram.com/pubs/pdf/FR359/FR359.pdf>

Nwagha UI, Nwachukwu D, Dim C, Ibekwe PC, Onyebuchi A

- (2010) Maternal mortality trend in South East Nigeria: less than a decade to the millennium developmental goals. *Journal of Women's Health*. 2010; 19(2):323-7. <https://doi.org/10.1089/jwh.2008.1028> PMID:20092418
- Smith SL, Rodriguez MA (2015) Agenda setting for maternal survival: the power of global health networks and norms. *Health Policy Plan*. 2015.
- Ogu RN and Ephraim-Emmanuel BC (2018) Nigerian Government Expenditure, Economic Productivity and the Prevention of Maternal Mortality: A Call to Action. *Journal of Economics, Management and Trade*, 21(1): 1-9
- Omo-Aghoja, L.O, Aisien, O.A, Akuse, J.T, Bergstrom, S., Okonofua, F.E (2010). Maternal mortality and emergency obstetric care in Benin City, South-south Nigeria. *Journal of Clinical Medicine and Research*. 2010; 2(4): 55-60.
- Ogu RN, Agholor KN, Okonofua FE (2016). Engendering the Attainment of the SDG-3 in Africa: Overcoming the Socio-Cultural Factors Contributing to Maternal Mortality. *African Journal of Reproductive Health* 60 (2): 62 -74.
- Ogu RN, Ephraim-Emmanuel BC (2018a) Nigerian Government Expenditure, Economic Productivity and the Prevention of Maternal Mortality: A Call to Action. *Journal of Economics, Management and Trade*. 21(1): 1-9. doi: [10.9734/JEMT/2018/39799](https://doi.org/10.9734/JEMT/2018/39799)
- Ogu, R.N and Ephraim – Emmanuel, B.C (2018b). Prevention of Maternal mortality in Nigeria: Public Health to the rescue. *Journal of Gynaecology and Women’s Health*. 10(1): 1-4. 5 5 5 7 8 0 . D O I : 10.19080/JGWH.2018.10.555780002.
- Okeke E.C, Oluwuo S.O, Azil E.I (2019). Women's Perception of Males' Involvement in Maternal Healthcare in Rivers State, Nigeria. *International Journal of Health and Psychology Research*. 2016; 1:9-21.
- Okonji, O.C.; Nzoputam, C.I.; Ekholuenetale, M.; Okonji, E.F.; Wegbom, A.I.; Edet, C.K.(2023). Differentials in

Maternal Mortality Pattern in Sub-Saharan Africa Countries: Evidence from Demographic and Health Survey Data. *Women* 2023, 3, 175–188. <https://doi.org/10.3390/women3010014>.

- Olonade, O., Olawande, T.I, Alabi, O.J, Imhonopi, D., (2019). Maternal Mortality and Maternal Health care in Nigeria: Implications for Socio- Economic Development. *Macedonian Journal of Medical Sciences*. 2019 March 15 ; 7 (5) : 849 - 855 . <https://doi.org/10.3889/oamjms.2019.041> eISSN: 1857-9655 ID Design Press, Skopje, Republic of Macedonia
Open Access Review Article
- Orgingene, B., Teryila, O., Baffoe, P and Ojo, O (2022). Factors Affecting Maternal and Neonatal Mortality in Northern Nigeria: A Multiple Linear Regression Analysis . *MedRxiv Preprint* . Available at <https://doi.org/10.1101/2022.06.30.22276507>
- Orjingene, O., & Morgan, J. Effectiveness of Community-Based Interventions in Reducing Maternal Mortality in Sub-Saharan Africa: A Systematic Review. *International Journal of Tropical Disease & Health*. 2020 41(9), 9-21. <https://doi.org/10.9734/ijtdh/2020/v41i930314>
- Oreh, A., (2022). Maternal Health in Nigeria; Bisocial Theory, History and Implications of Covid _ 19. *African Policy journal*. (2021 – 2022 Edition). Pp 95 – 106
- Osunu P.T , Ofili, C. C and Nwose, E.U (2021). Maternal mortality in Nigeria: A consideration of infection control factor. *Preventive Medicine and Community Health*. 4 (1) : 1-3. doi: 10.15761/PMCH.1000158
- Piane GM. (2019). Maternal Mortality in Nigeria: A Literature Review. *World Medical & Health Policy*. 2019; 11 (1):83–94. <https://doi.org/10.1002/wmh3.291>.
- Oyedepo, E.O (2016). Correlates of Poverty Status among Rural Households in Ogun State, Nigeria: An Asset Index

