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Reproductive Health Factors and Maternal Mortality of Internally Displaced Women in Nigeria

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Abstract

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Doctoral Study Submitted in Partial Fulfillment

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Abstract

Approximately 529,000 women die from pregnancy-related causes every year, with 99% of these maternal deaths occurring in developing countries. In Nigeria, each year, about 59,000 maternal deaths occurs with a mortality rate of 576 deaths per 100,000 births. Women constitute about half of the 33.2 million internally displaced persons (IDPs) worldwide. The purpose of this retrospective cross-sectional study was to explore the association between the reproductive health factors and maternal mortality of internally displaced women in Borno state Nigeria. The McCarthy and Maine's model for determinants of maternal mortality informed this study. A secondary dataset of 400 women (age 14-49 years) who died from pregnancy or its complication and those who were alive in IDP camp clinic and specialist hospital between 2016 and 2020 were used. Data were analyzed using descriptive and inferential statistics, chi square and binominal logistic regression. The findings showed that not attending at least 4 antenatal care (ANC) and postnatal care (PNC) visits increase the odds of maternal deaths by 1.75 and 0.28 times, respectively, and the use of family planning method reduces the odds of maternal death by a factor of 0.73. Also the findings showed that women living in IDP camp have a higher risk of maternal death compared to women living in their personal homes. Also the risk of maternal death was high among adolescent mothers between the ages of 14-19 years in Nigeria. Findings from this study will draw the attention of the legislature to develop policies towards improving access to reproductive health services in the IDP camps and it would also address the issue of health inequality leading to positive social change.

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Section 1: Foundation of the Study and Literature Review

Introduction to the Study

Reproductive health ensures that every pregnancy is wanted and planned and every pregnant woman can access adequate reproductive health services for safe and positive pregnancy outcomes. Reproductive health has many valued outcomes; however, maintaining focus on maternal death is necessary in high maternal mortality areas. Maternal mortality, defined as the death of a mother during pregnancy or within 42 days after the end of pregnancy due to health problems related to pregnancy, is considered a significant health problem in the world (World Health Organization [WHO], 2019). Approximately 529,000 women die from pregnancy-related causes every year, with 99% of these maternal deaths occurring in developing countries (WHO, 2019). In Nigeria, where there are over 39 million women of childbearing age. Each year, approximately 59,000 maternal deaths are reported with a mortality rate of 576 deaths per 100,000 births, representing 14% of the global maternal mortality burden (WHO, 2019).

Batista et al., (2018) explained that the accessibility of health care services to the community and the national health systems' status impacts maternal mortality as observed in Brazil's smaller states. In Nigeria, the extent to which health care services (ANC, PNC, and Family Planning services) are accessible to the community has slightly improved with the services commonly provided and commonly received in public/government facilities compared with private facilities (FaladeFatila & Adebayo, 2020). When some comparisons were made, the (National Demographic Health Survey [NDHS], 2013) reported that as of 2013, about 39% of women were not receiving any antenatal care, and

58% received no PNC. Only 38.1% give birth with a skilled birth attendant. However, more recently Ugwu and Itua (2020) found that the majority of the women had more than four antenatal care (ANC) visits that are even beyond WHO's minimum recommendation. Also, there was increased PNC and family planning (contraceptive) uptake. Despite these improvements, the maternal mortality rate had remained high and presented a significant health concern requiring an investigation in Nigeria. This situation is worsened by the current insurgency and insecurity in the country. Many women have become internally displaced and now live in IDP camps, and no adequate evidence exists to explain their reproductive health problems. The lack of information on IDP women's reproductive health factors justified this study to determine if the internally displaced women have the same reproductive health problems as other Nigerian women. Such data may inform government and health care practitioners' policy direction to develop appropriate interventions for reducing maternal mortality in the country and address health inequality.

Section 1 highlighted the topic of this study and the introduction part. Additional contents include the study's foundation and literature review, the study's purpose, research questions and hypotheses, theoretical foundation, and nature of the study. Finally, this section also includes the literature search strategy, literature review related to key variables, definitions of variables, assumptions, scope and delimitations, significance of the study, summary, and conclusion.

Problem Statement

In recent years, violence and conflict have become widespread in Nigeria, with increased insecurity, terrorism, militancy, and economic problems. Consequently, conflict has occurred at all level of the population and the most horrific has been the Boko Haram insurgency (Abonyi & Ezeh, 2017). This group emerged and suddenly began conflict while trying to stop Western education (Alozieuwa et al., 2017). They declared Western education taboo and subsequently struggled to institutionalize sharia (Islamic) law in the northern states of Nigeria, with indiscriminate attacks since 2009 (Alozieuwa et al., 2017). The insurgency initially began in one state and gradually spread across the northeast region (Borge et al., 2016). The activities included mass shootings, suicide bombings, destruction of properties, and kidnappings focusing on motor parks, mosques, churches, schools, and marketplaces (Abonyi & Ezeh, 2017).

This insurgency has resulted in a loss of lives and rendered thousands of other people, mostly women and children, homeless and they become IDPs (Abonyi & Ezeh, 2017; Internal Displacement Monitoring Center 2015; Olanrewaju et al., 2019). Some of them moved as refugees to neighboring countries such as Chad, Cameroon, and Niger republic (Baba, 2017). At the same time, those that did not leave the country live in both official and unofficial camps facing many challenges.

Women constitute about half of the 33.2 million IDP worldwide (Olanrewaju et al., 2019). Although many IDPs face widespread human rights violations, displaced women are often at higher risk than other affected populations because they are faced with different health challenges (Mudasiru et al., 2019). First, they suffer psychological

trauma because they are separated from their families and loved ones. They experience insecurity, such as gender-based violence and domestic violence. They may use illicit drugs and smoke to cope with their difficult situations. They have higher risks of contracting communicable diseases such as the human immune deficiency virus (HIV) and sexually transmittable diseases (STDs). Because they are vulnerable to rape and forced prostitution (Daniel, 2017; Oladayo 2014), they have a higher risk of unwanted pregnancies, unsafe abortions, morbidity, and maternal deaths (Olanrewaju et al., 2019).

Mudasiru et al., (2019) reported that because of the poor health service delivery within the IDP camps, internally displaced women suffer from noncommunicable diseases such as diabetes, hypertension, chronic kidney diseases, and heart failure, which in pregnant women complicates the pregnancy and increases their risk of maternal death. Paul (2018), added that poor health care services in the IDP camps have disrupted immunization services, preventing women from accessing the human papilloma virus vaccine that prevents cervical cancer. Also poor access to vaccines increases the risk of contracting measles and meningococcal meningitis among pregnant women thus causing poor pregnancy outcomes.

Burns et al., (2018) reported that it is harder for women to lead healthy, safe, and productive lives without safe drinking water, adequate sanitation, and excellent hygiene facilities. The IDP camps usually have poor water and drainage systems. Mudasiru et al., (2019) found that poor hygiene and poor sanitation among IDPs resulting from inadequate water supply have caused the rise of vector-borne diseases such as malaria, diarrhea, hepatitis E, and yellow fever in the IDP camps in Afghanistan and Pakistan.

These vector-borne diseases in pregnant women cause miscarriages and other similar complications that culminate in maternal death.

According to Olanrewaju et al., (2019), there are no special arrangements for pregnant women in IDP and refugee camps. There are poor antenatal services that are inadequate to detect and address likely pregnancy-related complications and other signs of poor pregnancy outcomes. The poor delivery systems, poor PNC services, and limited family planning programs lead to maternal and infant mortalities. Nigeria is one of the most conflict-prone countries globally. The reproductive health factors associated with maternal deaths of internally displaced women in Northeast Nigeria have not yet been identified. Consequently, in this study, I have investigated the impact of reproductive health factors and maternal mortality of internally displaced women in Nigeria as a significant public health issue.

Purpose of the Study

The purpose of this quantitative study was to explore the reproductive health factors of women living in the IDP camps because of the Boko Haram insurgency as compared with the reproductive health factors of other Nigerian women and maternal mortality. Specifically, in this study, I have provided evidence on the reproductive health factors of internally displaced women in Borno State and the impact on maternal mortality.

Research Questions and Hypotheses

Research Question 1: Are there associations between reproductive health factors (number of ANC visits, number of PNC services received, availability of family planning services) and maternal deaths among ID women of ages 14 to 49 years in Borno state Nigeria?

$H_0$1: There are no associations between reproductive health factors (number of ANC visits, number of PNC services received, availability of family planning services) and maternal deaths among ID women of ages 14 to 49 years in Borno state Nigeria.

H_a1: There are associations between reproductive health factors (number of ANC visits, number of PNC services received, availability of family planning services) and maternal deaths among ID women of ages 14 to 49 years in Borno state Nigeria.

Research Question 2: What is the association of maternal death between internally displaced women who went to the IDP camp clinic and other Nigerian women who went to Specialist hospital in Borno state?

$H_0$1: There is no association of maternal death between internally displaced women who went to the IDP camp clinic and other Nigerian women who went to Specialist hospital in Borno state.

H_a2: There is an association of maternal death between internally displaced women who went to the IDP camp clinic and other Nigerian women who went to Specialist hospital in Borno state.

Research Question 3: What is the association between adolescent (14-19 years) motherhood and maternal mortality among IDP women of 14 to 49 years of age in Borno State Nigeria?

$H_0$3: There is no association between adolescent (14-19 years) motherhood and maternal mortality among IDP women of 14 to 49 years of age in Borno State Nigeria.

H_a3: There is an association between adolescent (14-19 years) motherhood and maternal mortality among IDP women of 14 to 49 years of age in Borno State Nigeria.

Theoretical Foundation

McCarthy and Maine's (1992) model was used to examine maternal mortality determinants in recent years. The model proposed that maternal death occurs when both intermediate and distant determinants influence a risk factor (woman getting pregnant). The intermediate determinants are ANC, PNC, and family planning, while the distant determinants include community factors such as place of residence. Justification for choosing the model include the following:

- The model focus is women of reproductive age group (14-49 years) and is centered on maternal death.
- Inclusion of socioeconomic determinants of health such as place of residence, categorized as community factor, is provided for in the McCarthy and Maine's model.

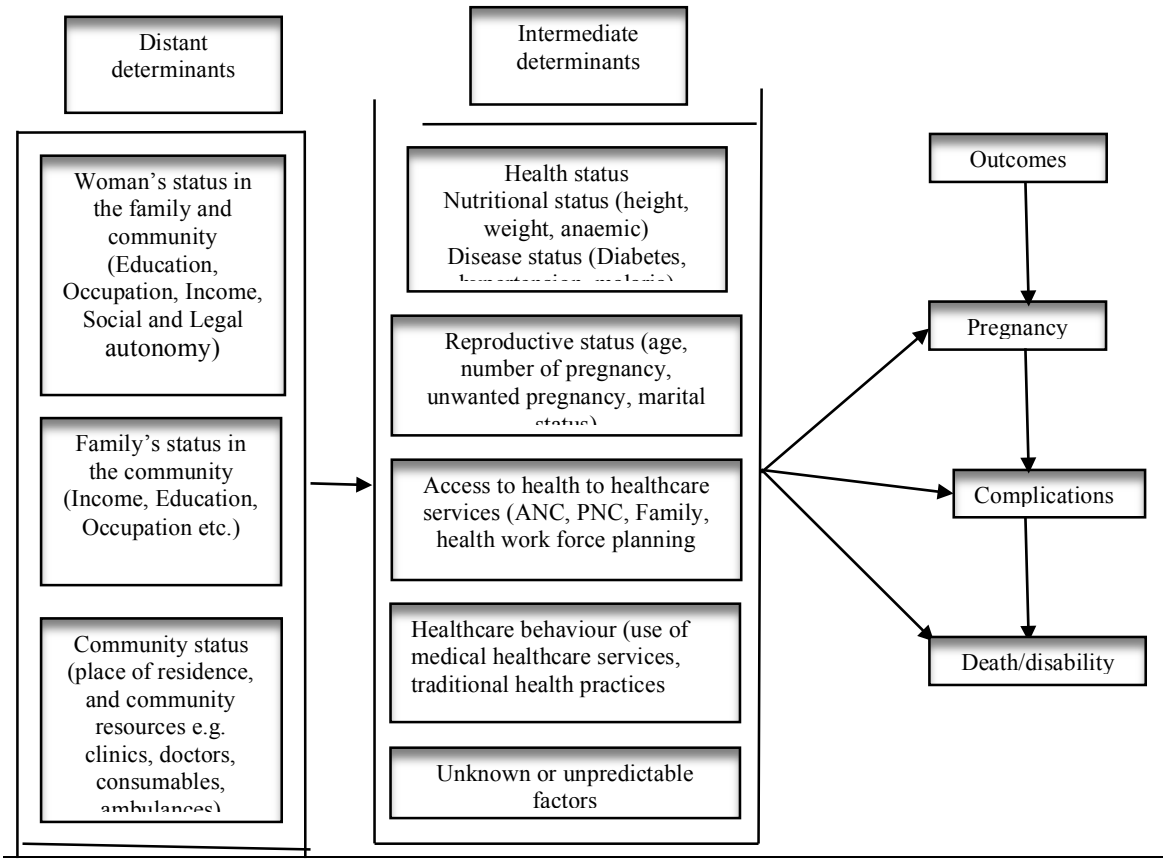
- McCarthy and Maine's model combines biological and social variables into one framework, which informed this study.

Theory Origin

From the framework, a woman's reproductive status (age), her health status, her access to quality healthcare services (ANC, PNC, Family planning program, etc.), her healthcare behaviors, and other unknown/unpredictable circumstances are the intermediate factors that impact maternal death (see Figure 1).

Figure 1

Figure Title McCarthy J, Maine D. A framework for analyzing the determinants of maternal mortality. Stud Fam Plan. 1992:23:23.



McCarthy and Maine's theory describes the primary stages involved in the process that evolves from pregnancy to death (maternal mortality). The theory shows that before maternal mortality occurs, the woman must have the following risk factors: (a) she must be pregnant and (b) she must develop pregnancy-related complications (complications arising directly from the pregnancy or preexisting medical condition exacerbating the pregnancy).

Several risk factors impact pregnancy outcomes through a sequence of events which are directly influenced by some intermediate determinants. These events are: woman's reproductive status (age), her health status, her access to quality healthcare services (ANC, PNC, Family planning program, etc.), her healthcare behaviors, and other unknown/unpredictable (McCarthy & Maine, 1992). Distant determinants, in turn, influence these intermediate determinants. Distant determinants are cultural or socioeconomic factors such as women's status in the family and community status, such as residence, availability of clinics, doctors, and nurses, which affect maternal mortality through intermediate determinants. The interaction between the risk factors, the intermediate, and the distant determinants predispose the pregnant woman to many unfavorable medical conditions that culminate in maternal death (McCarthy & Maine, 1992). McCarthy and Maine's framework was appropriate for this study because it comprises maternal death determinants, as outlined in the research questions.

Major Theoretical Propositions and Assumptions

The McCarthy and Maine's (1992) model assumes that maternal death is controlled by the probability of a woman getting pregnant and the risk of developing obstetric complications once the woman gets pregnant. Another assumption was that the likelihood of dying after getting pregnant is modified by access to essential maternal healthcare services, utilization of safe abortion, and emergency obstetric care. Others are maternal anemia, under-nutrition, infectious and noninfectious diseases (Figure 1). In this study, the community status, which is the place of residence characterized by inadequate clinics, shortage of doctors, inadequate hospital consumables, and insufficient hospital

equipment were assumed to influence maternal deaths through the intermediate determinants such as ANC attendance, PNC services, family planning services, and healthcare workforce.

Previous Literature and Research Applying the Theory

McCarthy and Maine's framework has been used widely by many researchers. For example, Kusuma et al. (2017) acknowledged the appropriateness of McCarthy and Maine's framework in evaluating the effectiveness of household and community cash transfers on determinants of maternal mortality in Indonesia. The author conducted a difference-in-differences (DID) analysis after two years of intervention and found that household and community cash transfers can improve maternal mortality determinants. The community program provides a more positive impact than the household program. These researchers' findings have shown the link between socioeconomic and community status and maternal mortality, just as McCarthy and Maine (1992).

Similarly, Ariyo et al., (2017) applied McCarthy and Maine's model to guide their research that assessed the sociocultural correlations of maternal mortality, using the year 2013 demographic health survey in Nigeria. Also, Hamal et al., (2018) also applied this model through review of the health systems accountability problems that lead to maternal deaths and inequities in India. Other researchers who applied McCarthy and Maine's model because of its appropriateness are Meh et al., (2019) and Meh et al., (2020). They assessed maternal mortality levels and determinants in northern and southern Nigeria, using sample sizes of 51,492 and 18,665 women, respectively.

The Rationale for the Choice of the Theory

This theory was a good fit for this topic for several reasons. The Nigerian budget allocation to the health sector is far lower than that of many other countries. Moreover, the healthcare financing mechanism does not operate optimally as resources are not allocated equitably to improve efficiency. Funding for primary health care is affected the most because most spending occurs at the federal and state levels, where focus is mainly on secondary and tertiary hospitals.

Over the last two decades, low spending on healthcare has worsened the situation by limiting the expansion of highly cost-effective and result-yielding interventions. The universal health service coverage is just 39% (Izugbara et al., 2016), thus exposing many individuals and households to catastrophic health expenditures, culminating in poor health outcomes. Maternal health is one of the worst-hit and records about 576 deaths per 100,000 live births. The trend analysis of budget allocation over the last few years has shown that the total health budget continues to rise and the recurrent expenditure. However, the capital expenditure has been gradually declining. For example, the capital budget increased from 28.65 billion nairas in 2016 to 55.61 billion in 2017 and 86.49 billion nairas in 2018; but suddenly fell to 57.09 billion in 2019 46.48 billion nairas in 2020. The Nigerian government's lack of commitment to prioritize health funding has left households, families, and communities to use about 10% of their income on health.

McCarthy and Maine's framework (1992) showed how these distant determinants (place of residence) influence maternal health outcomes through the intermediate determinants (ANC, PNC, family planning). Therefore, the framework has offered me the

opportunity to analyze these intermediate determinants (ANC, PNC, etc.) that could impact maternal deaths in IDP camps in Nigeria.

