REDUCTION OF MATERNAL MORTALITY IN NIGERIA

(Focus- Northern region)

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Reduction of Maternal mortality in Nigeria (Focus - Northern region)

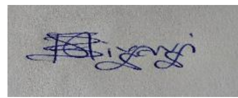
This thesis is submitted as final requirement for the degree of Masters in Public Health (MPH).

By Fridah B. Miyayi

The Republic of Kenya.

Declaration

This work has been done using data from various sources done by the country survey system, other researchers and writers, sourced mainly through the internet, all have duly been acknowledged and referenced accordingly as stipulated by the institutional requirements. The thesis "Reduction of maternal mortality in Nigeria (Focus- Northern Nigeria)" is my own original work and I did not receive any tokens or any form or coercion to do this writing.

Signature: 

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Abbreviations

AIDS	**Acquired Immuno-Deficiency Syndrome**
ANC	**Ante Natal Clinic (or Care)**
APH	**Antepartum hemorrhage**
CI	**Confidence Interval**
CS	**Caesarean Section**
EMOC	**Emergency Obstetric Care**
ERCC	**Emergency Response Coordination Centre**
EPMM	**Ending preventable maternal mortality**
FGM	**Female genital mutilation**
FP	**Family Planning**
GDP	**Gross Domestic Product**
GNI	**Gross National Income**
HCW	**Healthcare workers**
HDI	**Human development index**
HIV	**Human Immunodeficiency Virus**
HMIS	**Health management information system**
IDPs	**Internally displaced people**
LMIC	**Low- and Middle Income Countries**
MDGs	**Millennium Development Goals**
MM	**Maternal mortality**
MMR	**Maternal Mortality Ratio**
MM Rate	**Maternal Mortality Rate**
MOH	**Ministry Of Health**
MSS	**Midwives Services Scheme**
MVA	**Manual Vacuum Aspiration**
NCDs	**Non Communicable Diseases**
NDHS	**Nigerian Demographic Health Survey**
NHA	**National Health Accounts**
OOP	**Out Of Pocket payments**
PM	**Proportion of maternal deaths among deaths of females in reproductive age %**
PHC	**Primary Healthcare**
PNC	**Post Natal Clinic**
POCs	**Products of conception**
PPH	**Postpartum hemorrhage**
PRD	**Pregnancy related death**
RNHP	**Revised National Health Policy**
RVF	**Recto – vaginal fistula**
SDGs	**Sustainable Development Goals**
STIs	**Sexually transmitted infections**
SURE-P program	**Subsidy, reinforcement and empowerment**
TBAs	**Traditional Birth Attendants**

TFR	**Total Fertility Rate**
THE	**Total Health Expenditure**
UN	**United Nations**
VVF	**Vesico -vaginal fistula**
WHO	**World Health Organization**
YLL	**Years of Life Lost due to premature mortality**
YLD	**Years of life lost due to disability**

Glossary of terms

- **Antepartum hemorrhage- "**bleeding through the birth canal after 24weeks of pregnancy but before the time of birth".
- **General Government Expenditure on Health- "**amounts spent on health by the local, state and cental government excluding social services".
- **Gross Domestic Product- "**total value of services and commodities produced by a country in a year"
- **Human Development Index –"** composite statistic of life expectancy, education, and income per capita indicators, which are used to rank countries into four tiers of human development".
- **Life expectancy-** " the average number of years a person may expect to live".
- **Maternal morbidity –** "any health condition attributed to and/or aggravated by pregnancy and childbirth that has a negative impact on the woman's wellbeing".
- **Maternal Mortality Rate- "**the number of resident maternal deaths within 42 days of pregnancy termination due to complications of pregnancy, childbirth, and the puerperium in a specified geographic area (country, state, county, etc.) divided by total resident live births for the same geographic area for a specified time period, usually a calendar year, multiplied by 100,000."
- **Manual Vacuum Aspiration-** "suction of the contents inside the uterus through the cervix during induced or incomplete abortions"
- **Puerperal sepsis-** "infection of the genital tract commencing from the time of membrane rupture/labour to 42days after delivery"
- **Postpartum hemorrhage**- "bleeding through the birth canal amounting to 500-1000mls within 24 hrs after delivery"
- **Total Fertility Rate-** "number of children to be born per woman if they were to pass child bearing age"
- **Total Health Expenditure-**"sum of both public and private expenditure on health covering curative and preventative sections"
- **Vesico- Vaginal Fistulas-** "an abnormal fistulous tract extending between the bladder (or vesico) and the vagina that allows the continuous involuntary discharge of urine into the vaginal vault".
- **Window period**- "time between the period of exposure to HIV and the time a test will give a positive result"

[1]

Acknowledgement

I would like to acknowledge the NUFFIC scholarship program for sponsoring me to be able to go through this life- changing course. I would also like to acknowledge my thesis advisor who has worked relentlessly, hand in hand with me, with positive criticism and making me think out of the box to make this work what it is today. Without prejudice, I would like to recognize the KIT team that has worked with us tirelessly throughout the year with our many diversities to enable us acquire what it takes to be a Public health specialist.

Dedication

I dedicate this thesis to my fallen hero, mentor and best friend, my Dad George Edwards Miyayi, who up to the time of his untimely demise encouraged me to come and further my education, who made sure I promised to overcome my hesitation and would not let his illness and eventual death hinder me from pursuing this masters' degree. I also dedicate this to my four female friends who within this educational year have met their early death and joined the statistics in maternal mortality. Last but not least I salute my mother and my friend Margaret Jaimbo Miyayi, for helping me keep my head above the water, always encouraging me, always a shoulder to lean on and for taking good care of my babies when I was away for this whole year. May the good Lord Bless you all.

Quotes:

"Grant me the serenity to accept the things I cannot change, courage to change the things that I can, and wisdom to know the difference" – Summer Quotes

"In matters of style, swim with the current; in matters of principle stand like a rock"- Thomas Jefferson

"You may never know what results come out of your actions, but if you do nothing there will be no results" – Mahatma Gandhi

[1] All the above definitions have been extracted either from WHO, UNFPA, UNICEF, World Bank, Trends in Maternal mortality 1990-2015 and any articles that cited them

ABSTRACT

Background: Maternal mortality refers to the death of a woman during pregnancy or within 42hrs of termination of pregnancy, irrespective of where the pregnancy is situated, cause of death could be incidental or accidental. Maternal mortality is 75% preventable, thus an issue of global public health concern. It still remains high in Low and Middle income countries and in Africa, it is highest in Nigeria. ***Objectives:*** The objective of this writing was to explore the enabling and disabling factors influencing high Maternal Mortality in Nigeria, with special focus on Northern Nigeria where maternal mortality remains highest, to be able to recommend possible interventions that have proven to be successful in the reduction of MMR (in the southern region)to the Nigerian Ministry of Health (MOH), and other stake holders. ***Methodology:*** The method of choice was a literature review, assessing data sourced out through the internet, that has been done by different researchers and writers, seeking to answer the question why maternal mortality rate in Nigeria is not improving as fast as it should despite interventions. ***Findings:*** Leadership is wanting right from the top otherwise policies exist but are not implemented and there are no bodies monitoring this. Poverty is a key factor influencing several aspects of maternal health: be is services offered, accessibility, affordability and even quality of services offered. Shortage of qualified health work force and their distribution in the country takes a fair share of the burden in maternal mortality. The insecurity in the North by the militant Islamic group Boko Haram has left a vast area in the north affected and subsequently reduced the accessibility and availability of health facilities. Improving the transport sector especially the roads/means of transport in the rural areas will influence maternal health services utilization. Some essential drugs are needed to be available even to the traditional birth attendants as they over-see a large percentage of home births. Outdated religious and cultural beliefs are still being practiced and this negatively impacts on maternal deaths. Most health facilities are ill equipped for emergency obstetric services. Unsafe abortion is a key player in maternal mortality and this has to do with the laws surrounding abortion. There is poor family planning uptake due to a variety of reasons. Child marriage practices and teenage pregnancies are influencing the high maternal mortalities. Education amongst women and the community is essential for reduction of maternal deaths to be achieved. Lack of women empowerment indirectly contributes to high maternal mortality rates.
Conclusions and Recommendations: It is evident that a lot needs to be done on the ground in Nigeria as a whole that will most definitely

positively impact on maternal health in general. Good leadership will go a long way in changing what is happening in Nigeria, especially the eradication of corruption. Woman education and empowerment will facilitate a change in the independence and human rights of a Nigerian woman. Some cultural practices are outdated and need to be abolished. Religious leaders should actively be involved in conjunction with community elders to ensure smooth transition of behavioral change, which will further enhance acceptance of current medical methods that are aimed at reducing maternal mortality. Country should invest in retaining their trained medical work force to reduce brain drain. Continuous medical education should be part and parcel of the requirements a practicing medical personnel should have to under-go to ensure quality maternal health service delivery.

