

# **FACTORS INFLUENCING INCREASE OF MATERNAL MORTALITY IN LIBERIA: A LITERATURE REVIEW**

**Vera D. Weah**

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55<sup>th</sup> Master of Science in Public Health/International Course in Health  
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LITERATURE REVIEW

A thesis submitted in partial fulfilment of the requirement for the degree of  
Master of Science in Public Health

by

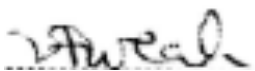
Vera D. Weah

Liberia

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Signature: 

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## Abbreviations

ANC	Antenatal care
BEmONC	Basic Emergency Obstetric Newborn Care
BEmOC	Basic Emergency Obstetric Care
BPHS	Basic Package of Health Services
BSN	Bachelor of Science Degree in Nursing
CEmONC	Comprehensive Emergency Obstetric Newborn Care
CHAs	Community Health Assistants
CMs	Certified Midwives
EmOC	Emergency Obstetric Care
EPHS	Essentia Package of Health Services
EPI	Expanded Program on Immunization
EVD	Ebola Virus Disease
GBV	Gender-Based Violence
GDP	Gross Domestic Product
GFATM	Global Fund for AIDS, TB and Malaria
HIV	Human Immunodeficiency Virus
HMS-BSB	Helping Mothers Survive – Breeding after Birth
IHME	Institute for Health Metrics and Evaluation
LDHS	Liberia Demographic Health Surveys
MDGs	Millennium Development Goals
MIS	Malaria Indicator survey
MOH	Ministry of Health
NHPD	National health Promotion Division
NPHIL	National Public Health Institute of Liberia
OBmC	Obstetric Emergency Care
Pas	Physician Assistants
PNC	Post-Natal Care
PPH	Post-partum Hemorrhage
RMNCAH	Reproductive Maternal New-born, child and Adolescent Health
SARA	Service availability readiness assessment
SDGs	Sustainable Development Goals
SES	Socio-economic status
SRMNCAH	National Sexual, Reproductive, Maternal, New-born, Child and Adolescent Health
TTMs	Trained Traditional Midwives
UNFPA	United Nations Population Fund
UNICEF	United Nations International Children's Emergency Fund
USAID	United States Agency for International Development
WHO	World Health Organization

## **Abstract**

### **Introduction**

Liberia is among the countries with the highest maternal mortality rate in the world. The main medical cause of deaths is due mostly to post-partum hemorrhage which constitute 25% of all deaths. We explored and analyzed the contributing factors of maternal mortality in Liberia. We also recommend evidenced-based solutions to the government in addressing maternal deaths and improving women's health in the country.

### **Methodology**

A literature review was conducted using main data bases and desk review of key documents. The documents include national policies, plans from Ministry of health website and reports of demographic and health surveys and Malaria indicator survey 2016 from Liberia.

### **Results**

From our review, 75% of maternal deaths occur in the health facilities, 56% of them occurring without receiving any care by skilled birth attendant. Emergency obstetric care is not available in 35% of health facility due to unavailability of skilled staffs, drugs and supplies. Due to poor referral system, 60% of referrals from peripheral to referral health facilities are done through commercial and private transports.

### **Discussion**

The poor quality of care in both urban and rural areas, including the shortage of drugs and supplies in the health facilities and limited skilled staff are the main factors contributing to maternal deaths in Liberia. We recommend the government to conduct regular trainings and supportive supervisions on drugs and supplies stock management in all the health facilities. Also, define clear retention strategies which may include supportive supervisions, provision of equipment, monetary incentives, better accommodation and career path.

**Key words:** factors, maternal mortality, obstetric care, three delays, Liberia

**Word Count:** 11011



## **Introduction**

According to World Health Organization (WHO), maternal death is “death of a woman while pregnant or within 42 days of termination of pregnancy, irrespective of the duration and site of the pregnancy, from any cause related to or aggravated by the pregnancy or its management but not from accidental or incidental causes” (1). The main medical cause of maternal mortality worldwide is obstetric hemorrhage with most of them occurring in the health facilities (2).