The rational of the Choice of the Theory to maternal mortality

Applying McCarthy and Maine's model guided the identification of the factors that serve as barriers to accessing adequate reproductive healthcare services among IDP women in Nigeria. The intermediate determinants are personal effect modifiers such as ANC visits, PNC services, family planning services, and mother's age at birth. The distant determiners are community status (place of residence and community resources such as clinics, doctors, hospital consumables, equipment, and ambulances).

Accordingly, the literature review focused on ANC, PNC, family planning, place of residence, mothers' age at delivery, and maternal death, just as in the statistical research questions outlined previously. The literature review helped in identifying specific gaps in the statistical literature, confirming that the problem statement presented on page 6 has not been solved, and the research questions have not been answered. Therefore, the literature review has justified the originality of the proposed dissertation research and its relevance to answer the research question. McCarthy and Maine's (1992) model informed the study on maternal mortality. The model implies maternal death occurs due to the interconnection between risk factors (pregnancy and pregnancy complications), intermediate determinants (poor access to ANC, PNC, family planning), and distant determinants (community status such as place of residence).

Synthesis of Previous Writings by Key Theorists Related to Neonatal Mortality

There are different theories that relate to maternal death. McCarthy and Maine's (1992) model concluded that any intervention planned to reduce maternal deaths must be tailored to reduce the likelihood that women get pregnant or minimize the possibility that women may develop complications related to pregnancy or improve pregnancy outcomes. While Thaddeus and Maine (1994), developed other women's survival models, they focused on the three delays (delay in the decision to seek medical care, delay in reaching care, and delay in receiving adequate health care) that contribute to maternal mortality among women with complications. While incorporating both the demand and supply-side interventions in the model, these researchers developed this integrated approach because they believed that increasing health services' availability without empowering the communities to access them will only increase health inequalities. Likewise, there will be no impact when communities are only empowered, and there is no facility access.

Gabrysch and Campbell (2009), further expanded the Thaddeus and Maine model by including care-seeking for uncomplicated pregnancies. In addition to the poor physical accessibility, these researchers focused on quality care and economic and sociocultural factors leading to maternal death. This conclusion then makes the Thaddeus and Maine model more comprehensive. On the other hand, Freedman and Kruk (2014), developed a framework for understanding respectful care during childbirth. Through their framework, they highlighted the importance of societal and national factors in understanding health equity and maternal healthcare. The core of these researchers' arguments was that system-

level deficiencies seen as usual and accepted could lead to poor treatment of women, eventually contributing to maternal death.

Other researchers Jewkes and Penn-Kekana (2015), highlighted a form of gender inequality in the reproductive health system. These researchers developed a framework to show how violence against women in obstetric care settings as a type of broader gender inequality creates normative power differentials between health workers and pregnant women. However, current evidence focused only on childbirth, ignoring other critical reproductive health issues, including safe abortion, ANC, PNC, and family planning, rendering the model inappropriate to guide maternal death studies. Afulani and Moyer (2016), also added new knowledge by revealing that the disparities in three important determinants (*Perceived need* for care*, perceived accessibility* of the service, and *perceived quality* of care) contribute to inequalities in the use of skilled birth attendants. This information may explain the strong connection between the use of skilled birth attendants and maternal death.

Gebremedhin (2018), developed the Person-Centered Care Framework for Reproductive Health Equity. According to this framework, settings with societal acceptance of differential treatment or discrimination based on socio-economic status may also have more normative acceptance of women's poor treatment in the health facility. The researcher concluded that the way women are treated in communities and healthcare centers reflects much broader policies, societal level behaviors, and norms. Getachew et al., (2017) undertook a study to determine obstetric causes of maternal mortality and the associated factors among women of reproductive age in Aneded

woreda, Northwest Ethiopia. The study results show that most reproductive age women have insufficient knowledge of direct obstetric causes of maternal death. The researchers also found that women's awareness of obstetric deaths can be influenced by their educational status, occupation, obstetric history, and health facility distance. However, the study did not look at the women's ANC and PNC attendants, and these are the necessary means through which women acquire obstetric knowledge.

Aluko-Arowolo and Ademiluyi (2015), undertook a study to understand maternal health in the context of culture and infrastructure in the Nigerian Society. This study added new knowledge on the association between infrastructure and maternal death to the existing literature. However, the researchers focused on only developmental factors, excluding factors associated with the healthcare service delivery that could limit the study on maternal deaths. Ibrahim (2016), conducted a survey to identify the social-economic determinants of maternal mortality in rural communities of Oyo State, Nigeria, but the study was limited in geographical coverage. A study on Maternal Mortality and Maternal Health Care in Nigeria by Olonade et al., (2019) attempted to address the gap using the 3016 WHO, UNICEF, and UDHS representative of the entire country. The researchers applied the McCarthy and Maine conceptual framework for analyzing maternal mortality determinants in the study, and findings were nationally representative.

Key Statements and Definitions Related to the Theory

This study explored the reproductive health factors by assessing the intermediate factors impacting maternal mortality in IDP camps in Nigeria. The study was informed by McCarthy and Maine's (1992), conceptual framework. According to the World Health Organization (2018a), the definition of maternal mortality is the death of either a pregnant woman or death of a woman within 42 days of delivery, the outcome is a binary variable considered a success (1 = if the mother's death occurred within 42 days of delivery) or failure (0 = if the mother did not die within the specified period). Independent variables are ANC visits, PNC services, Family planning services, place of residence, and the mother's age at delivery. ANC is the specialized medical care provided by a qualified medical professional for pregnant women who receive it during their antenatal visit. (WHO, 2018a). According to the World Health Organization, pregnant women should have four ANC attendance before delivery. During the antenatal care services, all diseases and pregnancy-related complications will be detected early and managed accordingly. PNC is another specialized medical care provided by a qualified medical professional for mothers who start receiving it immediately after giving birth. World Health Organization (WHO, 2018c) recommended that mothers who gave birth should receive at least four PNC services. This study sought to determine whether adequate or inadequate ANC and PNC services affect maternal deaths. Family planning is the process by which individuals and couples anticipate and attain their desired number of children taking full control of their child spacing and timing of their births through contraceptive methods. Accordingly, mothers should plan for their family planning

method immediately after birth. Because the World Health Organization (2008) reported that family planning is beneficial to individuals, families, communities, and societies because it helps couples avoid unintended pregnancies and prevent maternal death. Also, family planning reduces the spread of sexually transmitted diseases, reducing infertility rates. Place of residence can be defined as the neighborhood where people live. Mother's age at delivery means the mother's age at the time she is giving birth. Finally, the study population will be mothers of ages 14-49 years in the IDP camp and specialist hospital. The McCarthy and Maine conceptual framework for analyzing determinants of maternal mortality will inform the study.

The study focused on personal factors (ANC, PNC, and family planning) and community factors (places of residence) impacting maternal death. McCarthy and Maine's (1992) model has explained how the interaction between the risk factors (getting pregnant and developing pregnancy-related complications), the intermediate determinants (personal factors such as ANC visit, PNC services, and family planning program), and the distant determinants (community factors such as place of residence) predispose pregnant women to several unfavorable medical conditions that culminate in maternal death. The adoption of the model helped in identifying the impact of poor access to reproductive health services on maternal death among ID women. This study's findings may inform the review of relevant policies or initiation and development of appropriate policies by the government of Nigeria for implementation by different stakeholders, including health care practitioners, communities, families, household members, and parents. The findings will also help shape the policies that shape the development of

interventions targeted at reducing health inequalities in ID women and the risk of maternal death.

Nature of the Study

This study was a retrospective study using secondary data from hospital records collected by the health professionals. The data were collected from all women of reproductive age (14 to 49 years) in the hospitals. In the study, I adopted a correlational cross-sectional design guided by Campbell and Stanley (1966) and Vogt et al. (2012). I applied binary logistic regression to determine the effect of ANC attendance, PNC services, Family Planning, place of residence and mothers age on maternal mortality, I also use Chi square analysis to determine if there is a risk of maternal deaths between the two groups of women in the two hospitals. The design supports secondary data from the hospital records to investigate ID women's' reproductive health factors and maternal mortality in Nigeria.

Literature Search Strategy

The search strategy deployed to identify the relevant articles on maternal mortality was diverse. It encompassed reviewing related reports underlying the conceptual framework and the main causative factors of maternal mortality, especially in developing countries. In the search process, I focused on quantitative studies that described the associations between reproductive health care services and maternal deaths. The key parameters were the number of ANC visits during pregnancy, the number of PNC visits after delivery, place of residence, and the mother's age.

The databases I searched included Dissertations and Theses @ Walden University, ProQuest Dissertations & Theses Global, ProQuest Central, PubMed, Medline, PsycINFO, Google Scholar, the Cochrane Library, Health & Medical Collection, Science Direct, Nursing, and Allied Health and Public Health. In some instances, the search terms will include developing countries or sub-Saharan Africa to narrow down the search to Nigeria. Also, the review included bibliographies of previous studies and doctoral dissertations on maternal mortality. The journals accessed comprised *Global Public Health, Biosocial Science*, *Global Health, Environmental Research, and Public Health*, *Social Indicators Research, Pediatrics*, and *Malaria.* Others include *Reproductive Health, African Journal on Reproductive Health, Medunab*, *International Journal of Population Research, Lancet Infectious Disease, and Lancet (ScienceDirect), Health and Social Behavior, Maternal Research and Treatment.* I will Also access *Health Services*, and *Research* and *Management Epidemiology* and *BMC Health Policy.*

My literature review for the theoretical framework focused on McCarthy and Maine's model of maternal mortality determinants. It included a systematic review of peer-reviewed abstracts, articles, research papers, conference presentations, and other publications relevant to this research. All the studies selected were from peer-reviewed journals and credible national and multinational organizations such as World Bank, WHO, UNICEF, Centers for Disease Control and Prevention, and SDGs. The literature review has informed the study design and influences the choice of the independent variables.

Key Search Terms

Keywords used in my searches included *maternal, mortality, morbidity, maternal mortality, maternal health, maternal morbidity, maternal deaths, neonatal tetanus mortality, theory/framework for maternal mortality, and binary regression model. Others were ANC attendance and maternal death/mortality, PNC attendance and maternal death/mortality, Family planning and maternal death/mortality, shortage of skilled workforce and maternal death/mortality, and the mother's age. Additional search terms include developing countries, Africa, sub-Saharan Africa,* and *Nigeria*.

Inclusion and Exclusion Criteria and Scope of Literature Review

I also set criteria for inclusion. English research articles on maternal deaths, reproductive health, access to health services, antenatal attendance, postnatal attendance, family planning, maternal age, and health workforce were selected. The articles selected were mostly quantitative studies and few qualitative ones, and in all the articles, the study populations were women of ages 14 to 49 years old. Exclusions were articles on disease surveillance and screening, disease outbreak, disease causation, etc. and articles on women of 14 to 49 years of age but not related to reproductive health. The literature reviews also included studies on maternal mortality/deaths and maternal morbidity but disregarded articles exclusively on infant or neonatal deaths and articles published in other languages. Although most researchers undertook studies in developing countries; however, there was no restriction on publication date because there are still limited articles specifically on maternal deaths in Nigeria.

The information I extracted from the literature review include the name of author, date, year of study, the statistical method applied, theoretical /conceptual framework, assumptions, results, risk factors, conclusions, limitations, and recommendations for future research. Peer-reviewed articles were prioritized mainly because they are reliable, valid, organized, and easy to analyze.

Literature Review

This section reviewed peer-reviewed articles on access to reproductive health factors and their relative importance in improving maternal health outcomes. Studies have shown that timely delivery of adequate and high-quality reproductive health services such as ANC, PNC, and family planning programs by skilled health practitioners will avert nearly all preventable maternal deaths (Sageer et al., 2019).

The limited knowledge about the access to reproductive healthcare services and its impact on maternal mortality among IDP women and whether or not the IDP women have the same reproductive health issues as other Nigerian women justified this study. In the literature review I have identified gaps by previous researchers and contributions to the existing studies on maternal death which may help Nigeria and other developing countries form appropriate policies. These policies will promote the equitable provision of reproductive health services that will curb the high mortality rates of internally displaced women.

Early Studies on Maternal Death

Many women die during childbirth globally each year. Early studies on maternal death in developing countries revealed that about 500,000 women die from pregnancy

complications and abortion each year (WHO, 1985). The number of maternal deaths in India and Bangladesh was 100% that of the United States (Bhatia, 1985). The high rates of maternal death worldwide are linked with the safe motherhood initiative that focused on reproductive, socio-economic, transportation, and health factors as the diverse set of characteristics that influence maternal death (Adler et al., 2012). Assarag et al., (2015) explained that despite the Save motherhood initiative, the low and middle-income countries still account for 300,000, which is 99% of all global maternal deaths. In these countries, the MMR was 242 deaths per 100,000 live births that is 14 times higher than that in high-income countries who have MMR of 17 deaths per 100,000 live births. What these statistics mean is that Africa and Asia tend to see the highest maternal death rates compared to other parts of the world. Anastasi et al., (2015) reported that of all the developing countries, Sub-Saharan Africa alone has 201,000 deaths, accounting for 66% of maternal deaths, and has the highest MMR of 546 maternal deaths per 100,000 live births. The second highest was Oceania, which has MMR of 187, then Southern Asia:176, South-Eastern Asia: 110, Western Asia: 91, Northern Africa: 70, Caribbean: 67, Caucasus and Central Asia: 33 and the zone that has the lowest rate in Eastern Asia which has 27. Therefore, high maternal mortality rates have been a -standing problem in Nigeria and Africa.

In 1999, United Nations General Assembly declared the MDG, which focused on reducing maternal mortality by 75% between 1990 and 2015 United Nations General Assembly (2000). The World Health Organization (2015), reported that between 1990 to 2015, there was a remarkable decline in MMR across most MDG regions. The highest

reduction was in Eastern Asia, with 72% decline, Southern Asia 67 %, South-Eastern Asia 66%, and Northern Africa 59% Others are Central Asia, Oceania, and the Caucasus, who all have 52% decline, then the Caribbean and Latin America both have 50 %, Sub-Saharan Africa,45% decline, and the lowest was in Western Asia where MMR declined by only 43%. Despite the substantial progress, challenges remained as the majority of the countries still experience high maternal deaths.

Maternal mortality had been a significant public health issue in developing countries. Nigeria and India still account for more than one-third of all global maternal deaths because of the lower declining pattern (Tadele & Abebaw, 2017). Tadele and Abebaw (2017), undertook an ecological study using international data bases from 2008 to 2016 from, UNICEF, UNDP, World Bank and WHO, to identify correlates of maternal mortality in developing countries. The result showed significant relationship between the maternal mortality and socio-economic status, health care system, antenatal care coverage, skilled birth attendance, adult literacy rate and others. Similarly, Sajedinejad et al., (2015) undertook a study to determine the distant macro structural factors affecting maternal mortality at the global level, the researchers used the Pearson correlation coefficients to assess the relationship between the indicators and maternal mortality. These researchers found that education, agriculture and food production, employment and labor structure, economic policy, and private sector infrastructure investment, were all critical factors that strongly contribute to rising numbers of maternal mortality. Cameron et al., (2019) used 2010 Indonesian Population Census as source of data to identify difference in MMR between high and low-performing provinces. Through their findings,

the researchers proved that increase health workforce reduces maternal death because the multilevel logistic regression analysis they conducted revealed that the reduced MMR observed in high performing provinces is strongly associated with the increased supply of midwifes to that province. Furthermore, Sageer, et al., (2019) linked the sustained high mortality rates across Nigeria and sub-Saharan Africa to inaccessibility and underutilization of maternal healthcare services and inadequate trained health professionals. While, Izugbara et al., (2016) linked maternal death with poor ANC services. In their report, they described that more than half of Nigerian women do not make the four recommended antenatal care visits during their pregnancy, and since 1990, approximately 60% of childbirths have been taking place at home. And by 2003, only about 33% of Nigerian women have utilized postnatal care despite its relative importance in averting maternal deaths. Meh et al., (2019) used the Nigerian Demographic and Health Surveys of 2008 and 2013 to assess differences in the levels and determinants of maternal mortality in women of North and South of Nigeria. Multivariable logistic regression was applied, the researchers discovered that maternal mortality was more pronounced in the North than in the south region of the country because of the low media exposure and and poor education system in the North, and the increased uptake of contraceptive and wealth index in the South.

Studies Conducted Globally Regarding Reproductive Health factors and Maternal Deaths

The reproductive health factors in this study were ANC visits, PNC services, Family planning services, place of residence, and the mother's age at delivery. It is

assumed that each of these factors directly or indirectly have an association with maternal deaths. Meh (2017), undertook a study to identify the Determinants of Maternal Mortality using McCarthy and Maine's model. This researcher has confirmed that maternal mortality is substantially high in developing countries, and the age of mother at delivery, parity, and education were associated with maternal mortality in Cameroon. Researchers like Sageer et al., (2019) showed that the main contributory factors were hemorrhage, pre-eclampsia, and or eclampsia. Others include inadequate human resources for health, delay in seeking care, inadequate equipment, lack of ambulance transportation, and delay in referrals services.

A cross-sectional qualitative study by Azuh et al., (2017) in Nigeria showed that approximately 830 women die daily from preventable causes related to pregnancy and childbirth. The leading non-medical influencing factors were lack of awareness of pregnancy complications and antenatal care treatment. These researcher's technique was beneficial and provided qualitative insight by identifying the place of consultation/diagnosis, and the person who pays the treatment costs as additional factors influencing maternal mortality. Also Obare et al., (2016) undertook a study to determine factors contributing to maternal deaths in Nairobi, Kenya. The researchers reported that about 4 out of every 1000 women who give birth die from pregnancy or pregnancy-related complications. Most of these maternal deaths were due to preventable medical conditions and the leading cause being poor health-seeking behaviors.