Key words: Maternal Mortality, Three-delays, Pregnancy-related complication, Evaluated interventions, Northern Nigeria.

WORD COUNT: 11,511

Introduction

I am a medical doctor who transitioned into Health systems management at the time of proceeding to do my masters' degree. After acquiring my bachelors' degree in medicine and surgery in Moscow 2007, I moved back home to Kenya where I did my board exam and did my internship at Kenyatta National hospital, Nairobi- the biggest referral hospital in East Africa. I acquired hands-on experience with tropical diseases of all sorts. After a year of full completion of internship I worked in the Accident and Emergency of the same hospital for 6 months. I later on moved to a private company AAR Healthcare Kenya, as a general practitioner in 2010. I worked in this position till November 2013, after which I was promoted to middle management as Health center manager, a position I held until the time of resignation to pursue other interests.

With the passion I have always had for maternal and child health, coupled by the fact that maternal mortality remains a global menace, I chose this topic "Reduction of Maternal mortality in Nigeria (focus- Northern Nigeria)" to give me more insight on the issue in Nigeria because it ranks second in absolute high numbers of maternal mortality (after India) in the world. This was also to reduce any bias that I would have towards maternal mortality in my own country, being actively involved in the health system. This also gives me an opportunity to do something international, as most of our study has been limited to our countries, giving me the capacity to work in a country other than my own.

The thesis below comprises of seven chapters, clearly explaining the topic all through to the interventions recommended. The chapters are explained as follows:

First Chapter- explains some back ground information on Nigeria as a country, giving some information on the demographic profile, socio-economic profile, an overview of the health systems and policies and the national health expenditure

Second Chapter – explains the problem statement, justification, objectives and methodology used, introducing the framework chosen

Third Chapter- mainly focuses on the results obtained in this study

Fourth Chapter- comprises of the discussion section.

Fifth Chapter- contains the conclusions made.

Sixth Chapter- is mainly about recommendations, looking at what is currently being done in Nigeria, evaluated interventions that have worked in other parts of Nigeria and the WHO recommendations for the interventions. The insight provided is critically based on findings, feasibility, applicability and sustainability.

The last two chapters are basically the references and annexes used for this writing.

REDUCING MATERNAL MORTALITY IN NIGERIA

Chapter 1- Background information on Nigeria

1.1 Introduction and demographic profile

Nigeria is the largest and most populated country in Africa, located in the Western part of Africa, bordered by Chad and Cameroon in the east, Niger in the North, Benin in the west and the Gulf of Guinea in the south[1]. It occupies a total area of 923,768 square kilometers and harbors a total population of approximately 173.6 million as at the year 2013 and is currently estimated at 182.2million for the year 2015. Nigeria has a Population growth rate (PGR) of 2.8 percent per annum with a Total Fertility rate (TFR) of 5.5%[2]. The Life expectancy in Nigeria is 53years for the males and 56 years for the females[3]. Nigeria has 36 states[4].

Below is a map of Nigeria showing its position, size and neighbors in comparison to other countries in the continent of Africa[5].

1.2 Socio- Economic profile

The gap between the rich and the poor in Nigeria is wide[6]. There has been a progressive downward trend on the quality of life of a normal average Nigerian over the past few years[7]. Bearing in mind that Nigeria is one of the countries with the highest capital resources in Africa mainly because of its oil reserves, it is a mystery why Nigeria should be falling in the category of poor countries, a lot of the reasons behind it being attributed to corruption[8]. Approximately half of the Nigerian population lives in dire poverty (poverty and its classification is elaborated on **section 3.1**)[9]. This is as a result of the country facing challenges such as poor leadership and governance, lack of policies for- and neglect of the agricultural domain, weak administrative laws and high debt burden, rapid increase in the population and high levels of corruption[8]. Consequently, the population suffers from lack of access to quality health care, unemployment, poor housing facilities, hunger, lack of credit facilities, lack of proper education, poor health status, increased disease burden and ultimately this leads to low life expectancy[8].

1.3 Overview of the Health systems and Health policy

Nigeria has a decentralized health system with a functional Health Management Information System (HMIS), having all primary, secondary and tertiary levels and built based on the three tiers of Federal, state and local governments steering the health system[10]. The Nigerian government acknowledges and monitors the three forms of health care delivery: alternative methods, traditional healing methods and medical healthcare[11]. There has been marked effort to have Primary health care (PHC) in both urban and rural areas of Nigeria[9]. However the rural populations still live with the inequity and inequality of this service provision (PHC centers)[9]. This negatively affects Nigeria as two thirds of its population lives in the rural areas[9]. PHC in Nigeria faces challenges more so in the uneven distribution of healthcare workers and the insufficient numbers of skilled health care workers[9]. This has highly been attributed to corruption, migration in search of better employment opportunities and preference to work in urban towns rather than in the rural areas[9].

In 1988, the Federal Republic of Nigeria formulated a national health policy with the aim of attaining quality health for all Nigerians[9]. However due to different emerging disease trends and environmental changes, policy revision was deemed necessary[9]. This was done in September 2004, when they launched the Revised National Health Policy (RNHP), clearly outlining both the roles of the governmental and non-governmental organisations[7]. The basic principles of this RNHP included the following:

- ”Social justice, equity, and the ideals of freedom and opportunity affirmed in the 1999 Constitution of the Federal Republic of Nigeria are basic rights.
- Health and access to quality and affordable health care are human rights.
- Equity in health care for all Nigerians will be pursued as a goal.
- PHC will remain the basic philosophy and strategy for national health development.
- Good-quality health care will be assured through cost-effective interventions that are targeted at priority health problems.
- A high level of efficiency and accountability will be maintained in the development and management of the national health system.
- Effective partnerships and collaborations between various health sectors will be pursued while safeguarding the identity of each”[7].

In relation to maternal health, policies to support maternal health such as notification of maternal death within 24hrs to a central body, review of all maternal deaths and existence of a subnational body for review of maternal deaths exist and policies indicating minimum ANC visits (four) are in place[7]. Also, in the same positive light, these policies include the right of every woman to receive skilled care during child birth, the discharge of a mother after delivery, presence of magnesium sulphate and oxytocin in the essential drug list for maternal health and recommended follow up review for both mother and the newborn child otherwise known as Post natal care (PNC) [7]. These positive policies (pro maternal health) were adopted in 2013[7]. However, areas falling short of the international recommendations in the policy sector were the absence of national and community level bodies to review maternal deaths[7].

1.4 National Health expenditure

The GDP of Nigeria is 972, 426 (Int $ PPP)[12]. The country's Total Health Expenditure (THE) as a percentage of the Gross Domestic Product (GDP) is 4 according to the National Health Accounts (NHA) for the year 2014[12]. This is seemingly the trend for the last eleven years (2004 to 2014), with the mean THE of the eleven years being 3.8%, which is quite low, considering the trends in severity of illnesses, epidemics and increased need for medical care and the World Health Organization (WHO) recommendation of a national THE of 5% as a means of gearing towards access to quality health care for all, implying that the THE in Nigeria is still less than a third of the recommended percentage[12]. This shows that as a country, Nigeria could not meet the health care needs of its population without the assistance of external sources such as donations and funds for financial cushioning[12]

As a result, Out Of Pocket (OOP) Expenditure as a percentage of the THE is very high – at 73[12]. Looking at this data, we can derive that most of the financing for health is mainly borne by the individual/ house-hold[12]. There

are no records of any expenditure towards Prevention and Public health services[12].

Chapter 2: Problem statement, justification, objectives and methodology

2.1 Problem statement

Maternal Mortality Ratio (MMR) is defined as the number of female deaths during the gestation period, birth or within a period of 42 days after pregnancy termination whether incidental or accidental and irrespective of the site of pregnancy, per 100,000 live births,75 percent of these deaths being due to direct complications of pregnancy[3] such as bleeding (hemorrhage), pre-eclampsia and eclampsia due to pregnancy induced hypertension, infections and sepsis, missed/misdiagnosed ectopic pregnancies, unsafe abortions, embolisms, non-communicable diseases (NCDs) in pregnancy such as diabetes, asthma, hypertension and other Human Immuno-deficiency Virus (HIV) and Acquired Immuno-deficiency Syndrome (AIDS) related conditions[13]**.**

Unlike their male counterparts, women face a higher risk of dying, especially due to pregnancy related complications and complications at birth[12]. Maternal life is of high importance to both the spouse, child, the woman's family, the community and country at large[12]. Death of a mother leaves the child with no maternal love or source of nourishment (breast milk) thus reducing the infants' chances of survival[12]. The woman's family faces loss of investment made during her upbringing in terms of basic needs and education[12]. The husband faces challenges of bringing up the child or children as a single parent and goes though loneliness due to lack of a partner, while the community loses out on her physical and mental contribution thus lowering the community productivity[12]. The country as a whole loses out on her economic and labor contributions[12].