- Approach. Journal of Agricultural Science and Environment. 16 (2) 1 – 17.
- Rai RK, Singh PK, Singh L (2012). Utilization of maternal health care services among married adolescent women: insights from the Nigeria Demographic and Health Survey, 2008. Women's Health Issues. 2012; 22(4): e407- e 1 4 . <https://doi.org/10.1016/j.whi.2012.05.001> PMID:22749200
- Red Care, (2018). Maternal HealthCare in Nigeria. Redcare HMO. Redcarehmo.com>2018/03/19>maternalhealthcareinNigeria. <https://redcarehmo.com/2018/03/19/maternal-health-nigeria/>
- Sageer, R., Kongnyu, E., Adebimpe, W. O., Omosehin, O., Ogunsola, E. A. and Sanni, B (2019). BMC Pregnancy and Childbirth. 2019 Edition 19 pp 1 - 8 . <https://doi.org/10.1186/s12884-019-2202-1>
- Shikuku, D. et al, (2020). “Early indirect impact of COVID-19 pandemic on utilization and outcomes of reproductive, maternal, newborn, child, and adolescent health services in Kenya,” medRxiv (2020) Preprint. <https://www.medrxiv.org/content/10.1101/2020.09.09.20191247v1>
- U N I C E F , (2 0 2 2) . M a t e r n a l M o r t a l i t y . <https://files.aho.afro.who.int/afahobckpcontainer/producton/files/iAHO Maternal Mortality Regional Factsheet.pdf>
- UNICEF, (2023). Maternal Mortality. UNICEF Data: Monitoring the situation of women and children. <https://data.unicef.org/topic/maternal-health/maternal-mortality/>
- United Nations, (2015). United Nations Sustainable Development Summit 2015; 25–27 September 2015; New York. Available from : <https://sustainabledevelopment.un.org/post2015/summit>.
- Uzoigwe SA (2016) Maternal Mortality: Current Situation. Department of Obstetrics and Gynaecology . <https://www.gazetteofmedicine.com/publications/>

- Vanguard, (2018) Global Worry Over Nigeria's low rating in maternal Death. Vanguard Newspaper march 27th 2018.
- Willey B., Umar N., Emma Beaumont, E., Allen, E., Anyanti, J., Bello, A.B, Bhattacharya, A., Josephine Exley,J., Makowiecka. K., Okolo,M., Sani, R., Schellenberg J., Spicer, N., Usman, U.A , Ahmed Mohammed Gana,A.M., Shuaibu, A, and Marchant, T (2021). Improving maternal and newborn health services in Northeast Nigeria through a government-led partnership of stakeholders: a quasiexperimental study. *BMJ Open* 2022;12:e048877. doi:10.1136/bmjopen-2021-048877
- World Development Indicators (2021).World Bank Data. [https:// databank. worldbank. org/ source/ world-development-indicators](https://databank.worldbank.org/source/world-development-indicators)
- World Health Organization (2017) Factsheet Maternal Health in Nigeria: Facts and Figures. Published by the African Population and Health Center, Kitisuru, Nairobi, Kenya. <https://aphrc.org/publication/maternal-health-in-nigeria-facts-and-figures/>
- World Health Organization. Fact sheets, (2018) <https://www.who.int/news-room/fact-sheets>
- World Health Organization (2019). Trends in Maternal Mortality 2000 to 2017: Estimates by 477 WHO, UNICEF, UNFPA,(2019). World Bank Group and the United Nations Population Division. 478 Geneva; 2019.
- W H O , (2 0 2 0) . W o r l d H e a l t h S t a t i s t i c s . <https://www.who.int/data/gho/publications/world-health-statistics>
- W H O , (2 0 2 2) . M a t e r n a l M o r t a l i t y i n Nigeria.https://files.aho.afro.who.int/afahobckpcontainer/reduction/files/iAHO_Maternal_Mortality_Regional_Fact_sheet.pdf
- WHO (2023). Maternal Mortality. Available online: <https://www.who.int/news-room/fact-sheets/detail/maternal-mortality>. Accessed 3rd September 2023.