Mufidah et al., (2018), investigated the cause of persistently high maternal mortality in Indonesia's rural district. Still, their sample (30 maternal deaths) was too

small for national representation. Yego et al., (2014), applied McCarthy and Maine's to determine the risk factors for maternal mortality in Kenya. The study results showed that antenatal care and maternal education are important risk factors for maternal mortality. A significant criticism of these findings was the researcher's focus on only maternal deaths from Tertiary Hospital Hospital, ignoring other hospitals in Kenya.

Literature on Selected Variables and Concepts

As detailed in McCarthy and Maine's model, the individual control factors influence maternal mortality by acting as intermediate determinants. These individual control factors are variables that include Antenatal care visits, post-natal care services, family planning program, place of residence, and mothers age at delivery.

Antenatal Care Attendance and Maternal mortality

Antenatal care is the special care given to pregnant mothers throughout their pregnancy. It is a complete package of routine and systematic medical reviews provided by qualified medical practitioners through repeated consultations, for early detection of diseases and likely pregnancy and birth complications.

The World Health Organization and UNICEF have recommended that every pregnant mother have at least 4 ANC visits during her pregnancy with the first visit during the first three months of conception (WHO report, 2007).

The relevance of ANC visit was explained by the findings of Makate and Makate (2017), as follows: During the ANC clinic, the trained health workers will conduct physical examinations on the pregnant woman to identify signs of stress, low blood pressure, and low PCV among others, they measure the size of the pregnancy as it is

compatible with the size of the baby and they also listen to the baby's heart sound. They administer TT vaccine and preventive treatment for malaria in pregnancy. They take blood and urine samples for laboratory tests to screen and diagnose other infections or diseases such as sexually transmittable diseases that can affect unborn babies. After diagnosing, they provide treatment as recommended by WHO. Ogu and Orazulike, (2017) have collaborated on the findings that ANC by trained, skilled care workers provides screening for hypertension, anemia, diabetes mellitus, infections, and reduces the incidence of perinatal illness and death of both mother and baby. It allows birth preparedness and identification of danger signs in pregnancy through timely treatment and appropriate referrals.

The researchers Shafique et al., (2017), reported that ANC is critical during pregnancy. In addition to diseases diagnosis and treatment, awareness was created on the importance of maternal and newborn health in averting neonatal deaths and improving pregnancy outcomes. This was supported by Gurusamy and Janagaraj, (2018) findings in Rwanda who reported that three out of every ten maternal deaths were a result of inadequate ANC services. This finding corresponds with those of Yego et al. (2014), who also revealed that the total absence of antenatal care during pregnancy was associated with high maternal mortality rates.

The researchers Alkema et al., (2016), underscored the importance of ANC in averting maternal mortality. The ANC coverage and skilled birth attendance in Canada, Finland, and Kuwait were 100% with MMR of 7 in 100,000, 4 in100,000, and 3 in 100,000. This information was in contrast with findings in Nigeria were the ANC

coverage was 61%, and MMR was 814 in 100,000 and that of Republic of Chad, where ANC was 55% coverage and MMR of 856 in 100,000 (WHO report, 2007). Girum and Wasie, (2018), conducted an ecological study using international databases of health metrics of 82 countries. The databases were from WHO, World Bank, UNDP and UNICEF between 2008 to 2016, to identify correlates of maternal mortality in developing countries. The researchers found an inverse and significant correlation between maternal mortality ratio and Antenatal care coverage. However, their study had some limitations as they used secondary data as the data source. Not all developing countries are represented in the databases in WHO, World Bank, UNDP, and UNICEF; this makes the generalizability of the findings questionable. Also of the 82 developing countries, 62 have relatively complete data from national death registration systems, which were used directly. For the other 20 countries, the multilevel regression model was developed using available national-level data from surveys, death registration, censuses, and surveillance systems. This study not only focused on ANC attendance as the correlates of maternal mortality but also investigated the use of skilled birth attendance, adult literacy rate, access to improved water source and sanitation, positive relation with disease incidence, and unmet needs among others. Dumbiri et al., (2018) undertook studies in northern Nigeria; the samples were too small to represent nationally. This study was based on McCarthy and Maine's model and binary logistic regression and Chi-square test was applied in the analysis.

Post-natal care and Maternal mortality

Post-natal care (PNC) is the care given to mothers and their newborn babies through systematic examination and appropriate pieces of advice given to the mother throughout the postpartum period (immediately after birth up to the first six weeks of life). The postpartum period is a critical phase in the lives of mothers and newborn babies. Sandhya et al., (2015) and Berhe et al., (2019), described the importance of the post-natal care services especially during the critical post-natal period (the first 24 hours after birth and within the early seven days of delivery) because this is the time when mothers and newborn babies have the highest risk of dying. The researchers reported that 45-50% of the mothers and newborns die during the first 24 hours of the postpartum period, while 65-75% of maternal and neonatal deaths occur within the first week of birth.

According to the WHO, mothers who gave birth in the health facility should receive adequate post-natal care in the first 24 hours. Those that gave birth at home should also receive the first post-natal care as early as possible within 24 hours of delivery. In addition to the first post-natal care, an additional three are recommended on day 3, day 7, and 6th week after birth (WHO, 2019). Post-natal care is provided in two phases; the first phase is within the early 24 hours, starting from the first hour after birth. The health practitioners provide a complete package of care that includes the regular assessment of the temperature, pulse rate, vaginal bleeding, uterine contraction, and fundal height of all the postpartum women and provision of intervention when any abnormality is detected. The second phase starts after 24 hours of delivery. The same

regular assessment of these women continues. At each subsequent post-natal contact, both mother and baby will be examined and monitored for any deviation from expected recovery after birth, and evaluating and intervening appropriately on time.

Salam et al., (2014) conducted a systematic review to identify the evidence-based birth and post-natal interventions that positively impact newborn and maternal health outcomes. These researches found that post-natal care interventions were associated with decreased maternal and neonatal mortality and morbidity. The investigations have succeeded in summarizing evidence from recent Cochrane and non-Cochrane reviews at the time of the study on childbirth and post-natal interventions. One criticism associated with systematic reviews is that some times the quality of the included articles could not be ensured and thus limiting the quality of the data used. The focus of this study was to assess the impact of PNC on maternal deaths among Internally displaced women.

Family Planning and Maternal Mortality

Family planning is the control of childbearing process to allow adequate child spacing among women of childbearing age. Family planning itself is an essential factor that reduces maternal death and improves child survival. Proper family planning methods and adequate child spacing play a crucial role in achieving a positive pregnancy outcome. Family planning prevents the rapid series of many pregnancies, and the longer the period between pregnancies, the lower the incidence of maternal death (WHO, 2019). According to UNFPA, (2016), there is a gap between women's reproductive intentions and their access to family planning options such as the use of contraceptives and safe abortion in many developing countries. UNFPA further reported that the sustainable development

goal component (healthy birth spacing practices to achieve fewer than 70 maternal deaths per 100,000 live births by 2030) could be attained maximally when the relationship between family planning and maternal mortality is prioritized.

The WHO recommends that family planning using locally available and culturally acceptable contraceptive methods is widely available and easily accessible to all women of childbearing age through trained health workers, mainly the community health workers. Ideally, five conditions determine the healthiest possible stage for pregnancy. These include having fewer than five previous pregnancies; the mothers' age which should be over the age of 18, but not more than 34; availability of at least three years spacing from the last live birth or one and a half years after an induced abortion or miscarriage (WHO, 2018a). The family planning programs designed includes outreach activities, dissemination of information, distribution of services, and supplies for modern means of fertility regulation. As part of the service delivery, community health workers provide sensitization to parents. Awareness lecture will be given to both men and women about the temporary and permanent contraception methods, including the traditional or natural methods, contraception use, its side-effects, and appropriate referrals for alternative methods or referrals to secondary and tertiary health centers for consultation in cases of complications. Following the sensitization, excellent counseling services on the choice to use a technique, which method to use with fully informed consent will be provided at the community clinics or any health facility that offer family planning services.

Ahmed et al., (2012) collaborated on the importance of family planning in reducing maternal mortality. These researchers discovered that maternal mortality would be 77% lower globally when family planning programs and contraceptive methods are optimally used. Also, when Lumbwe et al., (2015), used the family Planning model in Spectrum to project the impact of modern contraception on pregnancies, abortions, and births in South Africa from 2015 to 2030. The researchers used the Lives Saved Tool to estimate maternal and child deaths. They conducted a scenario analysis to test the impacts when Contraception use (CPR) was 0.1% annually and increased linearly to 99% in 2030. Their result revealed that there would be a decrease in unintended pregnancies, abortions, and births by about 20%, and approximately 7,000 infant and child death, and 600 maternal deaths would be averted. The proximate determinants of fertility the researchers used for their estimate is a reliable concept, and it represents a useful framework to capture the main effects of interest; however, it does not fully explain all the factors affecting fertility. The wide variation in the estimated total fecundity levels probably reflects differences in other features that affect fertility. Still, these features are not measured in the study because they are not included in the framework.

The researchers Ghulam et al., (2015), reported that despite the importance of family planning in reducing maternal mortality, practice and utilization of family planning methods is low in most areas that recorded high maternal deaths. When these researchers undertook a qualitative study to assess the knowledge, attitudes, and practices regarding family planning in Pakistan, their findings revealed that most participants knew about some modern contraceptive methods. Still, the overall contraceptive knowledge

and use were unusually low. However, the study targeted only young and newly married men and women who had not yet reached their desired family size and no child older than two years. Perhaps this may explain why the utilization of family planning methods was still low among the participants. A group of researchers Tran et al., (2018), also undertook a qualitative study to identify barriers and catalysts to Post Partum Family Planning (PPFP) uptake in Burkina Faso and the Democratic Republic of Congo. In this study, they found that the unmet need for PPFP in both countries remains critically high. The researchers concluded that it is important to explore optimal programmatic approaches to address the situation. The researchers only focused on assessing the uptake of modern contraceptives methods. And because women in Burkina Faso have prevalence rate for modern contraceptive methods of 15.0%, the same with the Democratic Republic of Congo, the researchers assumed that the experimental group participants would also use a modern method for their postpartum family planning. Therefore, this excludes the assessment of the traditional method. The qualitative approach, although useful in exploring sensitive issues, such as contraception and sexuality, participatory approaches in qualitative research face limitations in convenience sampling of informants (selection bias) and social desirability or recall bias (response bias).

This study applied a quantitative approach to determine the association between family planning services and maternal mortality, the finding of which could provide a policy direction in Nigeria.

Place of residence and maternal mortality

Adu et al., (2018), in their study on maternal mortality by region using the McCarthy and Maine model in Ghana, they looked at the effect of individual and community factors on maternal health outcomes. The researchers used hazard analysis, and their findings show that individual-level factors (education, wealth, etc.) and community factors (region, residence, etc.), are important correlates of maternal deaths. Also, Ellen and Turner, (1997) undertook a study to determine the association of neighborhood on health and they reported that individuals' health behaviors and outcomes are influenced by the neighborhood environments in which they live. Also, the researchers Ager et al., (2015) presented that local services' quality is one of the distinct mechanisms through which neighborhood conditions probably affect individuals. Mudasiru et al., (2019) in their cross-sectional study on IDPs' health challenges have revealed that people in IDP and refugee camps have limited access to global quality health service and the barriers to these services include a shortage of skilled health workers among others.

The consequences of the shortage of skilled health workforce as a barrier to global quality health services in some neighborhood, and its link with maternal mortality is collaborated by Kendall and Langer, (2015). These researchers reported that lack of sufficient skilled staff would undermine the high-quality antenatal care, emergency obstetric, delivery, and post-natal services needed to reduce maternal mortality. This study has added new knowledge that shows that increased facility delivery does not translate into reduced mortality. Azetsop and Ochieng (2015), who conducted maternal

death reviews in Malawi, have reported that inadequate health workforce is a significant contributor to poor pregnancy outcomes and maternal death. Because staff shortage delays the initiation of emergency interventions, delay decision making to seek care in cases of complications, and delay authorizing referral. Friday et al., (2018) used an unadjusted Poisson regression analysis to determine the association between the density (number) of healthcare providers and the number of maternal deaths in eight referral hospitals in Nigeria over a period 3-year (2011–2013). The researchers found 1343 pregnant women to be seen and managed by one doctor (1343:1) and 222 to be cared for by one midwife (222:1). There was an average of 441 births per specialist obstetrician (441:1). The regression analysis showed a significant negative association between the number of maternal deaths and the ratio of patients to a doctor, which translates as the higher the ratio of patients/doctors, the higher the hospitals' maternal mortality rates. The researchers concluded that the number of maternal mortality is associated with a low number of healthcare providers. However, these findings could not be generalized for the whole country as data from the Northeast zone of the country with different health challenges were not included in the analysis.

Also, Holmer et al., (2015) used a national data for the number of specialist obstetricians, surgeons, and anesthesiologists per 100 000 population (density) from the WHO Global Surgical Workforce Database to compare with the number of maternal deaths per 100 000 live births (maternal mortality ratio; MMR) in WHO member countries. The researchers conducted a regression analysis using a density threshold; their findings revealed that each 10-unit increase in specialist doctors' density correlates with a

13·1% decrease in MMR. This information shows that countries with higher densities of doctors had significantly lower maternal mortality ratios. The study has also closed a gap by identifying thresholds level, which could also be used as markers for health system capacity. The Lives Saved Tool (LiST) was used by Homer et al., (2014) to estimate maternal deaths that would have been averted if midwifery was scaled up in 78 countries. Their estimate shows that every 10% increase in midwifery-led maternity care coverage would result in about a 27% reduction in maternal mortality in low-income countries. In their study, these researchers have encompassed the scope of midwifery practice in reducing maternal death.

This study will focus on the differences in maternal deaths among internally displaced women and other Nigerian women. Therefore, the study attempts to fill the gap by understudying the connection between place of residence and maternal deaths using data from IDP hospital and Specialist hospital.

Mothers' age in pregnancy and Maternal Mortality

According to World Health Organization (2004) publication, and Bomela et al., (2020), age is one of the significant indicators of maternal mortality. Nair et al., (2017) reported that young mothers (adolescents aged 15 years or younger) face higher risks of complications and maternal death than older mothers of 20 years and above. Neal et al.,(2016), in their systematic review have revealed that adolescents have higher risks of suffering from maternal mortality causes such as preterm delivery and malaria in pregnancy, among others. Also, the WHO, (2019) described the risk of a higher chance of complications that lead to maternal death is higher among women of extreme

reproductive age (15 years and below and 35 years and above). Arguably, Andrea et al., (2014) compared Adolescents' risk of death during pregnancy or childbirth with that of older women. Their findings show that the adolescent maternal mortality rate is low compared with that of women older than 30 years. McCall et al., (2016) in their study also show that the odds of maternal death from medical comorbidities increased by 12% per year increase in age. Contrary to that, Fretts et al., (2019) described that most women over 45 years have good pregnancy outcomes and have a lower risk of maternal mortality.

Judy and El-Sayed (2018), undertook a population-based retrospective cohort study in Washington state, to examine the association between age and severe maternal morbidity and mortality among 828,269 pregnant women between 2003 and 2013. The result of their study show that the rates of maternal morbidity and mortality were high among teenagers (2.1%), lower among women 25 to 29 years (1.5%), low among those aged 40 to 44 years (2.3%), higher among women aged 45 and older (3.6%). The study has contributed most to the existing literature that demonstrates high rates of pregnancy-associated morbidities with age. In this study, I analyzed the association between the reproductive health factors of IDP women (ANC visits, PNC services, Family Planning Services, Place of residence and mothers age) and maternal death.

Research Methodologies of Reproductive Health factors and Maternal Mortality

Most research investigation on maternal mortality was conducted through quantitative approaches. Few studies used primary data, but most utilized secondary data from DHSs, hospital records, health surveillance sites, and verbal autopsies. While only a

few studies adapted qualitative and mixed-method designs, some researchers undertook meta-analysis and systematic reviews on the determinants of maternal mortality. All approaches used provided critical information that added new knowledge on maternal death to the existing literature; however, they had limitations. An advantage of qualitative studies is that it allows for an understanding of women's reasons and experiences and perceptions on access to health services and its effect on maternal mortality. For example, Okonofua et al., (2018), in their research on perceptions of the causes of maternal mortality by women attending referral hospitals in Nigeria using the health belief model, showed that delay in accessing health care could influence maternal health. The researchers studied the understandings of various categories of women, who mostly believe that delays in reaching hospitals or after women arrive in hospitals are the lead causes of maternal mortality. Also, qualitative studies allow the use of a small sample size from the target population and enable the inclusion of persons excluded in quantitative studies. Bower et al., (2016), and Frankfort-Nach and Nachmias (2008), documented that qualitative studies have some limitations because they are usually restricted to single locations because of the elaborate IRB requirement and the cost.

Mixed studies are beneficial and essential in data validation because they combine both quantitative and qualitative approaches. The researcher Mourtada et al., (2019) employed the mixed methods approach to determine factors affecting antenatal care content concerning maternal death in Syria. The quantitative study focused on the determinants of ANC while the qualitative aspect focused on the adequacy of ANC content in two Syrian governorates, Aleppo, and Latakia. The quantitative findings

revealed that women's education level, the type of health facility they attended, and the health complications they developed were all determinants of the adequacy of ANC content received. And the qualitative result showed that additional factors such as doctors, organization of health services, selective prescription of ANC tests influenced the quality of ANC. In another mixed-method approach undertaken by Kozuki, N. (2015), the qualitative aspect of the study explored the degree of awareness on the use of ANC services and the competences of health workers on the use of ultrasound machines during ANC. At the same time, the quantitative part determined the usefulness of the knowledge of ANC services in improving pregnancy outcomes. The quantitative result described the education of mothers and health workers as critical, while the qualitative findings were more valuable in validating the quantitative results as it provided explanations behind the numbers. The studies in the examples above had the advantage of giving participants a chance to express their experiences and deliver in-depth personal feelings on factors affecting access to health services and their impact on maternal mortality. However, the mixed method also has some limitations of being expensive, requires a lot of interviewer time and resources.