Globally, maternal death has decreased by 44% from 385 deaths per 100,000 live births in 1990 to 216 deaths per 100,000 live births in 2015, with the annual drop rate of 2.3% (3). The reduction was due to the global efforts to achieve the Millennium Development Goals (MDGs) (4). However, about 830 women still dying worldwide every day from preventable causes associated with pregnancy and childbirth complications (5). Additionally, 99% of these deaths occurred in developing countries with more than 50% of them occurring in Sub-Saharan Africa (6).

Maternal mortality remains a major health challenge in Liberia at 1072 deaths per 100,000 live births (7), far from the sustainable development 2030 goal of 70 deaths per 100,000 live births (8). Liberia being committed to international agreements, has developed different strategies to reduce maternal mortalities. The strategies include, a strategic roadmap, every woman every child strategy, and compulsory reporting of maternal deaths by health workers (9). This strategic roadmap- Reproductive, Maternal, Newborn, child and Adolescent Health (RMNCAH) 2011-2021, ensures the delivery of obstetric emergency care at the appropriate level of care and strengthening of community-based interventions (10). Being a professional nurse with a Bachelor of Science (BSN) degree in nursing, I have worked as a clinical practitioner and a public health nurse in health promotion over the period of ten years in rural-Liberia. Currently, I work as coordinator for advocacy and community engagement, national health promotion division (NHPD), central-Liberia. Based on the experiences gathered over the years and being a team player in the fight against maternal mortality, I am eager to contribute by exploring influencing factors of maternal deaths in Liberia. Also, to recommend to policy makers evidences -based findings that could be considered during policy revision. Additionally, these findings will aid the NHPD in developing evidence -informed strategies that will be used for the implementation of maternal health promotional activities in the country.

**Chapter One: Background information of Liberia**

This chapter presents background information about Liberia including geography, demography, education, economic context, political background, ethnicity and cultural background, and health System.

**1.1 Geography**

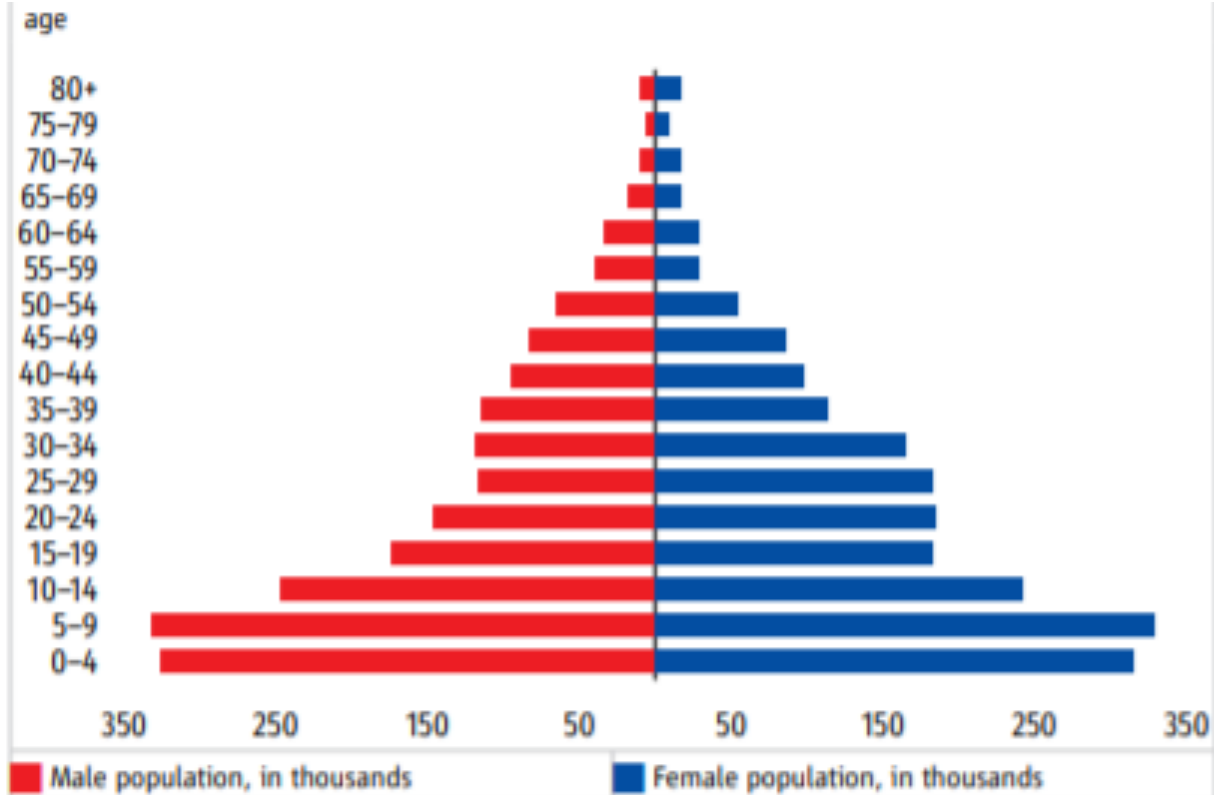
Liberia is located on the west coast of sub-Sahara Africa. It borders Sierra Leone to the northwest, Guinea to the northeast, Ivory Coast to the east and the north Atlantic Ocean to the southwest. The country comprises the total of 111,370 Km<sup>2</sup> of surface area and 22,000 Km<sup>2</sup> of territorial waters (11). Liberia is subdivided in five regions and 15 counties (12). The southeastern counties and Gbarpolu are considered hard to reach counties due to difficult terrains, presence of forests, rivers, swamps and sparse population (13). The capital of Liberia, Monrovia city is located in the Montserrado county (Fig 1).