Most Pregnancy-related deaths (PRDs) are preventable, as the ways to which to deal them or prevent complications in pregnancy and birth are well known. The recommendations of maternal care are at least four Ante- natal care (ANC) visits, birth with a skilled attendant and post-partum care[10]. However, it is noted that only 40% of women in Low- and Middle Income Countries (LMIC) have the recommended care during pregnancy, birth and post-delivery[10]. Globally, there is a concern on Maternal and Child health, hence it being a part of the Millennium Development Goals (MDG) and Sustainable Development Goals (SDGs)[14].

The MMR in Nigeria is seemingly on the downward trend, however not significantly according to data available, which is an issue of concern[15].Looking at the situation from 1990 to date, there seems to be a significant increase in number of live births but little change in maternal mortality. The table below gives a clear picture of the previous and current situation of MMR in Nigeria [2,16].

Year	MMR/100,000 live births and CIs	Total number of maternal deaths	Total number of live births	Proportion of maternal deaths among deaths of females in reproductive age

				of 15-49years(PM) %
1990	1350 [893-1820]	57000	4,220,000	36.0
1995	1250 [875-1690]	59000	4,700,000	32.4
2000	1170 [866-1520]	62000	5,290,000	28.2
2005	946 [747-1180]	56000	5,924,000	23.0
2010	867 [673-1130]	57000	6,573,000	22.6
2015	814 [596-1180]	58000	7,133,000	25.6

Disparities concerning global maternal mortality, have been recorded amongst the rich versus poor, urban versus rural, developed countries versus developing countries and health service inequalities[17]. 99% of the burden of maternal mortality is borne by the LMICs. MDG 5, stated that there should be a reduction in maternal mortality by three quarters (75%) between the years 1990 and 2015[18]. However in this period, global reduction of MMR was registered at 45% (currently 289,000 maternal deaths), which is still below the targeted 75% but quite an improvement from where it previously was – 523,000 maternal deaths[19].

There are various factors that should be considered when trying to reduce MMR, or to understand the reasons for high MMR in different countries (which will vary from country to country)[20]. Areas of interest would be factors such as leadership and governance, the health system, availability of health facilities especially when dealing with emergency obstetric care, access to maternal healthcare services, quality of healthcare services provided and utilization of ANC/PNCs[21].

2.2 Justification

Nigeria contributes to approximately 2% of the global population, yet it contributes to more than 10% of the maternal deaths worldwide[22]. While the global estimates of maternal deaths in 2013 was approximated at 289,000, Sub-Saharan Africa accounted for about 62% of this number (179,000), Southern Asia -24% (69,000) and the rest by other regions. On a country perspective, India had the highest number of maternal deaths reported in 2013, at an approximated 17% accounting for 50,000 maternal deaths[22]. Close on its tails was Nigeria with 14% (40,000) considering absolute numbers of maternal deaths recorded[22]. The current MMR in Nigeria stands at 560 maternal deaths per 100,000 live births, however in the Northern region could be as high as 900 maternal deaths per 100,000 live births[22]. The annual reduction rate of MMR for Nigeria between the years 1990 -2015 was only 2% (CI -0.2 to 3.3), not achieving the

recommended target of 5.5% - the annual reduction rate required to achieve the MDG 5[5]. Thus the MMR in Nigeria still remains high and is still an issue to be evaluated and tackled from various angles[23]. Looking at the graph below, Nigeria has maternal, neonatal and nutritional factors as top on the list in the analysis of burden of disease with the highest Years of life lost due to premature mortality (YLL) and Years of life lost due to disability (YLD)[24] as shown in **Figure 1** in the Annex section.

Nigeria has a Gross National Income (GNI)/capita (PPP International $) of 5, as at 2013[1]. This amount is significantly inadequate considering the health needs of the country in general. The Federal, state and local governments are supposed to provide health care services for the population of Nigeria, with their financing coming from different sources, namely out of pocket payments (which is the main source), taxes, donations, health insurance (both national and private) and community financing[25].

2.3 OBJECTIVES

2.3.1 Main Objective

To explore the enabling and disabling factors influencing high Maternal Mortality in Nigeria(focusing on the Northern region), to be able to recommend possible interventions that have proven to be successful in the reduction of MMR (in the southern region) to the Nigerian Ministry of Health (MOH), and other stake holders.

2.3.2 Specific Objectives

1. To provide a comprehensive overview of Maternal Mortality in Nigeria (levels for sub-groups and trends).
2. To analyze factors influencing high MMR in Nigeria (concentrating on Northern part of Nigeria, where MMR is highest).
3. To learn from interventions aiming at reduction of MMR in Nigeria and compare to other evaluated interventions in the southern region of Nigeria.
4. To assess applicability of interventions recommended by international specialized bodies.
5. To give recommendations on the reduction of MMR in Northern Nigeria.

2.4 METHODOLOGY

2.4.1 Study design

The study design used is Literature review, with the use of the three delay framework, with the sole purpose of finding key factors influencing the high MMR in Nigeria and how this high numbers can be reduced.

2.4.2 Search strategy

The search engines mainly used were Google scholar, Pub-med and VU library for scientific data. Gray literature was obtained from the web pages of UN, WHO, NDHS, UNICEF, UNDP and UNFPA. Google was also used for this purpose.

2.4.3 Key words and year boundaries

For the purpose of this literature review, key words were used in the search engines together with combination words. Key words used were "Nigeria", "northern Nigeria", "maternal mortality", "factors contributing", "factors influencing", "first delay", "second delay", "Boko Haram", "human resource", "pregnancy related deaths", "unsafe abortion", "areas affected", "consequences", "safe motherhood", "emergency obstetric care", "postpartum", 'rape", "terrorism", "poverty", "utilizations", "community", "skilled", "demographic", "infrastructure", "health", "national expenditure", "socio-economic", "cultural", "religious", "political leadership", "primary health care", "maternal health policies", "maternal death", "strategy", "millennium development goals", "health care systems", "three- delay model", "prevention", "teenage", "child marriage", "islam", "workers". These words were used in combination with joining words such as "in", "of", "and". The year boundaries used for data to be analyzed in this study was limited to the years between 2005 and 2016. The search language was limited to English only. Writing was done in English.

2.4.4 Limitations

Like most literature reviews, the biggest limitation was evaluating all the documents read and picking what was important and what was not, a difficult task since it is not easy to know what the reader is looking for and whether what is seemingly not important and left out is not of importance to the reader. It would have been great to go to Nigeria and do primary data collection in the three parts of the Northern region (North West, East and central) and have a sample to deal with. Data in the North East may be under-estimated as the recording systems and data collection in the North East is still facing challenges. Some data was found to be conflicting from different sources, so to iron that out, latest information from international bodies was preferred and used. There are fewer studies that have been done based on the population, missing out on the home pregnancy- related deaths. Most available data is based on institutional data which at times can be confounded or biased (most likely under-estimated).

2.4.5 Conceptual framework

The Three- delay framework

The 3-delay framework has been chosen as the most appropriate one for this study due to the fact that maternal mortality has a number of factors surrounding it. For example, many women especially in the developing countries die from pregnancy related complications, unsafe abortion and the process of childbirth[26].

The Three-delay conceptual approach tries to explain how the events occur in such a way that it is interlinks with the stories as they are narrated by the family members of the deceased woman or hospital records on patients' follow–up, management and how meet their death. However there are a number of important factors that do not fit in the framework but play key roles in maternal mortality and they will be discussed at an earlier stage. It also clearly draws attention to the fact that unwanted deaths can be prevented if there is commitment and political will of a country and adequate provision of quality health services [27]. The 3-delay stages are as follows:

1. "Delay in making a decision to go for appropriate help in a health service point adequate enough to handle obstetric emergencies.
2. Delay in reaching the appropriate health service point as stated above (on time).
3. Delay in receiving adequate treatment once the woman has reached the health service point"[27].