The advantage of quantitative studies, on the other hand, as highlighted by Frankfort-Nachmias and Nachmias (2008), is that it enables researchers to apply scientific approaches to determine the sample size and provide for non-response because of the large population size involved. Also, quantitative methods benefit researchers as it promotes statistical approach in the analyses and examinations. Also, it makes the presentation of information easier using tables and graphs. Sajedinejadet al., (2015) and

Azuh et al., (2017) conducted quantitative studies on maternal deaths at the global level and in Nigeria, respectively. A strength of quantitative surveys is that both primary and secondary data can be used. Although primary data collection is not time-consuming but is very expensive, but the use of secondary is cheap. This research was quantitative, using secondary data from hospital records.

Definitions

The definitions of some terms in this study include the following:

Age of the mother: The accurately completed years of the mother at the time of delivery.

Antenatal care (ANC): The medical care or services that are given to pregnant women in health facility and recorded as yes/no. The services include a physical examination and laboratory investigations to detect diseases at their early stage and treat.

Postnatal care: The medical care or assistance given to women immediately after giving birth to 42 days after delivery. It is offered in a health facility and recorded as yes/no. The care includes a physical examination to detect any sign of complications that may arise after giving birth.

Family planning: The action that is taken to decide the number of children parents can have, the spacing between the children and how this may be achieved.

Place of residence: The neighborhood where people live, such as IDP camps.

Maternal deaths: The cessation of a mother's life during pregnancy or within 42 days after delivery. The death may be due to pregnancy and pregnancy complications.

Maternal mortality: The cessation of a mother's life during pregnancy or within 42 days after delivery. The death may be due to pregnancy and pregnancy complications

Maternal mortality rate: The number of women who die from pregnancy and pregnancy complications expressed out of every 1,000 women who delivered successful and alive.

Odds: The chance of a situation happening.

Intermediate factors: Measurable variables of health that are categorized into personal illness control factors (ANC attendance, PNC, and family planning) and maternal factors (age of the mother) in line with McCarthy and Maine's model. Measurable variables of health that are categorized into personal illness control factors

Distant determinants: Measurable variables that influence maternal dearth indirectly.

Socioeconomic determinants: Factors that determinants the social well being of individuals broadly categorized into household factors such as wealth index and community factors such as place of residence and geographical region.

Supervised delivery: Delivery of a mother under health professionals' supervision, either doctor, nurses, or midwives.

Health professional: Some qualified health personnel such as doctors, nurses, midwives and pharmacist

Nigeria: A country in sub-Saharan Africa, specifically West Africa.

Assumption

I assumed that records of maternal deaths collected from the hospitals would be representative of all deaths of mothers and pregnant women in Nigeria. The data recording focus was on mothers and pregnant women who were seen in the hospitals and have died, excluding the mothers that are alive. I also assumed that health professionals had captured all the information correctly. Translators were used when there was a need to translate the questions asked to local languages, and data were accurately recorded. Another assumption was that all pregnant women seen in the hospitals by health professionals provided accurate responses to the questions they were asked during medical history taking.

Scope and Delimitations

The study will include women aged 14 to 49 years covered in hospital records for the last five years. The study will consist of women who died during pregnancy or mothers who died within 42 days after giving birth recorded over five years (2016 to 2020). The study will exclude mothers' deaths after 42 days of delivery and deaths of mothers or pregnant women that did not fall within the five years.

Limitations

One of the likely limitations of data from the IDP hospital records is that estimates could only be provided at the community or the state level where the IDP hospital is based and not for the entire country possibly limiting the usefulness of data at national level. Policy makers may not use this to inform decision making at the national level. This study is also using data from another hospital aside the IDP hospital, which

has an adequate sample with regional representative populations that will enable country level decision making. Another limitation of data on mortality is that the data only relates to the dead mothers at the time of the survey, this may affect reliability and validity because information on mothers who succumbed to death at other times was excluded. In this study the information will be gotten from the hospital records where it is expected that all data are accurate since it is collected by medical professionals.

Significance

The effects of Boko Haram Insurgency on internally displaced persons have been extensively studied and analyzed in most aspects of life and according to research knowledge requirements. Despite many studies on Boko Haram insurgency and related issues, the health problems of women in the IDP camps in Borno State Nigeria have not been investigated. As the Boko Haram fight continues, men are mostly killed, and women are sphered, the women constitute the majority of the IDPs. Furthermore, disruption by the insurgency has pushed women and girls into new roles outside of their domestic sphere. Many of them lose their husbands to the conflict, so they now have more responsibilities as sole decision-makers for their remaining families while in the IDP camps. Most of the women in the camp are women of the reproductive age. Therefore, it was necessary to understand the reproductive health issues affecting these Internally Displaced Women and compare them with the reproductive health issues of other Nigerian women.

Significance to Theory

This study may contribute to existing knowledge and scholarly evidence on maternal deaths. The study findings will validate the theory by McCarthy and Maine because the results will show if intermediate determinants such as ANC attendance, PNC services, and family planning program have a significant effect on maternal deaths. This study may add to the body of knowledge on the impact of community factors such as place of residence (IDP camp) on maternal mortality as described by McCarthy and Maine's framework, an area with limited literature in Nigeria. Findings from this study may not only inform the policy direction in Nigeria but similar developing nations.

Significance to Practice

The study findings are essential as they will support the development, the designing, planning, and implementation of targeted interventions and comprehensive healthcare package to cater for the full complement of health issues of Internally Displaced Women instead of instituting fragmented vertical programs at national and community. The findings of this study will be used to identify feasible solutions that are cost-effective to address women's current reproductive health issues in the IDP camps. The study will help provide recommendations for policies and programs towards improving the mental, physical, and social well-being of the Internally Displaced Women in Nigeria and the world. By offering these recommendations, I hoped to fill a gap of insufficient knowledge on the women's reproductive health issues in the IDP camps in the literature.

Significance to Social change

The recommendations from this study may facilitate the establishment of community health groups, civil societies, and youth organization to mobilize, advocate, educate, and sensitize members of the public and the policymakers on the importance of ANC, PNC, family planning on pregnancy and its outcome, and also the impact of poor health care services in places of residence such as the IDP camp. This information may help the policymakers understand the reproductive health issues of the Internally Displaced Women, especially in the Northern States, and to develop programs, policies, and interventions that will help improve women's health and well-being in the IDP camps. Policy and decision-makers need to understand the reproductive health problems peculiar to the IDPs in Northern Nigeria. Because strategies that might have worked either in South-south or south-east parts of the country or elsewhere in the world may not necessarily work in Northern Nigeria because of differences in traditions, norms, and cultural practices. According to Simone & Mario (2019), all intervention measures have to be peculiar to each circumstance. Therefore, understanding the reproductive health issues of the internally displaced women within the Northern Nigerian context was critical to developing intervention peculiar to the IDPs in the Northern States.

Findings from this study may enable the Nigerian government to reflect on the reproductive health issues' risk factors and the barriers to accessing reproductive health services, especially by women in IDP camps. And to re-examine, develop, and implement the workable government health policies and programs that will address the health issues that the women in the IDP camp face. Findings from this study may also help the

Nigerian government identify a series of initiatives and develop a legal framework that will specifically incorporate the management of the women's reproductive health issues in IDP camps into the national health strategic plan.

Moreover, the study findings may also make it possible for the Nigerian government to develop and implement programs that will aid the recovery of women affected by the Boko Haram insurgency and other natural disasters. This study's recommendations could lead to the development and application of policies and interventions to support women traumatized by the Boko Haram Insurgency.

Identification of the women's reproductive health issues in the Internally Displaced person camp in Borno State Nigeria deepens researchers' understanding of individual roles and connections between terrorism and the health issues associated with IDP camps. It may also enhance researchers' understanding of the links among Nigerian government health policies and programs and the reproductive health needs of Nigerian women exposed to Boko Haram Insurgency. Comprehensive analysis of the IDP women's reproductive health problems in Borno State Nigeria can offer researchers new perspectives, assisting them in elucidating the reproductive health problems of women associated with IDP camp.

Summary and Conclusions

The literature has shown that maternal mortality is persistently high, particularly in developing countries where one out of every 75 pregnancies end in death. The review also demonstrated the existence of a relationship between ANC attendance, PNC services, family planning services, place of residence, mother's age at delivery and

maternal deaths. Other risk factors such as poor mothers' education, underlying medical conditions, shortage of skilled workforce in certain neighborhoods like refugee camps, and long waiting time for delivery were also found to be associated with maternal death. Moreover, research on delivery in hospital facilities found factors such as skilled workforce and health infrastructure as key in controlling maternal deaths. However, this finding was limited since the place of birth was involved. Other studies found ANC attendance significant in controlling maternal death, but most of these studies were not conducted in Nigeria but in other countries. More studies were recommended on the effect that reproductive health factors could have on maternal mortality, especially in the IDP camps, a gap that I attempt to fill using secondary data from hospital records.

In this section 1 presented the introduction of the topic. I provided information about reproductive health factors and maternal mortality. Vital information was provided on the extent to which previous researchers understudied maternal deaths. The problem statement highlighted the identified problem, which led to undertaking this study. Other parts that are included in this section are the purpose of the study, the variables to be measured, the research questions and hypotheses, the theoretical framework informing the study, the nature of the research, definitions of terms, assumptions, delimitations, limitations, and significance of the study. This research intends to fill a gap by identifying the effect that selected intermediate factors (ANC attendance, PNC services, family planning, place of residence, age of mother at delivery), have on maternal deaths. The findings will inform policy direction and may facilitate the attainment of the SDG goals

by 2030. I have documented the methodology for undertaking this study, source of data, target population, variables, validity, reliability, and ethical considerations in Section 2.

Section 2: Research Design and Data Collection

Introduction

The purpose of this retrospective cross-sectional study was to explore the relationship between reproductive health factors and maternal mortality of internally displaced women in Borno state Nigeria. I used secondary data to assess the difference in maternal death between the internally displaced women and other Nigerian women and provide policy recommendations that government officials could adapt to reduce the incidence of maternal deaths in IDP camps. This study was guided by the following research questions: What is the associations between reproductive health factors (number of ANC visits, number of PNC services received, availability of family planning services) and maternal deaths among ID women of ages 14 to 49 years in Borno state Nigeria? What is the association of maternal death between internally displaced women who went to IDP camp clinic and other Nigerian women who went to Specialist hospital in Borno state? What is the association between adolescent (14-19 years) motherhood and maternal mortality among IDP women of 14 to 49 years of age in Borno State Nigeria?

The independent variables were the number of ANC visits, PNC received family planning services, place of residence, and the mother's age at delivery. The dependent variable is maternal deaths. Table 2 on page 63 provides a structured view of the three hypotheses, the dependent variables, independent variables, and the statistical approach that will be applied for testing the hypotheses.

I reviewed more than 50 studies on maternal death in Section 1, the purpose of the review was to identify factors (such as place of residence) that serve as barriers to

accessing health services and its impact on maternal deaths. Also to provide recommendations on possible ways of addressing it around the world, especially in sub-Saharan Africa. In Section 2, I outlined and described the steps undertaken in this study. The section's contents include research questions and hypotheses, dependent and independent variables, research methodology, research approaches, study population, confidentiality, data management, and analysis, validity reliability, location, and dissemination of study findings

Research Design and Rationale

Study Variables

This study has both dependent and independent variable as required. The dependent variable is maternal deaths and is referred to as the death of a mother from the day of delivery to 42 days and is a success (1 = yes) if death occurs or failure (0 = no) if death does not happen as in the hospital records. The independent variable includes ANC attendance, PNC services, family planning services, place of residence, and the mother's age at delivery. The variables that were selected have facilitate the direct analysis of poor access to health services on maternal deaths among women of reproductive age (McCarthy & Maine, 1992). This study utilized secondary data from two health facilities to answer the research questions.

Research Design

A research design is a detailed plan of the study, outlined to align with the problem statement, the methodology used in data collection, and analysis, relevant to the

research questions (Frankfort-Nachmias & Nachmias, 2008). In this quantitative study I adapted a two-staged stratified cluster sampling design. The population frame was the hospital medical records of 5 years (July 2015 to July 2020) from the Bakasi camp clinic and Specialist hospital. IDPs occupy the Bakasi camp from five local governments out of the 27 local governments in Borno state. Therefore, the camp clinic is patronized by women mainly from these five local governments. The specialist hospital is patronized by other Nigerian women from all the six geopolitical zones in the country. Data collection was in both English, and a majority speaks other local languages of the population. The study population was the total number of women ages 14 to 49 years on the medical record. This study used the medical record data to establish possible causal factors of maternal deaths among ID women and other Nigerian women and to find out if the two groups of women are faced with the same reproductive health problems. The study applied quantitative approaches using descriptive and correlational analyses in line with Frankfort-Nachmias and Nachmias (2008).

The Rationale for the Design

Cross-sectional study is connected to population based surveys and it is also best in assessing the prevalence of diseases in clinical settings. In this study cross-sectional design is the design of choice in assessing the maternal mortality rate and its association between women patronizing the IDP camp clinic and other Nigerian women in the Specialist Hospital. Cross-sectional study design involves observation of a subset of a population for studying exposure and outcome variables at one point in time without any follow-up. And because of that, it fits well with the three research questions outlined

above as non of them required any follow up or a longitudinal observation. The design formed the bases that facilitated the study of the relationship between the dependent and independent variables, applying the McCarthy and Maine model (Creswell, 2009). The secondary data were readily available and accessible, with comprehensive data necessary to measure maternal mortality. The information (data) were also collected during patient consultation under professional and ethical guidelines, ensuring the validity and reliability of the data. Therefore, using this data saved time and resources.

Frankfort-Nachmias and Nachmias (2008) and Creswell, (2009) reported that a significant limitation of using secondary data is the difficulty to ascertain the temporal associations between causes and effects. Also, researchers, some times make deductions even when none exists. When using hospital records, the problems of poor record-keeping practices in health care facilities such as incomplete data, duplication, and inaccuracies in data make it difficult for researchers to accurately and reliably identify and define health problems. Another limitation was that national-level estimates can not be provided because of this study's data related to only women of reproductive age (14-49 years) living in IDP camp and those patronizing the specialist hospital. It excludes women not in the reproductive age group (14-49 years), not living in IDP camps, and those women going to other hospitals apart from specialist hospital. Despite the limitation, the correlation design helped in determining the impact of poor access to reproductive health services such as ANC, PNA, and family planning has on maternal deaths among women ages 14 to 49 years especially those living in IDP camp.

Methodology

The IRB approval number for this study is 02-26-21-0579393,

In this study I adopted a correlational retrospective design using data from medical records in the IDP clinic and Specialist hospital. The data were routine data collected by specialized staff in the hospitals; this study will use the most recent data collected from July 2016 to July 2020. The IDP camp clinic data represent women from only five local governments who mainly occupy the Bakassi camp. While the data in the specialist hospital represents all other Nigerian women from all the six geopolitical zones in the country. Data was collected in English, and translators were used when necessary to translate the questions to other native languages spoken by a majority of the population.

Target Population and Size

In this study I used medical record data from Borno state Nigeria. The projected population of Nigeria in 2020 is 206 million people, with a population growth rate of 2.6% (World Bank, 2019a). This study's target population included the total number of women of ages 14 to 49 years on the medical record from July 2016 to July 2020 in the two hospitals.

Sample and Sampling Procedure

The sampling method I applied was a stratified two-stage cluster design. In the first stage, the whole of Borno State was categorized into three strata based on the geographical locations. In each stratum, hospital patronage and epidemiological burden and maternal deaths pattern were reviewed and taken into consideration. Based on the

review, in state 2, one hospital was included from each stratum, and finally, one hospital was randomly selected out of the three hospitals included in the study. This process was how I selected both the IDP camp hospital and Specialist hospitals. This study's sample size was drawn from the target population in the sampling frame described below. The power analysis was used to calculate the sample size. And the sample size of 400 participants was selected systematically (using systematic random sampling) on the medical record list of the sampling frame.

Sampling Frame (inclusion and exclusion criteria)

The sampling frame is the total number of women of ages 14 to 49 years on the medical record in the IDP camp clinic and the Specialist Hospital Borno State.

Inclusions

The study will include mothers' death within 42 days of delivery, deaths of women in the reproductive age group of (14-49) and deaths of pregnant women that falls within the five years (2016 -2020)

Exclusions

The study will exclude mothers' deaths after 42 days of delivery, the deaths of mothers or pregnant women that did not fall within the five years, death of women not in the reproductive age group (14-49), not living in IDP camps, and those women going to other hospitals apart from specialist hospital.

Recruitment, Participation, and Data Collection

All staff (doctors, nurses, and midwives) on duty collected the patient's information at the times of consultations during each hospital visit. Every patient that goes in to the

hospital normally goes through the process of taking history (patients medical information). And all patients have to comply and give their information before they will be allowed to see a medical doctor for consultation. Therefore, the data collection is a standard procedure, and it has been in the health care system. The doctors and nurses in the hospitals collected the patient's medical information (data) using patients' hospital folders with a series of obstetric questions. The folders were developed purposely for recording the patient's medical history, and it is a routine process in all hospitals.

Procedure for Gaining Access for Secondary Data

The patient's hospital record was current data. However, the camp clinic's medical record has a representative sample for a few local governments, but the one from Specialist hospital has a representative sample for the entire country. I extracted the data for this study from folders in obstetric word. To obtain the data, I wrote a formal application to the Commissioner of Borno State ministry of health explaining this study's purpose. The data request included the ethical clearance from Borno State research ethics review board and Walden University. And to finally access the data from the IDP camp clinic, I had to get a pass from Borno State Emergency Management Agency to allow me enter the camp easily after I had ensured data confidentiality, and not to share data with a third-party.

Reputability and Justification of the data source

Medical records have good reputation because the health professionals are accustomed to collecting the data for defined purposes. In addition, medical records whether handwritten or electronic are handled properly because they are essential for the

continuity of care of patients, for clinical judgment especially for defending a complaint or clinical negligence claim.

Medical record is a rich source of data that is considered to be the gold standard in any study to identify patient mortality and morbidity (Murray et al., 2003). Medical record provides high-quality data that may give accurate results because, data collection is strategic and involves rigorous methodology.