**Fig 1:** Map of Liberia showing its the location in Africa the borders with other countries and counties and the subdivisions of the country (12,14)

**1.2 Demography**

According to the 2008 census, Liberia had a population of 3.5 million (13), with a growth rate of 2.7 % per year, making the estimated population of 4.8 million in 2018(15). Of the total population, 48.9 % are males and 50.1% are females. The average size per household is about 4.3 people (16). The population density is 31 people per Km<sup>2</sup>and the rural population constitutes 51% (17). The country has a young population with 49.1% below 18 years (16). Women of reproductive age 15-49 years constitute 50% of the female population (18). The country has a crude birth rate of 40.5% and death rate of 12%. The total fertility rate is 4 children per woman and the life expectancy for both sexes is 62 years (19).



**Fig 2:** Liberia population pyramid (11).

### **1.3 Education**

The government of Liberia is making progress to improve education by providing compulsory free education for its citizens up to secondary level (20). Nationally, 47% of the population are accessing education through government institutions compared to private non-religious and religious entities at 29.3% and 22.2% respectively. This has led to an increase in primary levels enrollment at 87% and net enrollment at 48% in 2015/2016(11). Despite this progress, about 65% of the Liberian population are literate (16) and 31% of women 15-49 years having no education (12). Moreover, residential disparity in education is observed between urban and rural settings with 78% urban residence being literate compared to 46.3% in rural residence (16).

### **1.4 Economic Context**

Liberia is a low-income country and is highly dependent on foreign assistance. It has one of the lowest Gross Domestic Product (GDP) at 352.30 USD which is equivalent to 3% of the world's average (21). Nationally, Liberia is making some progress in reducing poverty from 63.6% in 2007 to 54.1% in 2014(11). Hence, the 2016 national household and income survey classified 50.9% of the population as poor, of which 71.6% live in the rural areas (16). The principal sources of income are iron ore, forest, rubber, diamonds and gold (15). Liberia is among the countries that have met the Abuja target of 15% contribution to the health sector (18). However, donor support and out of pocket expenditure account for most of the health expenditures at 30 and 47% respectively (22). Moreover, due to the large inflows of external budget support and high dependency on humanitarian aid, Liberia is placed among the world's most aid- dependent countries (11).

### **1.5 Political Background**

Liberia was affected by two civil wars from 1989 to 1996 and from 1997 to 2003. The war affected negatively the economy, education and health services in the country. Governed by a democratic leadership, Liberia has conducted from October to December 2017 the third presidential election after the civil war (11).

### **1.6 Ethnicity and cultural background**

The official language in Liberia is English, although 17 indigenous languages from the same number of tribes are also spoken in the country (13). According to the Malaria Indicator Survey (MIS 2016), 88% of Liberians are Christians and 10% are Muslims (12). Polygamy is

legal in Liberia and 13% of the women are currently married to men in polygamous relationships (7). The country has strong cultural beliefs on the need for women to have many children so that they will be cared for by their children in their old age (10). As part of the local custom in Liberia, female genital cutting is practiced and is estimated at 49.8 % among women 15-49 years (23).