This can be demonstrated well in **Figure 2** below, including the different factors that could influence the three phases/stages

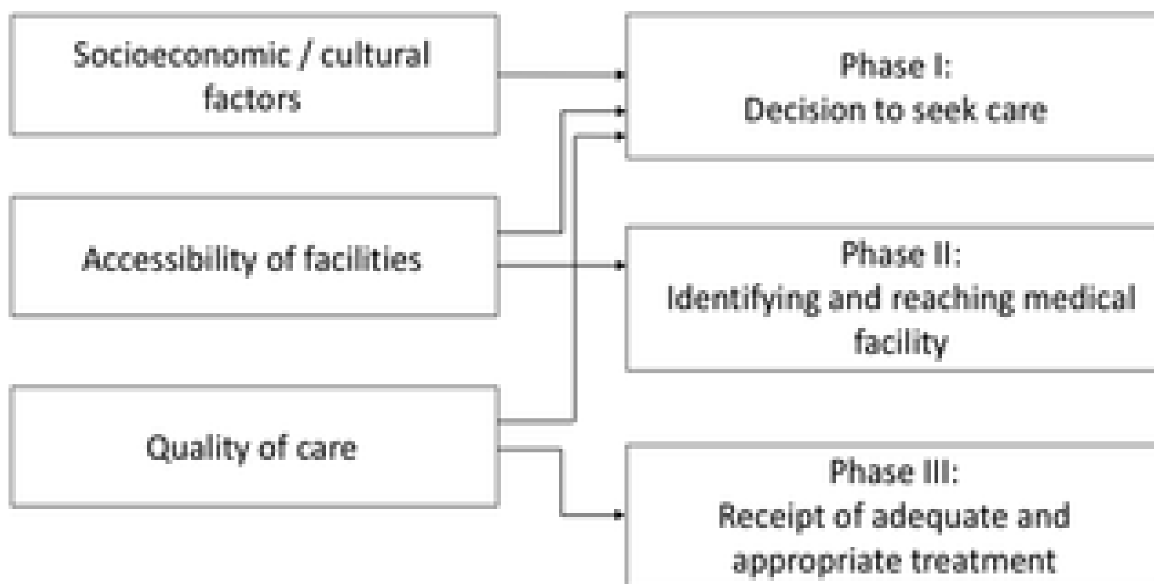


Figure 2. Three Delays Model[28].

http://dx.doi.org/10.1371/journal.pone.0063846.g001

With this approach, caution has been taken to clearly evaluate both sides of the coin: the demand and the supply side.
The **Figure 3** below illustrated this, indicating some of the reasons that affect the demand or supply side whilst also demonstrating how some reasons could affect both the demand and supply side.

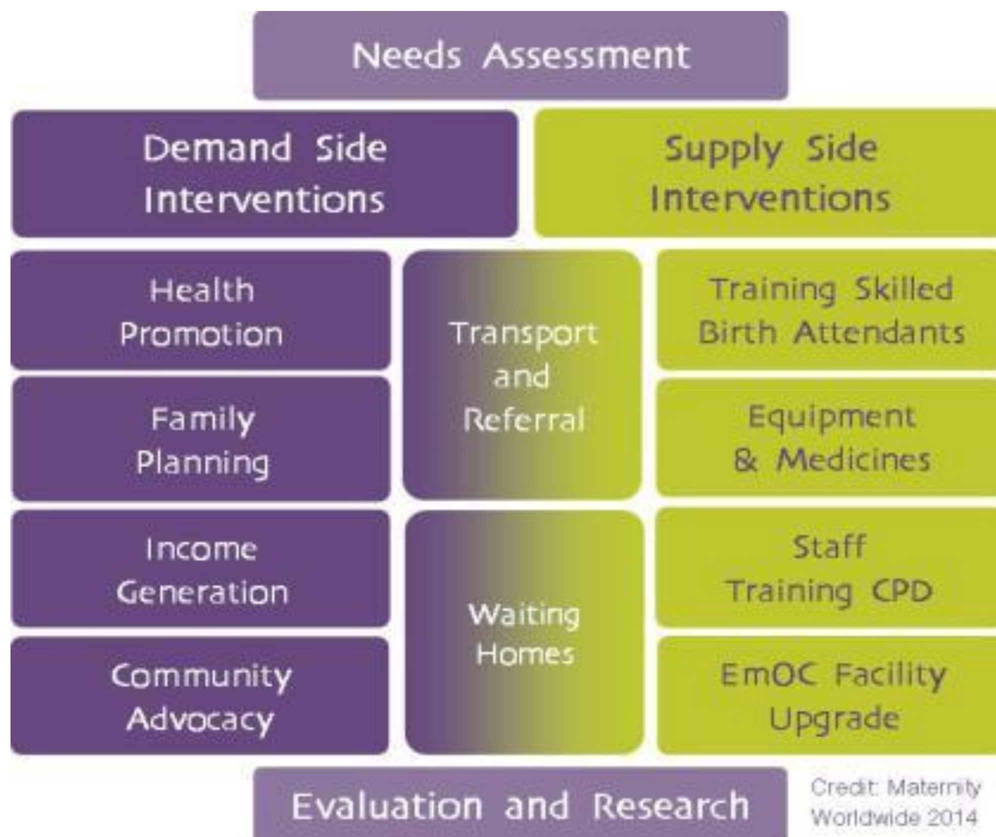


Figure 3. Thaddeus S, Maine D. Too far to walk: maternal mortality in context. Soc Sci Med 1994; 38: 1091-1110[29]

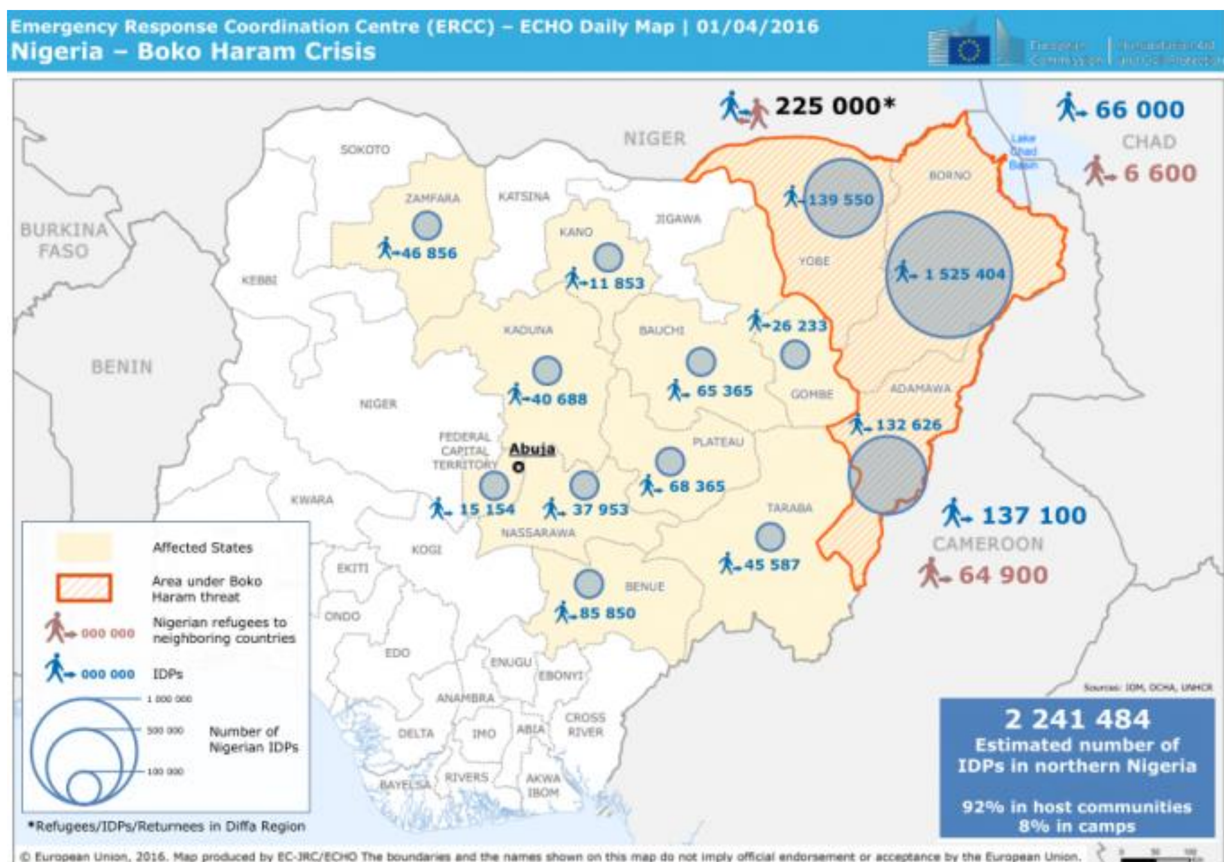
As seen depicted in Figure 3, some of these factors overlap, playing a role in both the demand and the supply sides.