Power analysis to determine the sample size

To calculate the sample size, I applyed Sullivan (2020)'s approach using the fomular below to obtain the adequate sample size for this study

In this approach, the hypotheses of interest are:

$$H_0: \mu_1 = \mu_2$$

versus

$$H_1: \mu_1 \neq \mu_2$$

where μ_1 and μ_2 are the means in the two comparison populations. The formula for determining the sample size to ensure that the test has a specified power is:

$$n_i = 2\left(\frac{Z_{1-\alpha/2} + Z_{1-\beta}}{ES}\right)^2$$

1. n_i is the sample size required in each group (i=1,2),
2. α is the selected level of a significant difference when the treatments are equally effective. According to Fleiss, (1981), the alpha level used in determining the sample size in most of academic research studies are either 0.05 or 0.01 because the lower the alpha level the larger is the sample size. For example, a study with alpha level of 0.01 requires more subjects when compared to a study with alpha level of 0.05 for similar outcome variable. For this study, I considered 5% level of significance which gives the value of $Z_{\alpha/2}$ as 1.96
3. $Z_{1-\alpha/2}$ is the value from the standard normal distribution holding 1- α /2 below it. It is the normal deviate at a level of significance and it is 1.96 in this study because I considered 5% level of significance.
4. $Z_{1-\beta}$ is the value from the standard normal distribution holding 1- β below it. It is the normal deviate at 1-β% power. And β% of type II error is 0.84 at 80% power.
5. Power is the probability of correctly rejecting the null hypothesis when it turns out to be false. Meaning that the two study groups in the underlying population does not statistically differ. Large values of power are desirable, for a study to have high chance of detecting a difference between groups if it exists. According to Hintze and Kaysville et al. (2008), the ideal power for any study is considered to be 80%.
6. σ is the standard deviation of the outcome of interest, it is obtained from previous studies of similar hypothesis during literature search. The mean number of deaths expected for population group one (IDP women) is 45 and standard

deviation = 9.30 per 100,000 live births (Prata et al. 2014). While the mean number of deaths expected for population group 2 (other Nigerian women) 40 and standard deviation = 8.01) per 100,000 live births (Prata et al. 2014).

7. ES is the effect size, and according to Sullivan (2020), it iss defined as:

$$ES = \frac{|\mu_1 = \mu_2|}{\sigma}$$

$$ES = (\mu 2 - \mu 1)/\sigma = \frac{45-40}{9.30+8.01} = \frac{5}{17.3} = 0.29$$

where $|\mu_1 - \mu_2|$ is the absolute value of the difference in means between the two groups expected under the alternative hypothesis, H_1.

I now substitute the effect size and the appropriate Z values for the selected α and power to compute the sample size.

$$n_i = 2\left(\frac{Z_{1-\alpha/2} + Z_{1-\beta}}{ES}\right)^2 \qquad = ni = 2\left(\frac{1.96 + 0.84}{0.29}\right)2 = 189$$

Samples of size n_1=189 and n_2= 189 will ensure that the test of hypothesis will have 80% power to detect a 5 unit difference in maternal death in IDP women patronizing IDP camp clinic as compared to other Nigerian women patronizing Specialist hospital. However, based on prior experience, it might be expected that about 5% of the data in each group may be incomplete. Therefore, an attrition rate (in both groups), was

calculated and added to the sample size to ensure a total sample size of 189 is obtained for analysis at the end

Attrition rate is calculated as follows:

N (number to enroll) x (% of complete data retained) = desired sample size

$$\text{Therefore N (number to enroll)} = \frac{desired\ sample\ size}{(\%\ complete\ data\ retained}$$

$$\text{N} = \frac{189}{0{,}95} = 199$$

So I selected a total of 200 participants (secondary data) in each group in this study to ensure that 189 in both groups were available for analysis.

Instrumentation

The patient's hospital folders served as the questionnaires, it is basically developed to collect patient information in the hospital for medical use. the medical review questions in the folder were developed in English as it is the official language mainly spoken in Nigeria. The questionnaires addressed reproductive health issues in women, and the respondents were usual patients who came to the hospital. The questionnaire (folder) collected information on demographic characteristics, education, sex, and age of the mother. Others are information on birth history, ANC, PNC, fertility, family planning methods, hypertension, diabetes, childbirth, and child mortality. It also contains the physician's physical findings, the results of diagnostic tests and procedures, therapeutic procedures and medications, and finally, information on maternal deaths. The

questionnaire (folder) has a column that contains the name and signature of the health professional that attended to the patient.

With the use of hospital folder as the questionnaire instrument, internal consistency is ensured. Because the instrument is designed to measure all causes of maternal death in relation to the research question, and for maternal death to occur it will have to be from the outlined causes hence the participants give the same or similar responses. Hospital folders also ensures content validity because the measure covers the construct of interest. For example, the folder has questions that inquire about causes of maternal death such as poor ANC visit, PNC services, Family Planning etc.

Data Management

The data for this study was stored in the hospital's record unit. Access to this data was granted after the presentation of the signed agreement.

Variables and Measures

The dependent variable for this study was maternal deaths, a binary outcome. The independent variables were maternal factors (age of the mother at delivery), personal control illness factors (number of ANC visits, number of PNC received, and family planning services) and community factor (place of residence).

Descriptive Variables

Maternal death was examined against all independent variables classified into maternal factors and personal illness control factors. Maternal death was recorded as a success if death occurred (1 = Yes), and a failure if no death occurred (0 = No). And the

personal control illness factors (number of ANC visits, number of PNC received, family planning services).

The table below shows the categorization of the variables and how they were referred to in the McCarthy and Maine's model. And table two further down showed how each variable is calculated and scored

Table 1

showing how variables are referred to in McCarty and Maine's Model

As in McCarthy & Maine"s framework	Variable category	Variable	Categorization
Distant determinant	Community factor	Place of residence	a categorical variable
Intermediate Determinants	Personal illness control factors	ANC, PNC, Family planning	a categorical variables
Intermediate Determinants	Maternal Factor	Mothers age at delivery	a categorical variable

The community-level factor was place of residence, the maternal factor was age of the mother at the time of delivery while the personal control illness factors were the number of ANC visits, number of PNC received, family planning method.

Data Analysis Plan

Table 2

Showing Research Questions, Methods of Analysis, Hypotheses and Variables

Research question	Analysis method	Null hypothesis	Alternative hypothesis	Independent and dependent variables
RQ 1: Are there associations between reproductive health factors (number of ANC visits, number of PNC services received, availability of family planning services) and maternal deaths among ID women of ages 14 to 49 in Nigeria	Binary logistic regression	Null Hypothesis (H01): There are no associations between reproductive health factors (number of ANC visits, number of PNC services received, availability of family planning), services) and maternal deaths among ID women of ages 14 to 49 years in Borno state Nigeria	Alternative Hypothesis (HA1): There are associations between reproductive health factors (number of ANC visits, number of PNC services received, availability of family planning), services) and maternal deaths among ID women of ages 14 to 49 years in Borno state Nigeria?	Independent Variables (i): ANC visits– this refers to the number of visits during pregnancy. It is a categorical variable that will be coded as (0 = <4 visits and 1= >=4 visits); PNC services refers to the number of care received within 42 days after delivery. It is a categorical variable that will be coded as (0 = <4 care received and 1= >=4 care received); Availability of family planning method is a categorical data that refers to whether or not the mother used family planning method. It will be coded as (1=Yes, the mother used family planning method or

				0=No, the mother does not use family planning method) . Dependent Variables (i): Maternal deaths - This is a binary variable which refers to whether a mother is dead or alive after the pregnancy. It will be coded as 1-Yes, Death occurred, and 0-No, Death did not occur.
RQ 2: What is the association of maternal death between internally displaced women who went to IDP camp clinic and other Nigerian women who went to Specialist hospital in Borno state?	Binary logistic regression	H01: There is no association of maternal death between internally displaced women who went to IDP camp clinic and other Nigerian women who went to Specialist hospital in Borno state?	HA2: There is an association of maternal death between internally displaced women who went to IDP camp clinic and other Nigerian women who went to Specialist hospital in Borno state?	Independent Variables (ii): Place of residence is a categorical variable coded as: (1 = IDP camp, 2 personal home) Dependent Variables (ii): Maternal deaths- A categorical variable referring to the number of deaths of mothers as a result of pregnancy or pregnancy related complication
RQ 3: What is the association between adolescent motherhood and maternal mortality among IDP women of 14 to 19 years and 20 to 49 yeas of age?	. Chi square test	There is no association between adolescent motherhood and maternal mortality among IDP women of 14 to 19 yars and 20 to 49 years of ages	There is an association between adolescent motherhood and maternal mortality among IDP women of 14 to 19 years and 20 to49 years of ages.	Independent Variables (iii): Mothers age at delivery refers to the age of the mother at time she is giving birth. It is a categorical variable. It is coded as: (1 = 14-19 years, 2 = 20-49 years Dependent Variables (iii): Maternal deaths- A categorical variable

The data analysis was in line with the research questions and hypotheses. Structured analysis software (STATA) was used to edit and validate the data while Statistical package for the social sciences (SPSS) version 24 was used to analyze the sample.

Pre-analysis and Data Screening

I generated frequencies and cross-tabulations on related demographic data and compare them with previous findings from other surveys. According to Warner (2013), cell frequencies will be checked to ensure expected frequencies are at least ten as required in binary logistic regression.

The research methodology selected for this study was more appropriate to answer the research questions because all the three questions were related to a past event, that is why it was a retrospective study. Also the statistical methods selected for testing the hypothesis were also justified as follows: in RQ 1 & 2, the dependent variables are binary variable so they fit well with binary logistic regression. While RQ 3 has 2 categorical variables and therefore, it fits well with the chi-square taste.

Statistical Analysis

Descriptive Statistics

According to Trochim (2006), descriptive statistics explain the simple characteristics of quantitative data and include sum, average, and variance measures. I used descriptive statistics related to mean and standard deviation for the independent variables personal control factors (ANC visits, PNC, family planning) and maternal

factor (age of the mother) and selected demographic characteristics of the population, indicating frequencies and counts of cases.

Inferential Analysis

The binary logistic regression was applied, and the odds ratio of maternal deaths was computed. To test hypothesis 1 and 2, binary logistic regression was applied to investigate the effect of the number of ANC visits, the number of PNC received, and family planning services on maternal deaths. Also to examine any statistically significant differences in maternal deaths across the two hospitals (IDP camp clinic and Specialist hospital). The odds ratios were applied to explain the associations between risk factors for maternal deaths at 95% confidence intervals (CIs). The association is statistically significant because *alpha* or *p* values are less than 05.

According to Warner (2013), screening of data was considered to determine the spread of maternal deaths. Also, cell frequencies was computed for categorical variables such as ANC visits, PNC received and family planning, to ensure more than five observations per cell. The first category was coded as the group of reference as guided by Warner (2013). The chi square test for independent variables was applied to test hypothesis 3, by identifying whether there is an association between adolescence motherhood and maternal death. One of the major concerns associated with chi square analysis is that it is sensible to sample size in that when large sample size is used, any small deference between the variables will appear statically significant. Chi square in SPSS some time gives a warning sign if cells have fewer than five cases and when there is large number of categories. However, these limitations was not a challenge in this

study because the sample size of 400 was just adequate but not too large and the categorical variables had limited number of categories which produced only smaller table.

Interpretation of Results

To interpret the statistical tests, confidence intervals was used to demonstrate the range within which a population parameter is likely to be found. The intervals for each null hypothesis corresponded with the study sample. They were set at a 95% confidence level, which was equivalent to 0.05 level of significance, and it is termed as *alpha* (α) level. In both the binary logistic regression and the chi square teste, the lower the α level, the higher the chances of rejecting the null hypothesis, which implies that p is smaller or equal to α.

Threats to Validity

Threats to validity could be a result of statistical analysis, construct issues, deductions, internal factors or external factors.

Threats to External Validity

This occurs when study findings from a sample are used to draw conclusions for the entire population whose settings, location, and future positions may change. (Creswell, 2014). An adequate sample with regional representative populations should be ensured to allow for grossing up of the data to address this threat. This study used statutory data, and the main advantage of statutorily collected data is its coverage. Data are collected for all inpatients, which reduces the risk of selection bias and ensures

representation of sample participants. Threats to external validity were minimized due to separation of duties and taking of sifts between the data collector (health professionals) Verification of data was undertaken hierarchically among the health professionals.

Threats to Internal Validity

These threats occur when the respondent's previous experience affects the context and quality of the answers to the questions being asked, affecting the conclusions (Creswell, 2014). A likely threat to internal validity is selection bias where a respondent selected for a particular study is previously selected for another survey, which could bias the responses. However, this does not happen with hospital records. Most of the internal validity challenges are not common when using hospital records because data collection is cross-sectional and without experiments. Also, as patients' consultation is not selective, this provides the spread of probability of equal distribution of characteristics across the patients, thus addressing the threat to internal validity.

Threats to Construct Validity

According to Creswell (2014), this occurs when study variable definitions and measures are inadequate. The standard definitions and measures of maternal deaths, ANC, PNC, family planning, and mothers' age, according to World Health Organization, were embraced in the hospital records. In this study, I also complied with the WHO standards of definition.

Statistical Conclusion Validity Threats

This threat arises when wrong deductions are made either due to a violation of vital statistical assumptions or limited statistical power (Creswell, 2014). The threat was

addressed by engaging an adequate sample of women aged 14 to 49 years to attain a computing power of at least 80 on all independent variables. With a computing power = 0.80, an alpha level of 0.05, an effect size of 0.15, and 5 categories. According to Faul et al., (2012), the minimum sample size for binary logistic regression is 568, an adequate sample size that suits both chi square and binary logistic regression was targeted. Also, I examined the theorized assumptions of binary logistic regression, and chi square.

Ethical Procedures

The primary ethical concern in the entire research process was to promote the participants' right and protect the resultant data. In this study, I used secondary data from hospital records which is free from ethnicity and language issues. I did not need any informed consent since there was no primary data collection from participants requiring the consent. However, IRB clearance was obtained to ensure that I upheld the ethical standards of Walden University. In order to protect the participant's rights, it required improvement in knowledge and skills in researching human subjects. The best way to achieve this is to read available literature, revised modules on advanced research, and undertake web-based training, which I did all. When accessing the data, the ministry of health's research department restricted only the variables of interest. In the hospitals, before the patient's history is taken by the health professionals, patients are informed on the importance of taking their medical history. Their maximum cooperation in answering the questions accurately was sought, and assurance of data confidentiality was provided to patients. To obtain the data, a formal application was written to the Commissioner of Borno State ministry of health explaining this study's purpose. The data request will

included the ethical clearance from Borno State research ethics review board and Walden University. And to finally access the data from the IDP camp clinic, I had to get a pass from Borno State Emergency Management Agency to allow me enter the camp easily after I have ensured data confidentiality, and not to share data with a third-party. Copies of the clearance and the pass are attached.

Before the research, consent was sought from the independent review committee to prove that the study adheres to requirements of the IRB as elaborated by Klitzman (2013).

Data Protection

Since the study was international (to be conducted outside the United States of America), to protect the data I sought for clearance from the IRB working closely with the research ethics committee of Borno State ministry of health. Another precaution for the secondary data was to ensure proper documentation of the methods used while collecting the data (patient's information). I accessed the secondary data after the IRB has reviewed the data list variables. Since the hospital records do always exist, I made a written request explaining the purpose and showing this research's general objective with the specific data requirements. I stored final data in a central server, and copies were stored in an iPad and a laptop, and in an external drive for backups for only research. Also, to ensure data protection, data was presented in aggregate to maintain participants' privacy.

Dissemination of Results

The results will be disseminated to health professionals and policymakers, including the staff from the ministries of health, Budget and finance, civil societies, the media, and the general public. The result will also be disseminated at webinars, international seminars, conferences and, articles written for publication in journals.

IRB Approval

Before I conduct the study, I applied for an IRB approval from the Institutional Review Board (IRB) to certify that this doctoral capstone has met the Walden University's ethical standards.

Summary

In this section 1 presented the research design and the rational for selecting the design. I provided information about the methodology, data source, the sampling frame and the sampling procedure. The data analysis plan highlighted how each variable was analyzed as well as the software that was used for the analysis. Other parts that are included in this section were the issues of threat to validity and ethical procedure. This research intended to fill a gap by identifying the effect that reproductive health factors (ANC attendance, PNC services, family planning, place of residence, age of mother at delivery), have on maternal deaths. I adopted a retrospective correlation design and applied the McCarthy and Maine's framework to undertake this study. I utilized secondary data from the hospital records collected by the health professionals, focusing on women of ages 14 to 49 years from 2016-2020. I recruited 200 women of ages 14 to

49 years that ware seen in the obstetric department from 2016 to 2020 in the two hospitals.

In section three, I described the data collection of the secondary data set, I explained how I conducted a binary logistic regression analysis and chi square test using SPSS, and I finally presented my results and findings.

Section 3:Research questions and hupothesis

The purpose of this study was to determine the reproductive health factors (ANC visit, PNC visit and Family planning) and their influence on maternal deaths among women ages 14 to 49 years in 2016 to 2020 in Nigeria. The research questions corresponding hypotheses that informed this study were as follows:

Research Questions and Hypotheses

Research Question 1: Are there associations between reproductive health factors (number of ANC visits, number of PNC services received, availability of family planning services) and maternal deaths among ID women of ages 14 to 49 years in Borno state Nigeria?

$H_0$1: There are no associations between reproductive health factors (number of ANC visits, number of PNC services received, availability of family planning services) and maternal deaths among ID women of ages 14 to 49 years in Borno state Nigeria?

H_a1: There are associations between reproductive health factors (number of ANC visits, number of PNC services received, availability of family planning services) and maternal deaths among ID women of ages 14 to 49 years in Borno state Nigeria?

Research Question 2: What is the association of maternal death between internally displaced women who went to the IDP camp clinic and other Nigerian women who went to Specialist hospital in Borno state?

$H_0$2: There is no association of maternal death between internally displaced women who went to the IDP camp clinic and other Nigerian women who went to Specialist hospital in Borno state?

H_a2: There is an association of maternal death between internally displaced women who went to the IDP camp clinic and other Nigerian women who went to Specialist hospital in Borno state?

Research Question 3: What is the association between adolescent (14-19 years) motherhood and maternal mortality among IDP women of 14 to 49 years of age in Borno State Nigeria?