### **1.7 Health System**

Besides the civil war that ended in 2003, the Liberian health system was devastated by an Ebola virus disease (EVD) outbreak from 2014 to 2016. A total of 28,616 cases including 11,310 deaths were reported in Liberia, Guinea and Sierra Leone, with many of victims being health care workers (24). Since the end of the outbreak, Liberia continues to struggle to deliver basic health services for its citizens (25). Health services in the country are delivered at tertiary, secondary and primary levels (26). According to the Institute for Health Metrics and Evaluation (IHME) 2017 report, the top four leading causes of deaths in Liberia are diarrhea, malaria, neonatal disorders, and lower respiratory tract infections (27). The country also suffers from high maternal and neonatal mortalities and stunting in children under 5 estimated at 32% (11). The inaccessibility to healthcare for 29% of the population and limited health work force remain major challenges across the country (8). Based on the current status of health workforce in Liberia, the ratio is 11.8 health workers per 10,000 people, far from the WHO thresholds of 23 health workers per 10,000 population (28). In the country, health services are delivered through public and private sectors independently and this has resulted to unregulated and inadequate services delivery across the private sectors (25). Service delivery in the private sector is done through contracted non for -profit NGO including religious institutions and for-profit private institutions (25). Liberia has 773 health facilities including both public and private which are distributed across the country with 40% of them concentrated in the capital Monrovia. Among the health facilities located in Monrovia, 83% are classified as private. The majority of the health facilities in Liberia are classified as clinics, representing 88% (667/773) of the health facilities. Besides the clinics, the country also has 38 hospitals, representing 5% of the health facilities, 55 health centers (7% of the health facilities), and three health posts (<1% of the health facilities) (29). Although the health services in private health facilities have different prices, the government health facilities and majority of the health facilities supported by NGOs in Liberia provide services, including obstetric care, free of charge (26).

Liberia has a National Health and Social Welfare Policy 2011-2021. It ensures the delivery of efficient and equitable health and social welfare services for the population through a multi-sectorial approach (26). The policy is implemented considering key guiding principles which are; health is a universal human right, equity, accountability, quality, efficiency and sustainability (26). Health services in Liberia are delivered using the basic package of health services (BPHS) and the essential package of health services (EPHS). The two approaches serve as foundation of improving the wellbeing of the people (25,30,31). According to the 2016 health sector scan report, Liberia has made progress in the extension of pooled funds systems and have strengthened their partnership with donors in financing. Additional progresses observed according to WHO, are the increased in functional health facilities by 27% between 2009 and 2016. Also, a decrease in the proportion of population who take more than one hour to reach a facility from 41% in 2008 to 29% in 2015(32). Yet, inadequate capacity and weak health system has resulted to inefficient use of resources (25).