2.4.6 Comprehensive overview of Maternal Mortality in Nigeria (why focus on Northern Nigeria).

There are six geopolitical zones of Nigeria (**see Figure 4** in the annex section)[30]. Part of the reason why Northern Nigeria is of interest is because, apart from occupying the largest portion of the country in terms of size (North East, North West and North Central combined)[17], it also has highest numbers/rates of PRDs recorded), evident from poor maternal health indicators such as early sexual activity, unsafe sex, lack of use of modern family planning methods, many uneducated women and so on [9]. Over seven eighths of the population living in the Northern part of Nigeria practice the Islamic religion, a factor that could shed light on the situation during the assessment of the behavioral aspect of the people in the Northern region[31]. This is also the area that has largely been affected by the militant Islamic group Boko Haram, leading to various health system challenges including migration[32]. Currently, Boko Haram seems to be concentrated on the North Eastern part of Nigeria, where it has even taken charge of some states (Borno, Yobe and Adamawa) and is still being fought by the Nigerian military, but multiple sources indicate a vast area of the whole Northern region as having been affected by their presence in the North and still

suffering the consequences of their invasion and internal population displacement seen in form of approximately 2.2million Internally Displaced People (IDPs)[33].

A current map of Nigeria [taken by the Emergency Response Coordination Centre (ERCC) in April this year- 2016] indicating the Boko Haram affected areas is included below:



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Looking at the sub- trends, some disparities are seen when in depth research was done over time[35]. For example in Nigeria especially in the Northern region, considering age, studies show that there is a higher MMR seen in adolescents and younger women of age 15-24 years and older women (above 45 years) whereas the middle aged women of 25 – 44 years of age had a lower MMR in comparison[35]. In regards to socio- economic status, the poor women had higher numbers of MMR in comparison to the wealthier women or women who had well-to-do families[35]. Marital status did not yield any significant correlation with MMR when the unmarried women were compared to the married ones[35]. Rural dwellers however showed a remarkably high MMR in comparison to the urban dwellers considering availability, quality and utilization of maternal health services[35]. The educated women were more likely to go for ANC and opt for health facility delivery as compared to the uneducated women[35].

Chapter 3. RESULTS

3.1 Overarching factors influencing high MMR in Nigeria (focusing on Northern Nigeria)

In order to critically analyze the factors influencing high MMR in Nigeria while specifically paying attention to the unique issues challenging the Northern region, the factors will be discussed under corresponding Delays (I, II or III) as per framework chosen. Some of the factors are as explained below. Some important factors do not directly fit into the model but are equally affecting the rates of high maternal mortality. These factors overarch all the factors under the 3-delay model and are mentioned below.

Female Genital Mutilation

Female Genital Mutilation (FGM) or female circumcision is a wide spread practice in northern Nigeria[36]. There are various reasons given for practicing FGM, varying from prolonging the period of virginity among the young ladies, curbing promiscuity, continuing generational customary practices, ensuring the men are viewed as superior, ignorance, the perception that a woman has some benefits during child birth, or as a source of income by the traditional circumcisers who campaign for continuity of the practice[36]. Female genital mutilation is done at various stages of a woman's life depending on the community's cultural practices (ranges from circumcision at birth, as an initiation to puberty, during pregnancy, during childbirth and some even at death)[36]. According to the WHO classification, there are four types of FGM practices:

"Type 1- Excision of the prepuce with or without excision of part or all of the clitoris.

Type 2- Excision of the prepuce and clitoris together with partial or total excision of the labia minora.

Type 3- Excision of part or all of the external genitalia and stitching/narrowing of the vaginal opening, also known as infibulation.

Type 4- Unclassified: includes pricking, piercing, or incision of the clitoris/labial cauterization by burning the clitoris and surrounding tissue, scrapping of tissues surrounding the vaginal wall, introduction of corrosive substances into the vagina with the aim of tightening or narrowing it"[36].

The most commonly practiced types of female circumcision in Northern Nigeria are type 1 and 4[37]. The women who have undergone FGM are highly likely to have complications during birth and labor such as excessive hemorrhage and obstructed labor that end up in increased maternal mortality numbers[36].

High prevalence of teenage pregnancy due to child/teenage marriages.

According to the oxford dictionary, a child is defined as a young human being below the age of puberty/legal age of majority, whereas a teenager is defined as any person between the ages of 13 and 19 years[38].

The population in the Northern part of Nigeria condones teenage/child marriage as a norm[39]. Early child bearing (between the ages of 15-19yrs) is highest in the Northern region (28.9%) in comparison to the Southern region (9.6%), urban areas 9.7% while rural areas stand at 31.8%[9]. Reasons behind child marriage are either poverty (family benefits from bride price and hence forces the young girl into marriage mostly to an older and financially stable man) or a matter of choice (girl child feels she will have a better life with the man and create an opportunity for elevation from poverty for the family members)[21]. Adolescent pregnancy complications (Vesico-vaginal fistulas -VVF,Recto-Vaginal Fistuals-RVF, obstructed/prolonged labor and uterine rupture) together with limited access and availability of EMOC increase the number of pregnancy related deaths[21]. Section 18 of the Marriage Act in Nigeria recognizes children to be persons under 21 years, however they condone marriage of the girls at 15 years and above with the consent of the parents[40].

Poverty

Poverty as defined by the World Bank is calculated factoring on how much money comes into a household and how much of it is consumed by the household[41]. A person or family is considered poor if they are living below a certain amount needed for basic necessities, also known as the poverty line[41]. Poverty line varies due to various reasons such as country, development levels, place, values and norms. Poverty has therefore been divided in to two categories: extreme poverty [living under less than US$ 1.25 per person per day (PPP)] and moderate poverty (living under US$ 2 PPP)[41].

Two thirds of the population of Nigeria lives in the rural areas, which are poverty stricken and have less infrastructure in healthcare in comparison to the urban areas and these are the areas with the higher MMR[42]. The population also tends to underuse the services even when they are available due to perceived poor quality of services rendered in the health facilities[30]. Presence of the militant Islamic group Boko Haram in the Northern region has been seen as a threat to the economy of the population in this part, since there is destruction of property and infrastructure, death and migration out of the area[43]. This already hinders business activities or investments in the area, be it foreign or local investment[27]. Studies show that the health financing is mostly dependent on the house hold /OOP[10].

Unsafe abortion and its complications

The definition of Unsafe abortion according to WHO is termination of pregnancy by people either lacking in the qualified medical skills to do so

or in a place that lacks the environment for safe termination of pregnancy which is minimal medical standards, or both[44]. Unsafe abortion has been seen to be on the rise in Nigeria, especially in the northern region[45]. The northern region has a higher TFR (6.1) than the Southern region (4.6)[9]. This has been linked to the poor uptake of family planning (unmet need) due to various reasons varying from religious and cultural beliefs to perception and acceptability of the family planning methods available to the population, not forgetting availability of the family planning devices and materials used[45]. FP use in the north was found to be 7.6% while in the south is was 31.6%, urban region fp use was 27% while rural regions was 9% [9]. In the year 2012, data estimates the number of induced unsafe abortions as 1.25million globally, with an unsafe abortion rate of 33 abortions per 1,000 women of reproductive age (15-49 yrs)[45]. This clearly indicates that unplanned or unintended pregnancy numbers were high[45]. More than half of the numbers of unplanned pregnancies ended up in unsafe abortions (56%)[45]. An estimated 212,000 women ended up in health facilities due to complications of unsafe abortion[45]. This placed the treatment rate at 5.6 women per 1,000 women of reproductive age (15-49 yrs) and a further 285,000 women who suffered severe health problems as a result of unsafe abortion but did not seek medical attention[45]. Of importance is that data showed that marital status, age, education, area of living (whether rural or urban) and economic status did not influence the cases of unsafe abortion and thus findings showed that all the above mentioned groups were affected[45]. With the law and culture in Nigeria clearly being against safe abortion, unplanned and unwanted pregnancies always end up in unsafe abortion and its complications which often leads to maternal death and/ or maternal injury, further increasing MMR[45].

Insecurity and lack of sufficient human resource in health

The Northern region is severely affected by the militant Islamic group - the Boko Haram, which is fighting to overthrow the government to form an Islamic state in West Africa under the extreme laws of Sharia[46].They use terror activities such as kidnapping and raping, bombing (including suicide bombers and gunmen), destruction of property such as police stations churches and health facilities, murder, forced marriages including child marriages among others[47]. Due to the unrest in the region, many sections of the population have been forced to move/migrate[33].High migration incidents, both internal (within the country) and external (to neighboring countries like Cameroon, Niger and Chad) increases the types of diseases that affect this region especially during outbreaks of infectious diseases such as diarrheal diseases, malaria (as a result of poor shelter) which consequently leads to either death or anemia and thus contributing to the poor health status of the population, especially the pregnant women[48]. The insecurity in the region also limits the number of human resource in the health sector willing to work there, with resistance for fear of compromised security[49].