H_03: There is no association between adolescent (14-19 years) motherhood and maternal mortality among IDP women of 14 to 49 years of age in Borno State Nigeria

H_a3: There is an association between adolescent (14-19 years) motherhood and maternal mortality among IDP women of 14 to 49 years of age in Borno State Nigeria

Data Collection

This retrospective study used data from the 2016 to 2010 in the two different hospitals. The hospitals were selected using stratified two-stage cluster design. In the first stage, the whole of Borno State was categorized into three strata based on the geographical locations. In each stratum, hospital patronage and epidemiological burden and maternal deaths pattern were reviewed and taken into consideration. Based on the review, in state 2, one hospital was included from each stratum, and finally, one hospital was randomly selected out of the three hospitals included in the study. In the hospitals, data collection was a routine procedure before any medical consultation. The doctors and nurses in the hospitals collected the patient's medical information (data) using patients'

hospital folders with a series of obstetric questions. The folders were developed purposely for recording the patient's medical history, and therefore, serves as the questionnaire. For this study, data of 400 participants (200 in each hospital) were selected systematically (using systematic random sampling) on the medical record list. The sample was a combination of women of 14 to 49 years, who have died and those who were alive within the period of 2016 to 2020.

Table 3

Descriptive Statistics of Independent Variables with Maternal Deaths

	MATERNAL DEATH					
	Mothers Death	%	Mothers Alive	%	Total	%
Number of ANC Visi						
< 4 ANC visit	269	67.2	83	20.8	352	88
> 4 ANC visit	11	2.8	37	9.2	48	12
Total	280	70	120	30	400	100
Number of PNC Received						
< 4 PNC visit	204	51	100	25	304	76
> 4 PNC visit	76	19	20	5	96	24
Total	280	70	120	30	400	100
Family Planning						
Yes using FP method	28	7	27	6.8	55	13.8
No not using FP method	252	63	93	23.2	345	86.2
Total	280	70	120	30	400	100
Place of Residence						
1 = IDP camp	166	41.5	34	8.8	201	50.3
2 = Person Home	114	28.5	86	21.2	199	49.7
Total	280	70	120	30	400	100
Age group						
14-19	83	20.8	15	3.8	98	24.6
20-29	197	49.2	105	26.2	302	75.4
Total	280	70	120	30	400	100

Descriptive Statistics by Variable of Interest

The key variables for analyzing the reproductive health factors impacting maternal deaths were personal factors referred to as intermediate determinants that include the number of antenatal care (ANC) visits, the number of postnatal care visits, and family planning. The community factor and the maternal factor, also known as distant determinants, were the place of residence and age of the mother at the time of delivery respectively. The descriptive statistics included women ages 14 to 49 years who attended the IDP camp clinic and specialist hospital between 2006 and 2010.

I undertook a cross-tabulation of the independent variables with maternal deaths. Out of a sample of 400 women in the study, 280 (70%) women experienced maternal deaths, out of which 166 (41.5 %) of deaths were recorded in IDP camp clinic while 114 (28.5%) of the deaths were recorded in the specialist hospital. Those women that did not experience maternal death were 120 (30%), 34 (8.8%) in the IDP camp clinic, while 86 (21.2%) in the specialist hospital. Overall, 352 (88%) of the total women ages 14 to 49 years attended less than 4 ANC visits, 170 (48.2 %) in the IDP camp clinic and 182 (51.7%) in specialist hospital), while 48 (12%) attended 4 or more ANC visits, 30 (62.5%) in IDP camp clinic and 18 (37.5%) in the specialist hospital. Concerning the number of PNC visits, 304 (76%) of the total women ages 14 to 49 years attended less than 4 PNC visits, 246 (81%) in the IDP camp clinic, and 58 (19%) in the specialist hospital. At the same time, 96 (24%) attended 4 or more PNC visits, 38 (39%) in the IDP camp clinic, and 58 (60.4 %) in specialist hospital). Only 55 (13.6%) of the total women used the family planning method 32 (58.2%) in IDP camp clinic and 23 (41.8 %) in the

specialist hospital. The highest proportion of women in both IDP camp clinic and specialist hospital not experienced maternal deaths attended more than 4 of either ANC and PNC visits and those who used family planning methods. However, the total number of women who attended 4 or more of both ANC and PNC visits and used family planning methods is only 4 (2%) in the specialist hospital but none in the IDP camp clinic. In Table 21, the distribution of women included in the study from both hospitals showed that the majority (75.5 %), were between the ages of 20 to 49 years, and women of 19 years and below were 24.5 %. The youngest mother was 14 years, and the oldest was 46 years. Out of the 24.5% women of 14 to 19 years, 83 of them (84.7%) experienced maternal death, and 15 of them (15.3%) were alive. While out of the 75.5% of women of 20 to 49 years, 197 (65.2%) experienced maternal deaths, and 105 (38.8%) were alive. In table 22 a comparison by place of residence showed that a total of 48 (49%) of women between 14-19 years were in the IDP camp and constituted 45 (30 %) of the total death in the camp. While 50 (51%) of women 14-19 years were in the specialist hospital and constituted (38) 33.3% of the total maternal death in the specialist hospital. From the analysis, none of the women experienced a maternal death contravening the requirement of at least 10 cases per cell, as Warner (2013) elaborated. This study's findings showed a strong association between reproductive health factors (ANC visit, PNC visit, Family planning) and maternal death among internally displaced women in IDP camp clinic and other Nigerian women in the specialist hospital. Although women in the IDP camp had more ANC visits, maternal deaths were higher 166 (59.3%) than other Nigerian women not in the camp, who had maternal deaths of 40.7% (114). Overall, the IDP camp had the

highest proportion of maternal deaths. Even within the IDP camp, the proportion of maternal deaths was higher among adolescent mothers of 14 to 19 years than the older mothers of 20 to 49 years.

Statistical Assumptions

Binary logistic regression requires the dependent variable to be binary. In answering research questions 1 and 2, maternal death was a binary variable coded as 0 = no maternal deaths recorded and 1 = yes, maternal deaths recorded, thus satisfying assumption 1. All the independent variables were categorical variables thus satisfying assumption 2 and they were number of ANC visits (0 = <4 visits 1 = > = 4 visits), and number of PNC visits (0 = <4 visits 1 = > = 4 visits). Others were family planning services coded (1 = yes the woman was using family planning method, and 0 = not using family planning method), place of residence (1 = living in IDP camp, and =2 living in personal homes). The 3rd assumption of independence of observations was satisfied. Assumption 5 required linearity of independent variables and log odds, meaning that there should be a linear relationship between the continuous independent variables and the logit transformation of the dependent variable. But this assumption was not relevant since all the independent variables in this analysis were categorical. Assumption 6 is that no data should show any multicollinearity, and the results showed none of the independent variables had correlations greater than 0.7 (see Table 5). Assumption 7 required data not to have any significant outliers; this does not apply in this analysis because there are no outliers. Logistic regression typically requires a large sample size. This work has reasonably gathered sufficient samples of 400 cases. Finally, in running

regression, it is a requirement that the independent variables do not correlate to each other. In the correlation table 4 below, the Pearson's correlation coefficient values only correlates at r = 1.000. Still, not different variables, which shows that the data used was suitable for the binary regression model I ran. Recall that a correlation of 1 means a positive relationship while -1 means a negative relation and 0 means no relationship.

The Chi-square test requires that there should be 2 variables, and both are measured as categories that are mutually exclusive and independent, data in the cells to be frequencies, or counts of cases rather than percentages. It also requires that value of the cell expected should be 5 or more in at least 80% of the cells. Research question 3 has 2 categorical data both presented in numbers and were independent and mutually exclusive. thus certifying all the 5 assumptions above.

Table 4

Showing Correlations coefficient

		Maternal Death Occurred	ANC Visit Category	PNC Visit Category	Family Planning Visits	Age
Pearson Correlation	Maternal Death Occurred	1.000	-.379	.112	-.166	-.279
	ANC Visit Category	-.379	1.000	.117	-.058	.379
	PNC Visit Category	.112	.117	1.000	.065	-.033
	Family Planning Visits	-.166	-.058	.065	1.000	-.341
	Age	-.279	.379	-.033	-.341	1.000
Sig. (1-tailed)	Maternal Death Occurred	.	.000	.012	.000	.000
	ANC Visit Category	.000	.	.010	.123	.000
	PNC Visit Category	.012	.010	.	.099	.255
	Family Planning Visits	.000	.123	.099	.	.000
	Age	.000	.000	.255	.000	.
N	Maternal Death Occurred	400	400	400	400	400
	ANC Visit Category	400	400	400	400	400
	PNC Visit Category	400	400	400	400	400
	Family Planning Visits	400	400	400	400	400
	Age	400	400	400	400	400

Table 5

Testing Assumption of Multicollinearity in Logistic Regression for RQ1&2

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
		B	Std. Error	Beta			Tolerance	VIF
1	(Constant)	1.099	.073		15.110	.000		
	ANC Visit Category	-.452	.067	-.320	-6.741	.000	.835	1.198
	PNC Visit Category	.171	.047	.160	3.636	.000	.977	1.023
	Family Planning Visits	-.372	.062	-.280	-6.026	.000	.876	1.142

Age	-.012	.002	-.247	-4.935	.000	.751	1.332

a. Dependent Variable: Maternal Death Occurred

From table 5 above, it can be seen that the Variance Inflation factor (VIF) are all less than 10 and the scatter plot graph below do not show any linear relationship, hence they support our regression model.

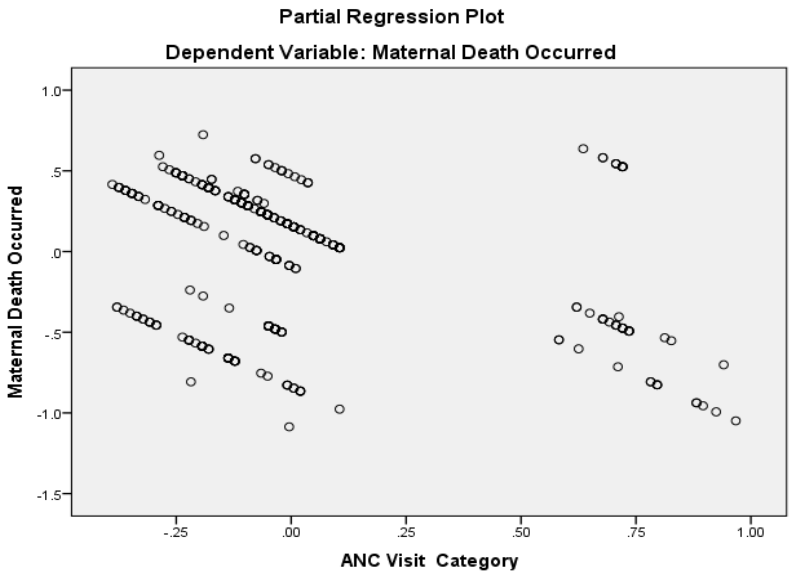


Figure 2

Figure Title Grouped scatter plots of maternal deaths by ANC visit

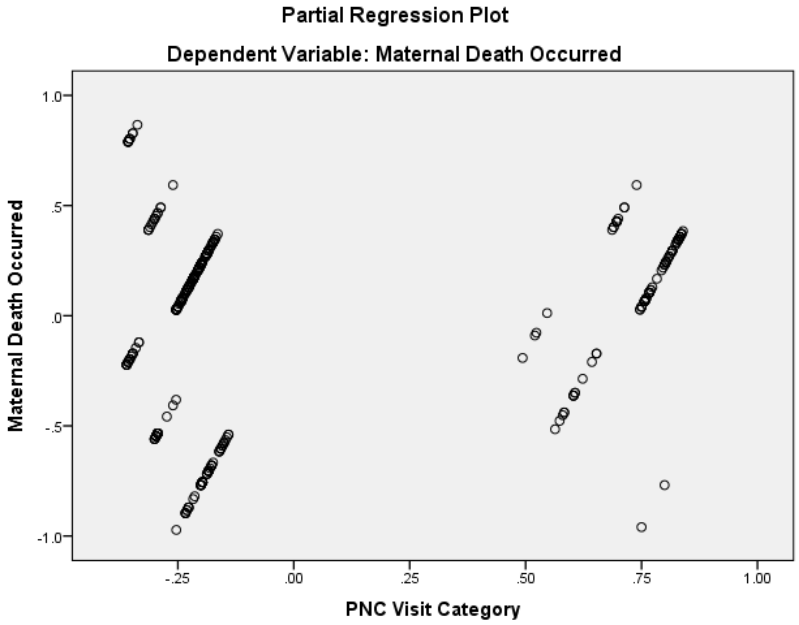


Figure 3

Figure Title Grouped scatter plots of maternal deaths by PNC visit

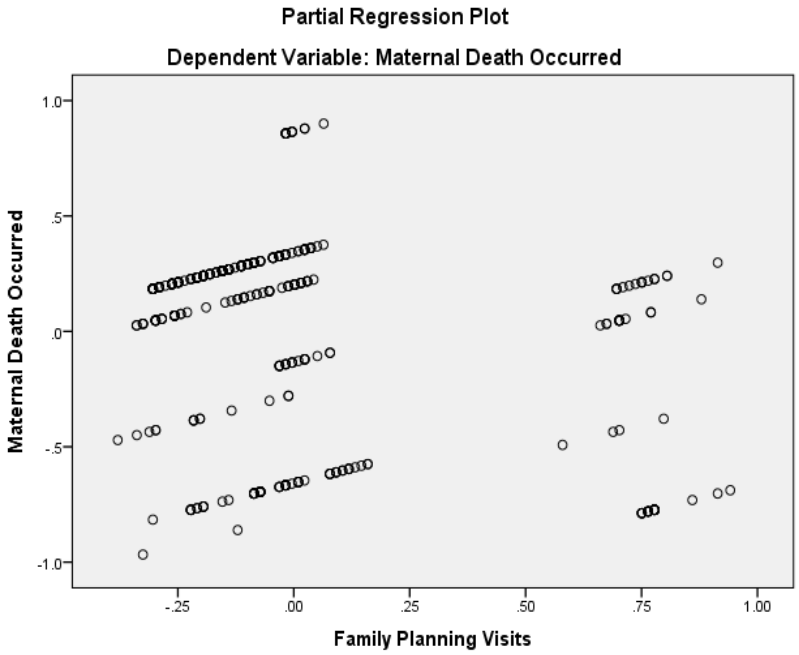


Figure 4

Figure Title Grouped scatter plots of maternal deaths by family planning method

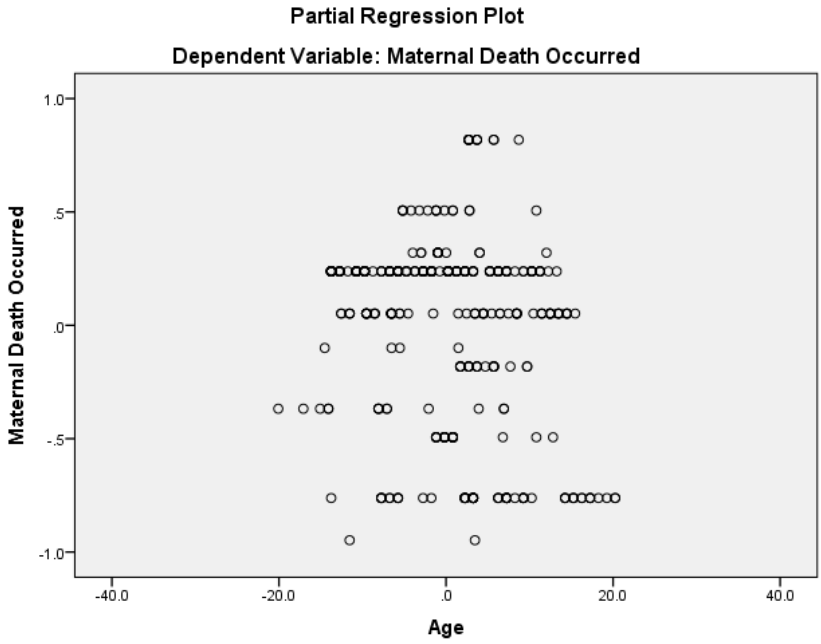


Figure 5

Figure Title Grouped scatter plots of maternal deaths by mothers age.

Statistical Analysis Findings

Personal Control Factors Effect on Maternal Deaths

Research question 1` (RQ1) was to determine whether there were associations between reproductive health factors (number of ANC visits, number of PNC visit and family planning services) and maternal deaths among IDP women of ages 14 to 49 years in Borno state in Nigeria? The corresponding hypotheses were:

$H_0$1: There are no associations between reproductive health factors (number of ANC visits, number of PNC services received, availability of family planning services) and maternal deaths among ID women of ages 14 to 49 years in Borno state Nigeria?

H_a1: There are associations between reproductive health factors (number of ANC visits, number of PNC services received, availability of family planning services) and maternal deaths among ID women of ages 14 to 49 years in Borno state Nigeria?

I undertook the binary logistic regression analysis using data from IDP camp clinic and Specialist hospital, and the independent variables are in Table 6 below.

Table 6

Dependent and Independent Variables for RQ1

Variables		Description
	Y	Maternal Mortality, mother dead or alive
Dependent variable	0	Maternal deaths not recorded
	1	Maternal deaths recorded
	X1	ANC visits attained during pregnancy
	0	Less than 4 ANC visits
	1	4 or more ANC visits
	X2	PNC visits attained after delivery
Independent variables	0	Less than 4 PNC visits
	1	4 or more PNC visits
	X3	Family planning
	0	Not using family planning method
	1	Using family planning method

The table above defined both the dependent and independent variables involved in RQ1 and tables 7 and 8 below classifies the number of participants according to whether maternal deaths occurred.

Table 7

Classification Table of RQ1 of the Binary Logistic Regression

Observed			Predicted		
			Maternal Death Occurred		Percentage Correct
			NO	YES	
Step 1	Maternal Death Occurred	NO	0	120	.0
		YES	0	280	100.0
	Overall Percentage				70.0

a. The cut value is .500

From the table above, it can be seen that out of the 400 cases, in both IDP camp and specialist hospital, 280 women experienced death while 120 women were alive.