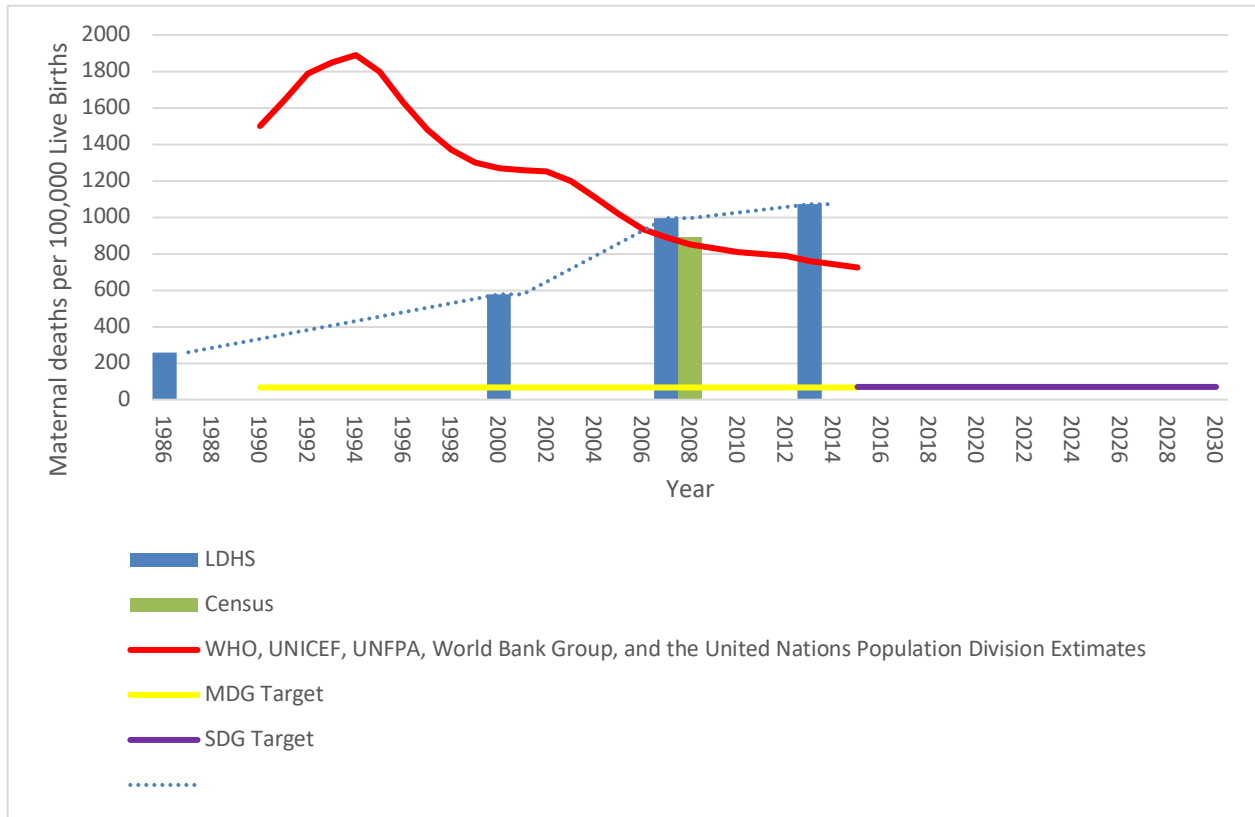
In Liberia, maternal health services are planned, coordinated, implemented, and monitored through the family health division (FHD) within the ministry of health. The FHD has a governance structure in place at counties and districts level. The FHD has an oversight responsibility to coordinate maternal health services delivery with other internal departments within the ministry of health. Also, they spearhead and collaborate with other agencies, institutions, organizations that are involved in the delivery of sexual reproductive health, maternal, newborn, and adolescent health services (10).

## **Chapter Two: Problem statement, objectives & Methods**

This chapter aims to explain problems affecting maternal health in Liberia and presents the problem statement, justification, study objectives, methods and conceptual framework.

### **2.0 Problem statement and Justification**

Liberia is among the countries with the highest maternal mortality rate in the world (6,32). The main medical cause of deaths is due to mostly post-partum hemorrhage which constitute 25% of all deaths. Other causes include sepsis, unsafe abortion, hypertension and. Other non- medical factors are increased teenage pregnancy, shortage of midwives mostly in rural health facilities and poor health seeking behavior as a result of long distance (10). However, despite these existing challenges, a drop in the trend of maternal mortality has been observed from 1500/100,000 live births in 1990(33,34) to 1072 per 100,000 live birth in 2013(7) and to 725 deaths per 100,00 live births in 2015(3,33,34). However, the current estimate of 725 deaths per 100,000 live births is still far from 70 deaths per 100,000 live births, which is the Sustainable Development Goal (SDG) 3 target (35–37). Nevertheless, the exact actual figures remain unclear and contradictory. The WHO, United Nations International Children's Emergency Fund (UNICEF), United Nations Population Fund (UNFPA), World Bank Group and United Nations Population Division estimates show a progressive decrease in trends since 1994, while the different Liberia Demographic Health Surveys (LDHS) show an increase in trends (Fig 3). The United Nations estimates were based on fertility rate, birth attendants and Human Immunodeficiency Virus (HIV) prevalence, using a regression model (33). Therefore, the data is less reliable comparing to the LDHS and Census data.



**Fig 3:** Trends of maternal mortality in Liberia from 1986 to 2015 according to different surveys and estimates (3,7,26,33).