High crime rate

With the increase in killing of men, children, kidnapping and rape of the women living in Northern Nigeria by the militant Islamic group – Boko Haram, many cases of unwanted pregnancies and increase in new STI/HIV infections are registered[50]. In most cases the pregnant rape victims wish to terminate pregnancy but this (induced safe abortion) is illegal in Nigeria[45]. As a result, many end up in the hands of unqualified individuals in places lacking medical standards or skills and procure induced unsafe abortion. This in fact is one of the major causes of high maternal deaths in Nigeria and most parts of the LMIC either due to infection, sepsis or severe hemorrhage[45].

Lack of policies and policy implementation in maternal health

Lack of clear policies on national review of maternal deaths and lack of proper implementation of the current policies in maternal health have been a contributing factor to the high MMR in Nigeria (as elaborated in **section 1.3**)[51]. The monitoring and evaluations (M&E) bodies and M&E strategies on implementation of important policies on maternal health and data collection regarding maternal health has remain wanting, particularly in the Northern part of Nigeria as a whole[36]. This reduces the impact of the maternal health policies put in place and inhibits evidence based evaluation of the interventions put in place for the reduction of MMR in Nigeria[35].

3.2 Factors influencing Delay I

Financial implications, poor previous experience in health facility, lower status of women, female education/poor understanding of risk factors

Financial implications and poor previous experiences

Owing to the fact that two thirds of the population of Nigeria lives in dire poverty **(**as seen in **section 3.1),** there is always a second thought when it comes to spending money[41]. The decision to seek medical help from a health facility is seen to have negative financial implications[41]. This affects the household budget as a whole[41]. It is further confounded by any previous bad experience by the person or a family member or friend having received inadequate health services at the facilities within reach or affordable to the people[35].

Influence of some religious practices

The main religion in the northern part of Nigeria is Islam[52]. The Islamic religion does not support the use of modern family planning (fp) methods, thus also contributing to the high fertility rate, poor uptake of fp services and consequently poor child spacing[53].

According to the Islamic religion, Purdah [alienating married women and young ladies (pubertal age) from interacting with men or strangers inside

and outside the homestead] is practiced[52]. This means that it also influences their health seeking behaviors[35]. They are expected to ask for permission before seeking medical assistance if not feeling well[35]. This has consequences on the importance of timely medical interventions when it comes to pregnancy complications and as the majority of the population in the Northern region essentially practices Islam, delays in making the decision to seek medical attention increases pregnancy related deaths[35].

Lack of Women empowerment and education

Level of education of the women in the reproductive age has shown a direct influence on safe motherhood in Nigeria[35]. Studies have shown that the more educated women in Nigeria tend to have high utilization of ANC services and health facility deliveries, unlike their lesser educated counterparts[35]. They also proved to be more knowledgeable regarding danger signs and where to get assistance if need be[35]. This not only increases chances of successful pregnancy but it also increases the chances of the infants' survival[35]. Educated women of reproductive age are able to read information disseminated on brochures, radio, pamphlets, newspapers and television[35]. This ensures they do not miss out on information disseminated for public health areas of concern such as importance of ANC during pregnancy and after delivery, compounded by emphasis on birth with a skilled birth attendant[35]. Educated pregnant women are also able to better communicate their own signs and symptoms[35]. The number of educated women is higher in the southern regions of Nigeria compared to the northern region, a fact clearly explained by the presence of most of the higher educational facilities in the Southern region[9].

Poor understanding of the risk factors and danger signs.

Several studies done in the Northern part of Nigeria show that most women who did not attend ANC or use a health facility/do not give birth with the assistance of a skilled birth attendant, do not know the benefits of attending ANC neither that of health facility delivery[54]. This also translated to lack of recognition of danger signs and lack of knowledge on how many ANC visits are required during a pregnancy on the minimum and the subsequent recommended follow up after delivery[54]. The few who attended ANC at an index pregnancy had a little bit more knowledge on danger signs and this seemed to increase by the number of ANC visits attended by the pregnant women/ young mothers[54]. Majority of women with middle to higher level of education had good knowledge on danger signs and importance of health facility delivery and delivery with the assistance of a skilled birth attendant[38]. This clearly depicted level of education as a factor influencing maternal mortality[54].

Some outdated cultural practices and beliefs.

Conservatism and traditional beliefs, superstition, different traditional practices and customs surrounding child birth, health and illnesses, together with a strong resistance to accept new ideas and ways of seeking

health care hinder uptake of maternal health services and favor traditional healers[40]. The culture in Northern Nigeria, demands that the male head of the house has to be the decision maker[40]. This includes the decision to seek medical attention for his family members and how much he is willing to spend for treatment[40]. In the event of an obstetric emergency in the household, whilst the man is away fending for the family, he has to be waited for, to make the decision on the way forward, which includes where to seek help and how much he is willing to spend[40]. This is not favorable for the impending pregnancy outcome as time is lost and the condition of the pregnant woman worsens[40].

Another cultural factor to be considered is the agricultural practices in the rural areas[40]. Most families engage in farming to minimize their monetary expenditure on food[40]. This includes preparing the land for farming, planting, weeding, harvesting, processing the food and eventually storing it[340]. This involves a lot of strenuous physical activity and it is mostly done by the women[40]. They are also the ones in-charge of taking care of the homes, children, sourcing for- and transporting firewood (as a source of fuel) to their respective homes[35]. This does not ogre well with pregnancy and can lead to complications especially when located in deeper parts of the rural suburbs and if anemia is part of the pregnancy due to malnourishment/ poor nutritional practices[40].

Nigeria also has a preference linked to male children[40]. Women who have no male child keep having children in a bid to get an "inheritor" for the man and perpetuate continuity of the man's family[40]. This is a reason for high parity even when the woman is of age and pregnancy is a risky prospect[40].

3.3 Factors influencing Delay II

Distance to health facility, availability and cost of transportation, poor roads and infrastructure, geography (mountains, rivers, rough terrains)

Unavailability and high transportation costs in geographically marginalized areas.

For the populations located in difficult to reach areas, such as crossing a river during floods and the rainy seasons, areas vastly affected by insecurity, areas with fewer means of transport and poor roads/ transport infrastructure, going to hospital during delivery becomes a challenge to the pregnant women in the Northh[55]. They (pregnant women) thus end up in the hands of Traditional birth attendants (TBAs) or an elderly female family member, who are not encompassed into the health system hence may be lacking in knowledge to recognize danger signs or ability to deal with obstetric complications[40]. Lack of adequate functioning ambulances in the region also plays a role in this stage of delay. Ambulances are too few to serve the vast population on Northern Nigeria[35]. The other reasons cited for lack of ambulance use even when they are present is that they are used by senior staff for personal errands and thus not available at the

time of need, have no fuel, they are ill-equipped, they have broken down and in need of repair or that there is lack of human resource due to under-staffing[35].

Longer distance to the health facilities

Due to the above road transport situation, prices of transportation automatically become high and are no longer affordable for the poor communities living in these marginalized regions[35]. Consequently the choice of home birth becomes the only favorable option of delivery, if lucky then it would be in the presence of a traditional birth attendant who may lack the necessary knowledge on danger signs in case of complications[35]. Northern Nigeria also has fewer numbers of health facilities thus skilled health staff available[22],[35]. Researchers also found that the users of health care facilities for the purposes of delivery were closer located to the health facility that those who had to use primitive means of transport covering longer distances to the health facilities[9]. The Northern population prefers home births to health facility births due to various cultural reasons[9]. Data shows that there were 25.6 percent health facility deliveries in the northern region whilst this was not the case in the southern region, recording 67.7 percent health facility deliveries[9]. In total the country had 36 percent of the births being assisted by skilled birth attendants[9].

Demographics and poor road infrastructure

Over time, there is unequal distribution of access to health services in Northern Nigeria[55]. Inequity and inequality in the healthcare system are not anything new. Rural areas seem to have poorer healthcare services in comparison to urban areas[55]. Looking at the demographics of the Northern part of Nigeria, together with the socio- cultural factors affecting the Northern part of Nigeria, several factors contribute to a high maternal mortality[55]. The unrest and internally displaced people has high influence on access of the health facilities in the Northern region[55]. Availability of transportation and the condition of the roads as discussed in **section 3.1** (under poverty) automatically cases a delay in reaching the health facilities on time thus aggravating the chances of the woman at risk dying[55]. With this in mind, the women will always opt for home deliveries, saving on the hustle of finding transport and the cost of transportation to the health facility[55].

3.4 Factors influencing Delay III

Blood, Human Resources, Guidelines/Policies, Referral-related factors, Patients' side factors and Equipment, Essential drugs availability.