Table 8

Classification Table of RQ1 of the Binary Logistic Regression

Observed			Predicted		
			Maternal Death Occurred		Percentage Correct
			NO	YES	
Step 1	Maternal Death Occurred	NO	60	60	50.0
		YES	26	254	90.7
	Overall Percentage				78.5

a. The cut value is .500

To test the adequacy of the binary regression model in predicting the effect of the independent variables on maternal deaths, the following test were ran (see Tables 9 & 10).

Table 9

Omnibus Tests of Model Coefficients

		Chi-square	df	Sig.
Step 1	Step	83.019	3	.000
	Block	83.019	3	.000
	Model	83.019	3	.000

I ran a binary logistic regression, a total of 400 cases were used, with 100% of dependent variables correctly predicted in the null model, there was no missing data. The omnibus test was conducted and the result showed that the model was statistically significant, $p = .000 < \alpha = .05$, therefore, it was adequate in predicting the effect of the independent variables on maternal deaths (see Tables 9 & 10).

Table 10

Model Summary

Step	-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square
1	405.672[a]	.187	.266

a. Estimation terminated at iteration number 5 because parameter estimates changed by less than .001.

From the results, the inclusion of the independent variables (number of ANC visits, number of PNC visits, and FP services) improved the prediction of cases into their observed categories of the dependent variable (maternal death). The percentage accuracy in classification was 78.5%, as I present in Table 8 above.

Table 11 below "variables in the Equation," is the essential table when carrying out Binary regression analysis. The *Wald test* statistics on the statistical significance was conducted, and the result showed that all variables (ANC, PNC, and FP services) in the equation are at a significant level (sig) of .000, which is less than 0.05, that is p=0.000 < 0.05, this means that all the variables considerably contribute to maternal deaths. In both IDP camp clinic and Specialist hospital, the odds of maternal deaths were 2.872 lower for women attending 4 or more ANC visits as opposed to women attending less than 4 ANC visits. With the data in *Exp(B),* for each unit reduction in the number of ANC visits during pregnancy, the odds of maternal deaths increased by a factor of 1.75 (1/0.57= 1.754). Also, the odds of maternal deaths were 1.271 lower for women attending 4 or more PNC visit as opposed to women attending less than 4 PNC visits. The findings presented in Table 11 showed that a one-unit decrease in the number of PNC visit increased the odds of maternal deaths by a factor of 0.28 (1/3.563 = 0.280). Similarly, the odds of maternal death are 1.354 lower in women using family planning methods than women not using family planning methods. A one-unit decrease in using the family planning method increased the odds of maternal deaths by a factor of 3.88

(1/0.258 = 3.88). Therefore, the coefficients of the model were *L*i = 1.206 – 1.314*x1* 1.271*x2* - 2.872*x3.* Where *x1, x2*, and x*3* represented Family planning, PNC visits, and ANC visits, respectively. I applied binary logistic regression to determine whether there were any associations between the number of ANC visits, number of PNC visits, family planning, and maternal deaths. The findings were statistically significant since the logistic regression model explained all the variance in maternal deaths as demonstrated by the Nagelkerke R2 and classifies 95.4% of cases. The model and the predictor variables explained associations between reproductive health factors (number of ANC visits, number of PNC visits, family planning) and maternal deaths among ID women of ages 14 to 49 years in Borno state, Nigeria. Hence I accept the Alternate Hypothesis and reject the null hypothesis.

Table 11

Output of Binary Logistic Regression Analysis of RQ1 (N=400)

								95% C.I.for EXP(B)	
		B	S.E.	Wald	df	Sig.	Exp(B)	Lower	Upper
Step 1[a]	ANC Visit Category	-2.872	.406	50.083	1	.000	.057	.026	.125
	PNC Visit Category	1.271	.353	12.948	1	.000	3.563	1.783	7.119
	Family Planning services	-1.354	.321	17.845	1	.000	.258	.138	.484
	Constant	1.206	.150	64.824	1	.000	3.341		

a. Variable(s) entered on step 1: ANC Visit Category, PNC Visit Category, Family Planning services.

Place of residence and Maternal Deaths

Research Question 2 (RQ2) sought to determine the association of maternal death between internally displaced women who went to IDP camp clinic and other Nigerian women who went to Specialist hospital in Borno state. The corresponding hypothesis Were:

$H_0$1: There is no association of maternal death between internally displaced women who went to IDP camp clinic and other Nigerian women who went to Specialist hospital in Borno state?

H_a2: There is an association of maternal death between internally displaced women who went to IDP camp clinic and other Nigerian women who went to Specialist hospital in Borno state?

I undertook the binary logistic regression analysis using data from IDP camp clinic and Specialist hospital, and the independent variables are in table 12 below.

Table 12

Dependent and Independent Variables for RQ2

Variables		Description
Dependent variable	Y	Maternal Mortality, mother dead or alive
	0	Maternal deaths not recorded
	1	Maternal deaths recorded
Independent variables	X1	Place residence
	1	Women living in 1DP camp
	2	Women living in their homes

The table above defined both the dependent and independent variables involved in RQ2 and tables 13 below classifies the number of participants according to whether maternal deaths occurred or not

Table 13

Classification Table of RQ2 of the Binary Logistic Regression

Observed			Predicted		
			Maternal Death Occurred		Percentage
			NO	YES	Correct
Step 1	Maternal Death Occurred	NO	0	120	.0
		YES	0	280	100.0
	Overall Percentage				70.0

b. The cut value is .500

From the table above, it can be seen that out of the 400 cases, in both IDP camp and specialist hospital, 280 women experience death while 120 women were alive.

To test the adequacy of the binary regression model in predicting the effect of the independent variables on maternal deaths, the following test were ran (see Tables 14 & 15).

Table 14

Omnibus Tests of Model Coefficients

		Chi-square	df	Sig.
Step 1	Step	31.186	1	.000
	Block	31.186	1	.000
	Model	31.186	1	.000

I ran a binary logistic regression, a total of 400 cases were used, with 100% of dependent variables correctly predicted in the null model, there was no missing data. The omnibus test was conducted and the result showed that the model was statistically significant, $p = .000 < \alpha = .05$, therefore, it was adequate in predicting the effect of the independent variables on maternal deaths.

Table 15

Model Summary

Step	-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square
1	457.506[a]	.075	.106

a. Estimation terminated at iteration number 4 because parameter estimates changed by less than .001.

The Table above is -2 Log Likelihood. The summary really did not give solid tangible insights because the explained variation in the model using both the Nagelkerke R Square and Cox and Snell R square for variables explained almost nothing (0%) of the maternal deaths. From the results, the inclusion of the independent variables (place of residence) improved the prediction of cases into their observed categories of the dependent variable (maternal death). The percentage accuracy in classification was 70.8%, as I present in Table 13 above.

The *Wald test* statistics on the statistical significance were conducted (see Table 16). The result showed that at a 95% confidence interval and the significance of p=0.000

< 0.05, there is a statistically significant association of maternal death between women in the IDP camp clinic and specialist hospital. The analysis shows that the odds of maternal death are 2.321 lower among women living in their homes and 1.263 lower among women living in the IDP camps. This finding indicates that maternal death is higher among women in the IDP camps than other Nigerian women living in their homes. Hence I accept the alternate hypothesis that says there is an association of maternal death between internally displaced women who went to IDP camp clinic and other Nigerian women who went to the Specialist hospital in Borno state. And women in IDP camp are more likely to experience maternal death than other Nigerian women living in their homes.

Table 16

Output of Binary Logistic Regression Analysis (n = 400)

								95% C.I.for EXP(B)	
		B	S.E.	Wald	df	Sig.	Exp(B)	Lower	Upper
Step 1[a]	Personal homes	2.321	.263	28.938	1	.000	.283	.178	.448
	IDP camp	-1.263	.235	28.891	1	.000	.211	.178	5.311
	Constant	2.820	.399	50.031	1	.000	16.772		

a. Variable(s) entered on step 1: Place of Residence.

I confirmed this finding by further conducting a cross-tabulation of the variables, as shown in the table 17 below.

Table 17

Chi-square teste to confirm the association of maternal death between displaced women and other Nigerian women

	Value	df	Asymptotic Significance (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	30.481[a]	1	.000		
Continuity Correction[b]	29.288	1	.000		
Likelihood Ratio	31.186	1	.000		
Fisher's Exact Test				.000	.000
Linear-by-Linear Association	30.405	1	.000		
N of Valid Cases	400				

a. 0 cells (0.0%) have expected count less than 5. The minimum expected count is 59.70.

b. Computed only for a 2x2 table

From the table above, since Chi-Square is testing the null hypothesis which states that "There is no association of maternal death between internally displaced women who went to IDP camp clinic and other Nigerian women who went to Specialist hospital in Borno state", the Sig value must be .05 or less for there to be a significant statistical

relationship between maternal death and place of residence. In the result, the Sig. is .000, so there is a very strong statistical significance relationship between the variables. More so, the number of maternal deaths in the IDP camp was higher than that of the Specialist Hospital, as shown in the table 18 below:

Table 18

Cross-tabulations to show number of maternal deaths according to place of residence

			Place of Residence		Total
			IDP Camp (1)	Personal Home (2)	
Maternal Death Occurred	No =.0	Count	34	86	120
		% within Maternal Death Occurred	29.20%	70.80%	100.00%
		% within Place of Residence	17.40%	42.70%	30.00%
		% of Total	8.80%	21.30%	30.00%
	YES=1.0	Count	166	114	280
		% within Maternal Death Occurred	59.30%	40.70%	100.00%
		% within Place of Residence	82.60%	57.30%	70.00%
		% of Total	41.50%	28.50%	70.00%
Total		Count	200	200	400

% within Maternal Death Occurred	50.20%	49.80%	100.00%
% within Place of Residence	100.00%	100.00%	100.00%
% of Total	50.20%	49.80%	100.00%

This table above was a cross-tabulation done to clearly bring out the number of deaths in IDP camp clinic and that of the specialist hospital. The result of this analysis further confirms the alternate hypothesis because it also showed here that maternal death were higher among women in IDP camp (166, 59.3%) as compared with women living in their personal homes (114, 40.7).

Adolescence motherhood and Maternal Deaths

Research Question 3 (RQ3) sought to determine the association between adolescent (14-19 years) motherhood and maternal mortality among IDP women of 14 to 49 years of age in Borno State Nigeria. The corresponding hypothesis were as follows:

$H_0$3: There is no association between adolescent (14-19 years) motherhood and maternal mortality among IDP women of 14 to 49 years of age in Borno State Nigeria

H_a3: There is an association between adolescent (14-19 years) motherhood and maternal mortality among IDP women of 14 to 49 years of age in Borno State Nigeria

I ran a chi square teste using data from IDP camp clinic and the independent variables are in Table 19 below.

Table 19

Dependent and Independent Variables for RQ3

Variables		Description
Dependent variable	Y	Maternal Mortality, mother dead or alive
	0	Maternal deaths not recorded
	1	Maternal deaths recorded
Independent variables	X1	Age of mother at the time of delivery
	1	Women age 14 to 19 years
	2	Women age 20 to 49 years

To answer RQ 2, I run a Pearson Chi-Square teste (see Table20), and the result shows that $\chi(1) = 13.345$, $p = .000$. (Which is less than 0.05) This tells us that there is statistically significant association between adolescent motherhood and maternal mortality among IDP women of 14 to 49 years of ages.

Table 20

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	13.345[a]	1	.000		
Continuity Correction[b]	12.435	1	.000		
Likelihood Ratio	14.623	1	.000		
Fisher's Exact Test				.000	.000
N of Valid Cases	400				

a. 0 cells (0.0%) have expected count less than 5. The minimum expected count is 29.40.

b. Computed only for a 2x2 table

I confirmed the Chi Square findings by further conducting a cross-tabulation of the variables as shown in the table 21 below.

Table 21

Cross-tabulation to show Maternal Death Occurred base on Age Category

			Age Category		
			14 - 19 Years	20-49 Years	Total
Maternal Death Occurred	NO	Count	15	105	120
		% within Maternal Death Occurred	12.5%	87.5%	100.0%
		% within Age Category	15.3%	34.8%	30.0%
		% of Total	3.8%	26.3%	30.0%
	YES	Count	83	197	280

	% within Maternal Death Occurred	29.6%	70.4%	100.0%
	% within Age Category	84.7%	65.2%	70.0%
	% of Total	20.8%	49.3%	70.0%
Total	Count	98	302	400
	% within Maternal Death Occurred	24.5%	75.5%	100.0%
	% within Age Category	100.0%	100.0%	100.0%
	% of Total	24.5%	75.5%	100.0%

This table allows us to understand that both age groups 14-19 years and 20-49 years, had a significant number of maternal deaths. The result showed that the percentage of maternal death within the age category 14-19 years was higher (84,7%) compared to that of 20-49 years (65.2%). Therefore, we can reject the null hypothesis and accept the alternate hypothesis that says there is an association between adolescent (14-19 years) motherhood and maternal mortality among IDP women of 14 to 49 years of age in Borno State, Nigeria. Moreover, table 22 below compared the number of adolescent deaths in each hospital (IDP camp clinic and Specialist hospital). The result showed that the highest number of maternal deaths occurred among women between the ages of 14-49.

Table 22

Adolescent Maternal Death Occurred by hospital

			Name of Hospital		
			IDP CAMP	SH	Total
Maternal Death Occurred	NO	Count	3	12	15
		Expected Count	7.3	7.7	15.0

	YES	Count	45	38	83
		Expected Count	40.7	42.3	83.0
Total		Count	48	50	98
		Expected Count	48.0	50.0	98.0

Summary

In Section 3, I presented the findings of the three research questions. The 1st research question looked at associations between reproductive health factors (number of ANC visits, number of PNC visits, and family planning method) and among women of maternal deaths among IDP women and other Nigerian women. The 2nd research question looked at any significant predictive relationships between place of residence and maternal deaths among internally displaced women in Borno state in Nigeria. The 3rd research question sought to determine the association of adolescent motherhood and maternal death among IDP women in Borno state, Nigeria. in neonatal deaths across geographic areas while controlling for maternal factor?

Answers to RQ1 – Reproductive health Factors and maternal Mortality

Findings from the binary logistic regression analysis results showed that women who attended less than 4 ANC visits during pregnancy had 1.75 times higher odds of experiencing maternal deaths than women that attended 4 or more ANC visits. At a 95% confidence interval, a one-unit increase in the number of women attending less than 4 ANC visits during pregnancy increases the odds of experiencing maternal deaths by a factor of 1.75. Women who attended less than 4 PNC visits during pregnancy had 0.28

times higher odds of experiencing maternal deaths than women who attended 4 or more ANC visits. At a 95% confidence interval, a one-unit increase in the number of women attending less than 4 PNC visits after pregnancy increases the odds of experiencing maternal deaths by a factor of 0.28. Also, at a 95% confidence interval, women not using the family planning method increase the odds of neonatal deaths by a factor of 3,88 compared to women using family planning methods. Overall, the combined effect of attending ANC and PNC visits and using family planning methods were statistically significant with P values $p = 0.000 < \alpha = .05$, as shown in the table below. Therefore, I failed to reject the alternate hypothesis in favor of the null.

Table 1

Binomial Logistic Regression Predicting Likelihood of Maternal Deaths RQ1

						95% C.I.for EXP(B)	
	B	S.E.	Wald	df	Sig.	Odds	Lower	Upper
ANC Visit Category	-2.87	0.40	50.08	1	.000	1.75	0.03	0.13

Step 1[a]	PNC Visit Category	1.27	0.35	12.95	1	.000	0.28	0.18	0.72
	Family Planning services	-1.35	0.32	17.86	1	.000	3.88	0.14	0.48
	Constant	1.20	0.15	64.82	1	.000	3.341		

a. Variable(s) entered on step 1: ANC Visit Category, PNC Visit Category, Family Planning services.

Answers to RQ2 – Place of residence and Maternal Mortality

In the 2nd research question, I also used binary logistic regression to determine whether there were any significant associations between residence and maternal death among women of 14 to 49 years of age in IDP camp and other Nigerian women in the Borno state of Nigeria. The assumptions of the binary logistic regression were fulfilled; the analysis included all the 400 cases with no data transformations. The binary logistic regression model was statistically significant because at 95% confidence interval and at the significance of $p=0.000 < 0.05$, there was a statistically significant association of maternal death between women in the IDP camp clinic and specialist hospital. The odds of maternal death were 2.321 lower among women living in their personal homes and 1.263 lower among women living in the IDP camp. Therefore, the risk of maternal death was higher among people in the IDP camp than among other Nigerian women living in their personal homes, (see Table 33). With these findings, I failed to reject the alternate hypothesis.

Table 2.

Logistic Regression Predicting Likelihood of Maternal Deaths RQ2

								95% C.I.for EXP(B)	
		B	S.E.	Wald	df	Sig.	Odds	Lower	Upper
Step 1[a]	Personal homes	0.23	0.26	0.29	1	.000	3.57	0.18	0.45
	IDP camp	0.13	0.24	0.29	1	.000	4.74	0.18	0.53
	Constant	2.820	.399	50.031	1	.000	16.772		

a. Variable(s) entered on step 1: Place of Residence.

Answers to RQ3 – Adolescent motherhood and maternal mortality

In testing the statistical relationship between adolescent motherhood and maternal death, at a 95% confidence interval, the Chi-square result showed that the mothers' age at the time of delivery had a significant effect on maternal death (p =0.000 < 0.05). Overall, when the variables were cross-tabulated, the findings showed that mothers of both age groups 14-19 years and 20-49 years had a significant number of maternal deaths. However, the percentage of maternal death within the age category 14-19 years was higher (84,7%) compared to that of 20-49 years (65.2%). So I accept the alternate hypothesis.

Table 3

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	13.345[a]	1	.000		
Continuity Correction[b]	12.435	1	.000		
Likelihood Ratio	14.623	1	.000		

Fisher's Exact Test		.000	.000
N of Valid Cases	400		

a. 0 cells (0.0%) have expected count less than 5. The minimum expected count is 29.40.

b. Computed only for a 2x2 table

In section 3, results were discussed, and findings synthesized while comparing with previous research studies and existing literature.