This downward trend can be attributed to efforts to achieve the MDGs, including training of midwives and provision of basic supplies to the health facilities (38). In addition, the figures from 2015 may be underestimated due to Ebola Virus Disease (EVD), as a result of the major reporting gaps that occurred during this period (39). This is supported by other studies considering up to 28% increase in maternal deaths after EVD outbreak comparing to 2013 figures (40). Nevertheless, current studies suggest that the change in women’s social economic and educational status, and improvements in the health system has contributed to the reduction of maternal deaths in Liberia. Some improvements observed are adequate ANC care, increased facility deliveries, increased awareness on maternal health, building of maternal waiting homes and increased referrals (41–43). Despite the progresses, data suggest that the country is still having challenges that need attention, considering that the MDG was far from being achieved and more efforts will be required to achieve the SDG 3.



## **2.1 Objectives**

### **2.1.1 General Objectives**

To explore and analyze factors contributing to maternal mortality amidst the many successes in Liberia, and to recommend evidenced-based solutions to government in addressing maternal deaths and improving women's health in the country.

### **2.1.2 Specific objectives**

- To explore key factors contributing to maternal deaths in Liberia.
- To identify and describe strength and weaknesses of existing interventions in place and used by the Liberian government in addressing maternal mortality.
- To explore best practices in addressing maternal mortality in other limited resource setting within the west Africa region, that could be adopted and use as an example for Liberia
- To use findings and recommend to Ministry of Health evidence-based solutions that will aide them in addressing maternal deaths in Liberia.

## **2. 2 Methods**

### **2.2.1 Literature Review**

A literature review was conducted using PubMed and Google scholar as the main databases. Other sources were Google search engine, WHO and Ministry of Health websites. The combination of words linked with the objectives, each determinant as in the framework and Liberia or West Africa. Maternal mortality AND factors AND Liberia OR Africa, maternal mortality AND culture AND Liberia OR Africa, maternal mortality AND quality care AND Liberia OR Africa are some examples of key word used. Some synonyms like maternal deaths or maternal health were also used. We included only articles written in English because of the researcher limitation in other languages. Also, included articles with years ranging from 2006 and 2019 to analyze factors associated with maternal death based on the trend of maternal death during that period.

### **2.2.2 Desk review of key documents**

We also conducted desk review of national policies, plans obtained from Ministry of health website and reports of demographic and health surveys and Malaria indicator survey (MIS) 2016 from Liberia obtained from the DHSs website. Also, some reports were provided from ministry of health directly through email since they were not published on the websites.

They include the service availability and readiness assessment (SARA)2018 report and the MOH annual 2016 report. The following list of documents were perused to identify planned and key interventions implemented in the country: The Investment Plan for Building a Resilient Health System (2015– 2021), Essential Package of Health Services (EPHS), National Human Resource Strategy, National Fistula Guidelines, National Adolescent Reproductive Health Strategy, Reproductive Health Commodity Security Strategy, Maternal and New-born Death Surveillance and Response Guideline July 2015, National Health and Social Welfare Financing Policy and Plan (2011–2021), National Sexual, Reproductive, Maternal, New-born, Child and Adolescent Health (SRMNCAH) 2015(10).

### **2.3 Conceptual framework**

To fully analyze factors influencing maternal deaths in Liberia, a number of frameworks were reviewed. During the revision, We came across the three delays framework adapted by Sabine Gabrysch 2009, the maternal mortality framework by McCarty and Maine 1992 and the Three delays framework by Thaddeus and Maine” framework (Fig. 4) which was selected considering it is related to the topic and it analyzes factors affecting the use of delivery care and maternal mortality (44).

This framework was used to analyze the research findings highlighting each determinant and linking it with the objectives. The three delays framework has emergency obstetric care in the health facilities, including institutional deliveries and post-partum care as key factors that can contribute to maternal mortality. Therefore, the same approach is used in our analysis.

It was read from left to right following the arrows. The left side of the framework shows factors affecting maternal health services utilization and maternal health outcome. The arrow demonstrates how the different factors contributes to each of the delay phases and the right side shows different levels of delay phases that leads to maternal deaths.

According to the framework, the decision to seek care which is the first delay, can be influenced by socio-economic and cultural factor. The second delay is delay in reaching the health facilities. It can be influenced by accessibility to health facilities. The third delay is the delay in receiving care and can be influenced by quality of care deliver at the facility (44). The three delays were discussed in phases starting from top to bottom.