Health facility infrastructure

Most of the Primary Healthcare (PHC) facilities in rural Nigeria lack in Emergency Obstetric care (EMOC) Services[56]. Numerous healthcare facilities have been targeted and destroyed by the militant Islamic group Boko Haram, further reducing the access and availability of quality health care in Northern Nigeria[57]. Evidently, as a result of this, low attendance of ANC and PNC is recorded, further lowering the number of both health facility deliveries and women who give birth with the assistance of a skilled birth attendant[35]. EMOC plays a crucial role in maternal mortality[35]. Health facilities with EMOC provision are divided into Basic EMOC and Complete EMOC service provision[58]. Basic EMOC services include parenteral antibiotics for control of sepsis, parenteral oxytocin drugs for uterine contraction, parenteral anti-convulsion drugs for pregnancy related hypertension (Eclampsia and Pre- eclampsia), manual removal of the placenta, assisted vaginal delivery and removal of retained products of conception (POCs)[25]. Complete EMOC includes the listed services in Basic EMOC plus Surgery [Caeserian Sections (C/S)] and blood transfusion during hemorrhage and acute anemia[25]. Access and availability of both basic and complete EMOC becomes a challenge in such a situation with destroyed health facilities and lacking human resources due to insecurity in the Northern region[59].

Shortage in Human resources/ Health care work force

There are three major key areas when it comes to human resource shortage[60]. Human resource shortage could be viewed under three sub-categories: unavailability of human resources, lack of competence of human resources available and lack of qualified human resources[35]. All the three factors mentioned above play a key role in insufficient work force in the health sector in Nigeria[61]. There are few medical training facilities in comparison to the medical needs of the huge Nigerian population and their distribution in the country is uneven[9]. Also, due to the poor pay and job dissatisfaction a lot of migration of medical staff seeking greener pastures occurs[61]. Brain drain of the trained health work force is therefore on the increase in comparison to those who stay behind and struggle to make ends meet from within Nigeria as years go by[61]. Sources also show that there is lack of facilitation of continuous medical training or education for medical staff (individually or institutionally) due to financial constraints, corruption and limited health care workers to substitute in times of absence during trainings or education[61]. This further leads to the current health care work force having out of date medical skills and knowledge[61].Shortage of Human resource in health in the Northern part of Nigeria can also be explained partially due to absenteeism of the medical personnel from their respective

duty stations[61]. This could be because of a number of reasons: lack of job satisfaction, insecurity threats due to effects and aftermaths of the presence of Boko Haram, lack of motivation due to poor pay, corruption, over-worked health personnel or insufficient skilled man power[61].

Lack of adequate number of blood banks/blood supply

Hemorrhage is amongst the leading causes of maternal death especially postpartum hemorrhage[62]. Absence of sufficient blood banks and blood in the blood banks is a contributing factor to increased maternal deaths in Northern Nigeria[63]. Trends in a study done in 2006, in University of Maiduguri Teaching Hospital in North–Eastern Nigeria, show a decline in blood donation in northern Nigeria (from 31% to 5%), whereas there is a significant increase in demand for blood transfusion by 11% and commercial blood donation is seen to be on the increase (from 20% to 63%)[63]. This is a clear indication of the inadequacy in terms of both blood banks and blood supple in this area[63]. In a study done in 2004-2005, in one of the tertiary hospitals in Ile-Ife in Nigeria, results showed that over 20% of the maternal deaths reported were due to delays in getting blood for transfusion[64]. A different study in one of the hospitals in Enugu State between years 1999 – 2003 also showed a high maternal mortality ratio of 772 maternal deaths/ 100,000 live births, also clearly indicating that type 3 delay accounted for the highest cause of maternal mortality- a whopping 46.4% of total maternal deaths[65]. There is scarcity of blood banks and blood supply in Northern Nigeria[63]. Evidence shows that in general, Nigerians have are not very willing when it comes to voluntary blood donation due to various reasons[63]. One of the reasons for the apathy in blood donation is the fear of HIV screening[63]. This is because many a times blood donation is intended for relatives or friends and this would involve HIV screening, whereas HIV is still a disease that is frowned upon and the victims' stigmatized[63]. Another reason (from the recipient side) is fear of blood borne diseases such as Hepatitis B and C, and more so HIV[63]. This is because most health facilities in Nigeria still use HIV tests that check on the antibody reaction, whilst this will not be able to detect HIV infection in the "window period"[63]. Blood donation has now become commercialized[63]. Whereas blood donation is supposed to be voluntary, poverty has led people to commercializing blood[63]. This is unfortunate as blood donation is usually required at desperate measures in relation to maternal mortality, hence having to outsource resources to get people to donate is not only time consuming but also is likely to cost us the lives of the mothers in need of blood transfusion[63].

Essential drugs availability

The policies in maternal health in Nigeria include magnesium sulphate and oxytocin as part of the essential drug list[66,68]. However many of the health facilities or health service points still lacked this in their stocks[66]. One of the major direct obstetric causes for maternal deaths is hemorrhage, but

most of the community workers and traditional birth attendants are not equipped with the essential drugs that reduce hemorrhage[68]. This in fact further complicates any interventions that could be placed to save a hemorrhaging pregnant woman or one who has just given birth and is suffering PPH[68].

Poor referral systems

Sources show that even after reaching the hospital on time, the turn-around time for service delivery was wanting, either due to shortage of qualified staff, absenteeism of the staff on call, negligence or even lack of knowledge in recognizing danger signs by the staff at hand[65]. By the time a patient in dire need of medical help is seen by the HCW, their chances of surviving have markedly reduced[65]. Lack of means from one health institution or homes to a referral health facility to facilitate the referral was also seen as a problem in Northern Nigeria[65]. Ambulances were either lacking, being used for personal use, lacking staff or necessary equipment inside them, or even lacking fuel[65].

Chapter 4: Discussion

4.1 Health system factors affecting MM in Northern Nigeria

Over time, evidence has shown that there is an inverse relationship between outcomes of delivery with skilled birth attendants and occurrence of pregnancy related deaths[66]. It is evident that difference in maternal deaths between area regions of Nigeria (North versus South), is highly likely due to access and availability of- or lack of adequate maternal health services, together with the fact that there are more home deliveries than health facility deliveries[47].Poverty has been seen as a factor influencing access to maternal health care in Nigeria, as a whole, as most health financing is out of pocket and is borne by the house-hold budget, meaning health care in financially inaccesible[35]. Poor uptake of family planning (due to religious factors and availability as a result of fewer health service points) and teenage pregnancies increase the lifetime risk of a woman dying in Northern Nigeria due to pregnancy related deaths. The fact that Misoprostol and Oxytocin drugs are included in the essential drugs list by the Sexual and reproductive health policies of Nigeria, it still does not translate to use of the same mentioned drugs for prevention and treatment of hemorrhage, be it antepartum (APH) or postpartum (PPH) mainly because the community health service points do not have access to them[67]. There is not only need for increased human resources for health, but also increased retention of the same Human resources and adequate preparation of health service point for obstetric emergencies in Northern Nigeria[51]. Unsafe abortion cases are still high and on the rise because it is still illegal in Nigeria to have an abortion[45]. MVA is still lacking in most health facilities, thus poor quality of post abortive care also leads to increasing pregnancy related deaths in the Northern region[45]. This is also as a result of poor uptake for family planning methods[45].

4.2 Socio- economic, cultural and environmental factors affecting MM in Northern Nigeria

Level of education of the women in reproductive age directly influences the outcomes of pregnancy[35]. Distance to a health service point and lack of transportation to the health service point hinders access to the recommended quality of care during pregnancy and birth[9]. Marginalized areas (places with poor road infrastructure) or areas facing a calamity such as floods and insecurity face challenges in lack of health services required, more so during emergencies[51]. This leads to poor quality of maternal health care[67]. Irregular supply of hospital amenities such as gloves and needles in health facilities reduces hygiene levels, thus increasing the rate of puerperal sepsis[67]. Inadequate number of blood banks together with poor attitude of the people of Nigeria in voluntary blood donation has vastly contributed to maternal mortality due to shortage of blood supply[63]. This is further compounded by the fact that blood donation has become commercialized and is no longer out of good will[63]. The insecurity in Northern Nigeria by the militant Islamic group Boko Haram has created a hostile environment not only for the population in Northern Nigeria but also for the health care workers (HCW) who are also under attack[48]. The same HCW are working with poor pay for the services rendered, lacking motivation and job satisfaction reducing the quality of care given to pregnant women and mothers, such as failure to screen the pregnant women during ANC[51]. Cultural and religious factors in the North such as decision making in the home during illness, health seeking behaviors and uptake of maternal health services need to be addressed[40].

Chapter 5: Conclusion

A couple of conclusions can be made in the case of Nigeria, with particular interest in Northern Nigeria in which MMR is highest in the country, compounded with the fact that it is currently vastly affected by insecurity and unrest[68]. This calls for introduction of region specific programs aimed at reduction of MMR[69]. Region specific programs, unlike general programs, cater for the specific needs and tackles the specific challenges in a certain area population which will have better results in MMR reduction, a good start being community based safe motherhood promotion in the utilization of obstetric health care[67].