Section 4: Discussion, Conclusions, and Recommendations

Maternal mortality is a global concern, and approximately 529,000 women die from pregnancy-related causes every year, with 99% of these maternal deaths occurring in developing countries (WHO, 2019). The situation is worse in Nigeria, where out of over 39 million women of childbearing age, about 59,000 maternal deaths occur each

year, with a mortality rate of 576 deaths per 100,000 births. Thus representing 14% of the global maternal mortality burden. The global effort to reduce the proportion of maternal deaths to fewer than 70 per 100,000 live births by 2030 SUG target requires countries to develop workable solutions that are achievable to minimize maternal deaths (WHO, 2019).

This retrospective cross-sectional study addressed the reproductive health factors and their impact on maternal mortality in Borno state, Nigeria. The reproductive health factors were personal illness control factors (number of ANC visits during pregnancy, PNC visits after delivery, and family planning) and maternal factors (age of the mother at delivery). The sample included women 14 to 49 years of age who visited the IDP camp clinic and Specialist hospital between 2016 to 2020. McCarthy and Maine's (1992) model for maternal mortality determinants provided the framework for the study. I answered all three research questions in this study using a cross-sectional design. In answering the 1st and the research question, I used binary logistic regression to ascertain whether there were associations between the number of ANC visits, number of PNC visits, family planning, and maternal deaths. To answer the 2nd research question, I also used binary logistic regression to determine whether there was any significant association of maternal death between internally displaced women who went to IDP camp clinic and other Nigerian women who went to the Specialist hospital. To answer the 3rd research question, I used the chi-square test to determine whether there was an association between adolescent motherhood and maternal mortality among IDP women of 14 to 49 years.

Summary of Key Findings

Of the total sample of 400 cases in both IDP and Specialist hospital, I found that 70% of women had experienced maternal deaths, and 30% were in their teenage years (14 to 19). Findings from descriptive statistics indicated that only 1 out of 10 women attended 4 ANC visits, 1 out of every 10 women attended 4 or more PNC visits, and 1 out of every 10 women used the family planning method. The findings showed that only 92 (23%) of the women received either ANC, PNC, or used the family planning method, while only 4 (1%) of them attained 4 or more of both ANC and PNC visits and also used family planning methods. The remaining 308 (77%) of the women in this study never had any ANC or PNC visit and never used any family planning method. Demographic findings showed that overall, the highest maternal deaths occurred in the IDP camp. However, in both IDP camp and Specialist hospital, nearly 3 out of 10 pregnancies were teen pregnancies (adolescents of 14 to 19 years), and nearly 5 out of every 10 maternal deaths happens among these adolescent mothers.

ANC visit, PNC visit Family planning) Effect on Maternal Deaths

In the 1st research question, the study findings revealed that attending fewer than 4 ANC visits during pregnancy increases the odds of maternal deaths by a factor of 1.75 among pregnant women. Also, attending less than 4 PNC visits after delivery increases the odds of maternal deaths by a factor of 0.28 among women that gave birth. Another finding was that not using any family planning method before the subsequent pregnancy

increases the odds of maternal deaths by 3.88 times among women not using the family planning method compared to those who are using the method.

The binomial logistic regression findings were statistically significant since the model, and the predictor variables explained all the variance in maternal deaths as demonstrated by the Nagelkerke R2 and classify 95.4% of cases. Therefore, there are associations between reproductive health factors (number of ANC visits, number of PNC visits, family planning) and maternal deaths. Hence I reject the null hypothesis for the alternate.

Effect of the Place of Residence on Maternal Deaths

I performed a binary logistic regression to determine a statistically significant association of maternal death between women in the IDP camp clinic and specialist hospital. I found that the logistic regression model is statistically significant since, at 95% confidence interval and at the significance of $p = 0.000 < 0.05$, the analysis showed that the odds of maternal death are increased by a factor 4.74 when living in ID compared to personal homes. Therefore, the risk of maternal death was higher among people in the IDP camps than among other Nigerian women living in their personal homes. The logistic regression model here also explained all the variance in maternal deaths as demonstrated by the Nagelkerke R2 and classifies 95.4% of cases. Hence I accept the alternate hypothesis over the null.

Age of mother at the time of delivery and maternal death

In the 3rd research question, I ran a Chi-square test to determine any significant relationship between adolescent motherhood (14-19 years) and maternal deaths among

IDP women. While these results showed the number of ANC visit, PNC visit, Family planning, and place of residence as significantly impacting on maternal deaths (p=0.000 < 0.05), similarly, the mothers' age at the time of delivery had a significant effect on maternal deaths (p = 0.000 < 0.05) Overall, the findings showed that both age groups 14-19 years and 20-49 years had a significant number of maternal deaths. However, the percentage of maternal death within the age category 14-19 years was higher (84,7%) than 20-49 years (65.2%). Therefore I failed to reject the alternate hypothesis.

Interpretation of the Findings

As in other studies such as Babalola and Oyenubi (2018) highlighted the persistently high maternal deaths globally, this quantitative cross-sectional retrospective study was also designed to determine the reasons for the stagnating maternal deaths in Nigeria. The focus was on reproductive health factors and their effect on maternal death among IDP women and other Nigerian women using the IDP camp clinic and specialist hospital information. The conceptual framework that informed the study was McCarthy and Maine's model for maternal mortality determinants (McCarthy & Maine, 1992). This study focused on immediate determinants (the number of ANC visits during pregnancy, PNC visits after delivery, Family planning) and distant determinants (age of the mother at delivery and place of residence) as independent variables, with maternal deaths the dependent variable. I used the binary logistic regression to answer research questions 1 and 2 and chi-square taste for the third question. The outcomes of the three research questions are interpreted in the paragraphs below.

ANC, PNC, FP, and Neonatal Deaths

The result of the analysis from this study highlighted the importance of ANC visit in pregnancy. The research shows that having less than 4 ANC visits during pregnancy increases the odds of maternal deaths by 1.75 times compared to having 4 or more ANC visits. This finding is in line with the World Health Organization recommendation that emphasizes attending at least 4 ANC visits during pregnancy. Kennedy et al., (2020) also documented similar findings in their study that examine the factors that influence the utilization of Focused ANC services among pregnant women in Ghana. In their results, pregnant women with 5 or more deliveries were more likely to have low utilization of Focused ANC services with p-value (p = .028), so they are more likely to experience maternal death. Collaborating these study findings, ANC attendance is, therefore, an easily accessible and efficient intervention in curbing maternal death, as reported by (WHO 2018a). Because ANC services provide a comprehensive medical checkup and medical tests such that any ill health is easily detected and addressed early, maternal deaths are reduced. PNC services are also a significant health concern after delivery, as highlighted in the World Health Organization report. A mother who gave birth should have at least 4 PNC visits, emphasizing that the first visit should be within the first 24 hours of delivery (WHO, 2018a). Somefun et al., (2016), in their study on the determinants of postnatal care non-utilization among women in Nigeria, supported the WHO report on the importance of PNC visit in curbing maternal death and recommended further research gap that this study has filled. One of the key findings from this research is that mothers who do not receive up to 4 PNC services increase the odds of maternal

deaths by 0.68 times compared to those who have 4 or more PNC visits. This study supported the systematic review by Gina Piane (2020), which reported that mothers receiving adequate PNC after delivery reduced maternal death. This study's findings also supported that limited uptake of PNC services during pregnancy increased maternal deaths among women aged 14 to 49 years. This cross-sectional retrospective study responded to the request for further research as highlighted by Obinna and Morgan (2020) following their conclusions of research study on the Evidence-based practices to reduce maternal mortality in sub-Saharan Africa.

Literature from WHO (2019b), recommends families, especially women, practice proper timing and adequate child spacing before becoming pregnant again. According to WHO, family planning could decrease infant and child mortality rates and improve maternal health. It is recommended that individuals and couples use contraceptive methods to anticipate and attain their desired number of children and their births' spacing and timing. Moreover, this is in line with the American college of obstetric and gynecology which reported that family planning helps couples avoid unintended pregnancies; it reduces the spread of STDs, thus reducing maternal death. The findings from this study showed that family planning had a statistically significant influence on maternal mortality. United nations population information network (1993), under their program on Family Planning, health & wellbeing, reported that family planning also promotes achievements of other societal goals such as the advancement of women, the stabilization of population growth, sustainable economic and social development, and preservation of the environment. However, this study finding did not collaborate with this

finding by the United Nations population network because this study focused on the health benefits of family planning concerning pregnancy and maternal death instead of family planning's social benefits. I recommend more studies to understand the social benefits that will be encountered with the use of family planning methods related to pregnancy and childbirth.

Place of Residence and Maternal Deaths

Binary logistic regression was undertaken to determine whether a place of residence was a challenge to maternal deaths. This study examined if staying in an IDP camp has any association with maternal death. From the results of this study, the odds of maternal death were 2.321 lower among women living in their personal homes than in IDP camp, where the odds of maternal death were just lower by 1.263. it is understood that the risk of maternal death is higher among people in the IDP camp than among other Nigerian women living in their personal homes. Hynes et al., (2012), revealed in their research study on refugee maternal mortality in 10 countries, from 2008-2010, that places of residence influence maternal death due to poor access to quality healthcare delivery. In their study, delays in seeking care, delays in accepting care, and provider’s failure to recognize the severity of the woman's condition were the most common avoidable contributing factors. Results from this study did not support this finding. Although the result showed maternal death is higher in the IDP camp, the main reason for that was not investigated. Therefore, I recommend further research to examine why maternal death is higher in the IDP camps.

Adolescence Motherhood and Maternal Death

Andrea et al., (2014) highlighted that the excess risk of maternal death among adolescent mothers might be less than previously believed. In their study titled Maternal mortality in adolescents compared with women of other age, data on maternal deaths were collected via the direct sisterhood method. Their findings revealed that in the 144 countries sampled; the adolescent maternal mortality ratio was low compared to women older than 30. Gakidou and King (2006) suggested that data obtained via the direct sisterhood method systematically underestimate true mortality. As opposed to other researchers, in this research, secondary data was collected from hospital records, and findings showed there is a statistically significant association between adolescent motherhood and maternal death. The result revealed that maternal death is higher among women between the ages of 14-19 years. However, I recommend further research using other research methods such as prospective studies to investigate maternal age and maternal death. The need to promote ANC attendance during pregnancy (at least four visits) through sustained advocacy and awareness creation with appropriate government policy is an implication for social change

In summary, this study showed that attending at least 4 ANC visits reduced the odds of maternal deaths by 1.75 times, and attending at least 4 PNC visits reduced the odds of maternal deaths by 0.28 times. Similarly, using family planning methods for child spacing reduced the odds of maternal death by 0.73 times and the odds of maternal death were higher among the women living in IDP camp. Overall the findings showed that there is an association between all the independent variables and maternal death.

Limitations of the Study

This was a retrospective using data from IDP camp clinic and Specialist hospital, and the analyses were for only selected independent variables. The study excluded other reproductive health factors that could have impacted maternal deaths like low socioeconomic status translating as lack of transport money to come to hospital on time and underline medical conditions such as postpartum hemorrhage. The data could be nearly accurate as all information was collected directly from the mothers when they were alive and using local language easily understood by all. And data collection was carried out by specialized health care workers (doctors, nurses and midwives). A potential limitation was that the data used were from mothers who died in IDP camp clinic and specialist hospital. This study excluded maternal deaths from other surrounding hospitals which could have impacted on the validity and reliability of the study findings. Although this limitation was mitigated because the sampling frame was between the period of 2016 to 2020, which provided a 5-year reference period with enough cases for the study since death is a rare event Another limitation was comparing the two different groups of women (the internally displaced persons and the ones living in their homes). However, this limitation was resolved because the women patronizing the specialist hospital are almost of the same class as the internally displaced persons because most of them are poorly educated. They are a combination of different tribes and low socioeconomic status. In the binary logistic regression, the assumption of the absence of outliers was not discussed because there are no outliers in the study. This study used

actual data from the IDP camp clinic and Specialist hospital, and as such, no transformations were made.

Recommendations

This study showed that not attending at least four ANC and PNC visits increase the odds of maternal deaths by 1.75 and 0.28 times, respectively. Also, the use of the family planning method reduces the odds of maternal death by a factor of 0.73. The mother's age at the time of delivery and place of resident were also found to be associated with maternal death. The binary logistic regression showed that women living in IDP camp have higher risk of maternal death compared to women living in their personal homes. Despite that ANC attendants were slightly higher among the internally displaced women, maternal death was also higher in the IDP camp. In addition to the reproductive health factors, there may be other unknown factors are explaining the maternal deaths in the IDP camp. I recommend future studies to determine other factors associated with maternal death in the IDP camps. The samples in both the IDP clinic and Specialist clinic are from low sociecomic status and different Nigerian tribes, therefore, I recommend future studies to determine any effect tribalism and low socioeconomic status may have on maternal death. Also, the Chi-square test revealed that the risk of maternal death was high among adolescent mothers between the ages of 14-19 years in Nigeria as opposed to the findings by Andrea et al., (2014) in many other countries. Therefore, more research is recommended to obtain more information about the impact of adolescent motherhood on maternal deaths, specifically to find out why these adolescents of age 14 to 19 years die from pregnancy.

Implications

This study on maternal mortality highlighted key findings on reproductive health factors of internally displaced women and their impact on maternal deaths in Nigeria. Although it did not have a nationally representative sample, this study was the first of its kind in Nigeria. A positive social change is that this study added knowledge to maternal deaths applying McCarthy and Main's model in Nigeria. The application of the binary logistic regression and the chi-square test was a simple and easy dimension to analyzing the differences of maternal deaths, thus encouraging similar research in other parts of the country or the world at large.

This study pinpointed the importance that attending ANC at least 4 times during pregnancy had on reducing the odds of maternal death by 1.75 times. Therefore, developing policies and programs at the national and subnational level targeted at pregnant women on the need to embrace Antenatal Care could be a significant contribution. Awareness creation on the importance of Antenatal Care, especially among pregnant women and subsequent attitude-change on the need to have at least 4 Antenatal Care visits could be a likely positive social change at the individual level. A likely contribution may be improving the continuum of care through awareness creation to reduce maternal death. The reduction of pregnant women's deaths possibly resulting in saving the lives of teen mothers and allowing them to benefit from their full potential when alive. Another important positive social change is the likely initiation of adult learning classes at the community level on the importance of antenatal care, postnatal care, family planning, and maternal health as a whole during pregnancy. This

intervention may translate to increased community awareness on the benefits of having at least 4 ANC visits during pregnancy and how it can avert maternal death. The reduction in maternal mortality may make the community contribute to economic development and hence improves household's livelihoods. The awareness on family planning options for adequate child spacing could reduce maternal and neonatal death, which will add to community population, thus a positive social change.

At the national level the positive social change from this study could be renewed policy direction on reproductive health system and increased advocacy for at least 4 antenatal care attendance during pregnancy and four postnatal care attendants that may translate to a reduction in the health budget, thus a saving to the Nigerian government. Specific policies may be developed to increase Antenatal Care attendants during pregnancy like free distribution of delivery kits at the health facility and free baby bags and other similar interventions that may benefit the population and reduce maternal deaths.This study showed that although maternal death was slightly higher in IDP camps, it was also unacceptably high among other Nigerian women living in their personal homes. Therefore, the Nigerian government must do more work throughout the country to create awareness on the need to improve maternal health and reduce the high mortality. Advocacy messages and Policies involving all stakeholders could be formulated using back-up evidence to create awareness of the importance of Antenatal Care and Postnatal Care during and after pregnancy. A joint effort among the public sector, private sector, international agencies like UNICEF, and the general public may be critical in awareness

creation on reproductive health factors, resulting in a positive social change. Globally, the significant positive social change could be contribution to realization of SDG target 3.1 of lowering the global MMR of fewer than 70 maternal deaths per 100,000 live births by 2030.

Conclusion

Reducing the stagnating maternal mortality standing at the rate of 576 deaths per 100,000 live births per year is a problem in Nigeria. In addition, violence and conflict have become widespread with increased insecurity, terrorism, militancy, and economic problems consequently contributing to the rising maternal mortality rate in the country. Over the last two decades, low spending on healthcare has worsened the situation by limiting the expansion of highly cost-effective and result-yielding interventions. The universal health service coverage is just 39%, thus exposing many individuals and households to catastrophic health expenditures, culminating in poor health outcomes. Maternal health is one of the worst-hit recording high maternal deaths. The purpose of this cross-sectional study was to examine the association between intermediate determinants (ANC visits, PNC visits, Family planning), distant determinants (place of residence) and maternal death as explained by McCarthy and Maine's framework. The findings showed that not attending at least 4 ANC and PNC visits increase the odds of maternal deaths by 1.75 and 0.28 times, respectively. Also the use of family planning method reduces the odds of maternal death by a factor of 0.73. The mother's age at the time of delivery and place of residence were also found to be associated with maternal death. While previous researchers underscored the critical effect of place of residence on

maternal death, the findings showed that women living in IDP camp have a higher risk of maternal death compared to women living in their personal homes. The ANC attendants were slightly higher among the internally displaced women, and the number of maternal death was higher in the IDP camp, a possible indication of other unknown factors contributing to maternal deaths in the IDP camp. The findings also showed that the risk of maternal death was high among adolescent mothers between the ages of 14-19 years in Nigeria as opposed to the findings by Andrea et al., (2014) in many other countries. The key finding from this study was that attending at least 4 ANC and PNC visits and using family planning methods contribute significantly to reducing maternal deaths. As the global attention focuses on achieving the SDG target of having fewer than 70 maternal deaths per 100,000 live births by 2030, this will need continued investment in maternal health research, maternal health targeted programs, and policy at the country and global level.

As focused action to reducing maternal death, concerted efforts in promoting community initiatives, awareness creation, and adult learning on the importance of attendance during pregnancy and PNC attendance and family planning method after delivery are critical. Such efforts may lead to a healthy population, healthy nation, and reduction in maternal deaths in Nigeria and globally, allowing Nigeria to reap from economic development benefits as in Agenda 2040

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