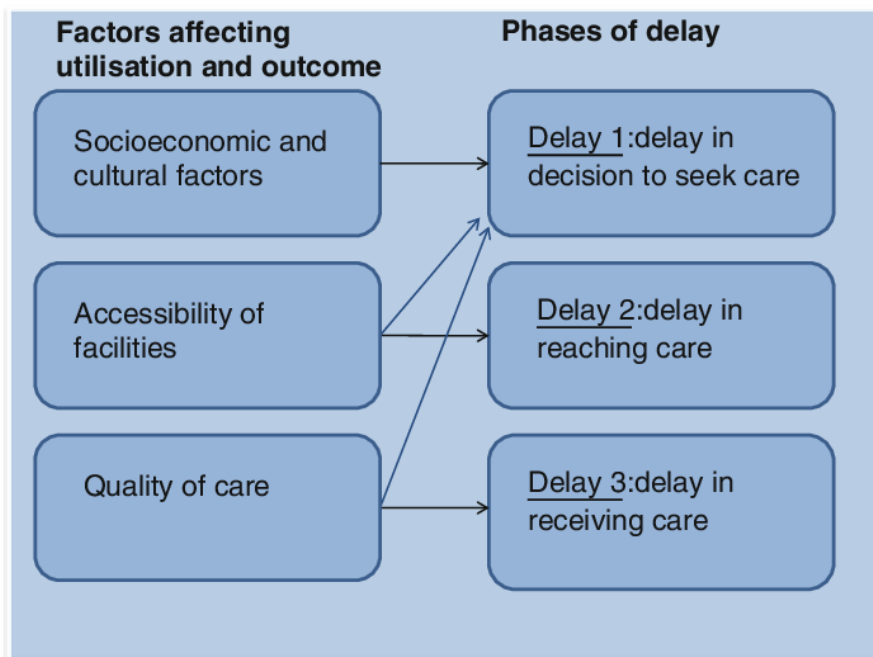
The first delay- Delay in deciding to seek care looks at factors involved in decision making from the individual and family perspectives. Those factors include actors influencing decision making from the cultural point of view. The characteristics of the women, including

knowledge of health condition, distance from health facility, socioeconomic status and previous experience on quality of care are also discussed in the first delay.

Socio-economic status (SES) by definition refers to the social position of an individual and family within the society (45). Our literature review identified sub-factors under socio-economic and cultural factors. They include education/occupation and income/ wealth with other factors such as age, and parity being predictors. Discussing these components of SES provides reasonable explanation on how SES influences health outcomes (45).

The second delay- Delay in reaching the health facility entails the expansion of access to quality obstetric emergency services. It looks at geographical accessibility including the distribution of health facilities, travel time from home to facility, type and availability of transportation means and transportation cost as sub-factors, according to our review.

The third delay- Delay in receiving care at the facility looks at appropriate care provision for client on arrival at the facility. Our review identified obstetric emergency service delivery package availability, functional referral system, availability of drugs supplies and equipment, availability of trained and competent health personnel and responsiveness during health care delivery as sub-factors were discussed under third delay.



**Fig 4:** The three delays conceptual framework with factors influencing maternal mortality (44).

## **2.4 Study Limitations**

Most recent articles after 2016 are not representative to the entire country, focusing on small geographical areas. Thus, we consider the diversities of Liberia, especially culture, demography, health services and population when extrapolating the results to the entire country. Although one articles about the attitude of health workers in Liberia was found, the magnitude and the health facilities reporting the problem was not possible to identify, since it was a qualitative study (46). Studies about the direct influence of age, parity, economic factors, education, limited decision-making power among women, geographical location and transportation, on maternal deaths in Liberia were not found. Indirect assumptions were made following the framework, associating the factors with seeking emergencies obstetric care, especially institutional deliveries. Moreover, studies demonstrating impacts of projects like maternal waiting homes, provision of incentives to the mothers delivering in the health facilities and other community projects in Liberia were not available. In the quantitative study on availability of health services in Liberia, although with a good power in terms of population, it had small sample size of health facilities involved. Therefore, probable type II error in the conclusions related to health facilities are expected (47). The published surveys reports do not have the data disaggregated by county, making it difficult to identify issues in lower administrative divisions.

## **Chapter Three: Results**

This chapter present findings from literature review using the conceptual framework on contributing factors of maternal deaths in Liberia (objective 1).