Addressing the region specific challenges facing the different areas in the northern region will increase utilization of maternal health care services, further decreasing the high MMR and this also includes male involvement in maternal health, with emphasis and education/advocacy and promotion of FP utilization[70]. This is because apart from having a high MMR, Nigeria also has a high fertility rate more so in the North, TFR of 6.1, giving room to a high lifetime risk of maternal mortality[71].

Access to facility and community based maternal healthcare service delivery points should be increased, hopefully increasing utilization of maternal care facilities[72]. Traditional Birth Attendants (TBAs) have been seen to play a major role in the birth process, integration of the TBAs into the health system, assisting them with necessary training and equipment will also reduce MMR, them being in a position to perform a safe delivery in the home environment or be able to identify danger signs early enough and refer to an appropriate level facility for further EMOC[40],[73].

As has been seen in the literature analysis, hemorrhage, whether APH or PPH is one of the major causes of MMR in Nigeria among others[74]. Having continuous training in facility and community based management of obstetric emergencies, including the use of Misoprostol, a drug used for management of PPH, in ANC and PNC service delivery posts will reduce the incidence of MM due to hemorrhage[75]. Also, proper sepsis (infection) prevention and management should be emphasized as this is also one of the major causes of MMR[43]. Given the conditions in the Northern part of Nigeria, prevention and proper management of infection is a good method of reduction of MMR due to sepsis[43].

Unsafe abortion is still and will continue to be a menace in the society of Nigeria and sub-Saharan Africa[76]. As long as abortion is illegal, women with unplanned or unwanted pregnancies will end up attempting induced unsafe abortion, hence a key starting point would be advocacy for legalization of safe abortion[77]. Availability of Manual Vacuum Aspiration (MVA) services in the primary health care level is crucial as a means of post abortive care as this will reduce cases of PPH as a result of post abortive (induced unsafe abortion) hemorrhage[55].

Improving data collection on prevalence and incidence of maternal morbidity is also a good way to assess progress with current and future policy implementation[78]. Maternal morbidity is caused by medical conditions such as uterine rupture, maternal depression, anemia, fistulas,

genital and uterine prolapse and scarring of the uterus or genitals[55]. Creating a link between mortality and morbidity outcomes further catapults the assessment of combating high MMR in Nigeria and the progress it is making with each intervention placed[55].

Chapter 6: Recommendations

6.1 Current intervention strategies in Nigeria

Nigeria adopted the Safe Motherhood Initiative (SMI) in Nairobi (Kenya) when it was launched worldwide in 1987 during a conference[20]. The SMI had the following strategies to reduce maternal mortality:

- "Poverty reduction and women empowerment and education.
- Income generating activities for women.
- Provision of family planning services and quality post abortive care, with revision of laws on safe abortion, while promoting women's rights.
- Advocacy discouraging child marriage/teenage pregnancies and harmful practices that lead to complications during pregnancy and birth.
- Provision of ANC, including screening, prevention and treatment of sexually transmitted infections (STIs).
- Provision of global access to skilled birth attendants and quality EMOC.
- Improving the quality of health infrastructure and number of Human resources.
- Managing the delivery fee costs through government subsidies and health insurance or universal health coverage (UHC)[54]."

In 2009, the introduction of Midwives Service Scheme (MSS) was done and involved the 36 Nigerian states and the three tiers of the Government. "The main purpose was to mobilize midwives (newly qualified, unemployed and retired) to selected PHC facilities in the rural regions, with the aim of achieving increased SBA coverage as a means directed to MMR reduction. By July 10th, 2010 about 2,622 midwives had been recruited and posted to PHC facilities in rural region. This program improved midwives' training and increased quality of maternal health care. It however faced challenges mainly being availability and retention of the midwives. More governmental support will be necessary for it to be a success"[79].

There was also introduction of the Subsidy, reinvestment and empowerment program (SURE-P): Maternal and Child health initiative in 2012 where the Government was promoting the use of skilled midwives in PHC for normal births (for the year 2013 -2016) by:

- "Improving the provision of quality maternal health care service (training and placement of midwives, community health extension workers and village health workers)
- Improving maternal health service use ($30 will be transferred to pregnant women who either get registered at a PHC, go for ANC, deliver at a heath facility or when they take the baby for their initial inoculation)
- Measuring the impact of introduced financial incentives

This program is still running to date but with challenges in retention of the midwives"[80].

6.2 Why interventions succeeded in the Southern region of Nigeria

The current maternal health programs in Nigeria have been seen to have markedly reduced maternal mortality in the southern region unlike in the North. The main factors to consider in Northern Nigeria is their socio-cultural, religious and environmental uniqueness in comparison to the rest of the southern region. The southern region indices are way better than the northern region and inequality in health care is evident between the two regions (as seen in **Chapter 3**). Some parts are doing far worse than others on different indicators, for example home births are highest in North west region (88%), family planning use is highest in the North central region (16%) and so on, yet these are still very poor indicators. The government on Nigeria should gear towards excellent leadership and administrative legislation to ensure that programs are monitored and edited as per the requirements of the mentioned marginalized areas. Focusing on eliminating corruption, poverty reduction and re-investment in the infrastructural side, together with active involvement on the advocacy of female education, birth with SBAs and ANC attendance in conjunction with educated women and religious and community leaders may go a long way in reducing MMR in Northern region. This could further be used as the channel to promote increased family planning use and girl-child education. Taking care of the Boko haram situation and bringing political stability in the North will also be key in retention of the midwives and HCW.

6.3 WHO strategies towards ending preventable maternal mortality (EPMM)

This was introduced in 2015b based on the following focus areas:

1. "Concerning maternal deaths (prevention and control)
2. Concerning maternal mortality (prevention and control)
3. Pertaining obstetric labor complications (prevention and control)
4. Maternal health services (improve standards and quality)
5. Health service has to be accessible
6. Universal coverage

The guiding principles mainly are based on focusing on country leadership and ownership, integration of maternal and newborn health services, applying human rights framework against violation, increase quality of sexual reproductive health and ensuring that health care is acceptable and accessible to all who need it"[81].

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Annex 1

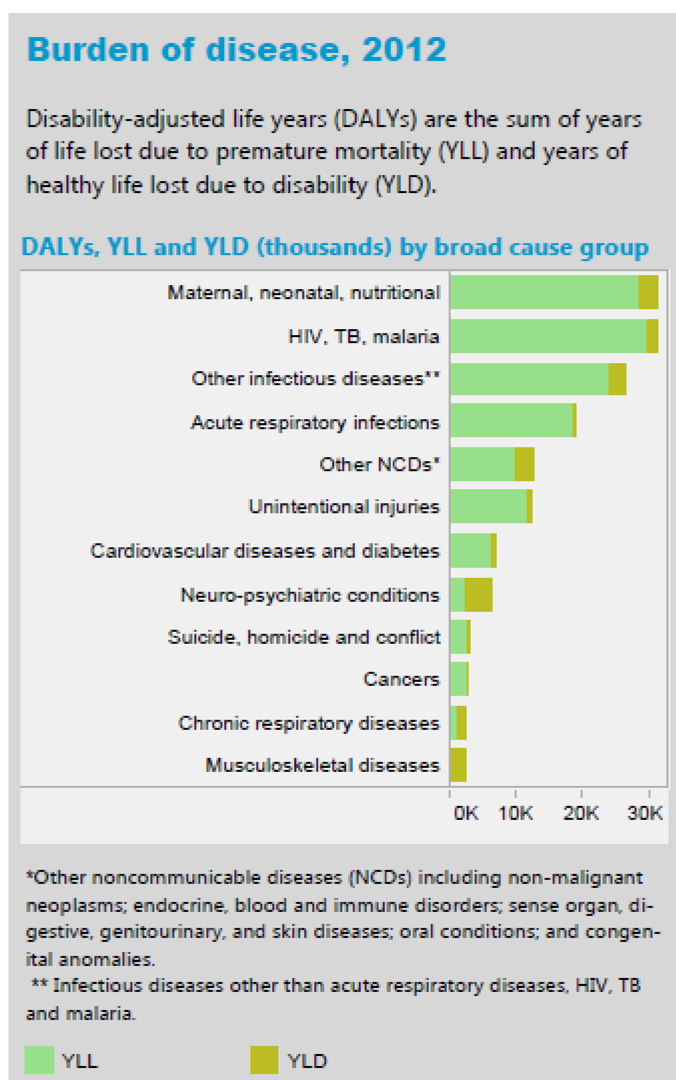

Figure 1: http://www.who.int/gho/countries/nga.pdf?ua=1

Annex 2

Figure 4.

map of nigeria showing the six geopolitical zones - Google zoeken [Internet]. Google.nl. 2016 [cited 17 August 2016].