### **3.0 Contributing Factors of maternal deaths in Liberia**

#### **3.1 Socio-economic and Cultural factors**

##### **3.1.1 Economic factors**

According to the conceptual framework, the socio-economic and cultural factors influence the decision to seek care during pregnancy. In 2016, the Lancet report on maternal health identified countries with high burden of maternal morbidity and mortality to be those experiencing financial constraints, having issues with gender and discriminations, affected by humanitarian crisis and living in a fragile state (48). Many studies have suggested that socioeconomic factors have a negative influence on women's decision to seek care, thereby contributing to maternal deaths (49–51). According to the report from an ecological study on correlation between socioeconomic status and maternal deaths conducted in 2017 on 82 countries, disparity of maternal deaths existed between different income groups, financial expenditure for health and unemployment levels (49). While other studies identified age, parity, marital status and residence as other important socioeconomic factors contributing to maternal deaths (51,52).

The civil war had a negative impact on Liberia's economy. According to the most recent data from MIS 2016, 42% of Liberians are in below the middle economic class, being 23.5% poorest and 18.7% poorer (12). A current study on maternal health care utilization which analyzed national cross-sectional surveys in Liberia between 2007 and 2016, identified a strong link between wealth index and ANC visits. It suggested that, pregnant women from rich backgrounds were 3.04 times more likely to attend ANC visit compared to from poor backgrounds (41). Also, a study conducted in Nigeria shows a significant relationship between wealth and ANC attendance at 92.0% for rich and 38.3% for poor women (53). Similar findings are seen in a number of studies showing wealth disparity and its effect on maternal health services utilization among pregnant women (54–56). A maternal deaths review in Liberia conducted in 2017 demonstrated that 48% of maternal deaths were reported among either unemployed or women practicing subsistence farming (46). However, is still unclear how many pregnancies occur among those group of people. Therefore, direct link between occupation and maternal mortality still also unclear.

No additional studies showing direct link between economic factors and maternal mortality in Liberia were found in our literature review. However, a study conducted in rural South Africa shows that the risk of maternal mortality is higher among women of poor socio-economic status (57).

### **3.1.2 Education**

A multi-country cross sectional survey on education and maternal outcome was conducted in 2014 on 29 countries from Africa, Latin America, Asia and the middle East. Findings from this study suggest that, women with low education status experienced severe maternal outcomes two times more often and are six times more likely to die compared to women with higher educational status (58). These findings are similar to current studies conducted in eastern Ethiopia reporting 83.7% illiteracy rate of mothers who died due to maternal causes (59). The more educated women are aware of the danger signs and are less likely to accept non-scientific explanations of their health status, like for instance, traditional explanations (11,60). The Liberia MIS 2016 shows that 35.5% of the women have no education and 27.5% have up to primary education (20). A secondary analysis of Liberia MIS 2016 dataset shows a significant decrease in institutional deliveries and antenatal care among the less educated women compared to the women with secondary school or higher (41). The maternal deaths review conducted by national public health institute of Liberia (NPHIL) in 2017 show that 29% of maternal deaths occurred among women with no formal education (46). However, the exact number of pregnancies among illiterate women was unclear, making impossible to establish any direct link between the deaths and education level. The economic class is interrelated to the level of education of people. The higher economic class people have more opportunities for education and the higher educated people have more opportunities to improve the economic status. Therefore, the high percentage of Liberians living below the middle economic level is contributing to the higher percentage of people with less than primary school of education. People with poor socio-economic status are less likely to use the maternal health care services in Liberia according the studies described in the previous section (see section 3.1.1 Economic factors).

### **3.1.3 Age**

In 2018, WHO reported that adolescent girls below 15 years are more at risk of maternal complications and deaths compared to older women (5). Opposing findings reported in Liberia from a recent study conducted in 2017 show that 40% of deaths reported occurs among women age 25-34 years old compared to 7.4% deaths among women below 18

years and 25% among women above 35 years (46). However, an analysis on maternal deaths age pattern conducted in 38 countries including Liberia shows that the affected age of maternal deaths varies across different settings (61). Hence, age does not seem to have a direct link with maternal deaths. However, other factors like parity, education, residence and wealth may be possible confounders (42,60,61). We did not find enough literature to determine the association between age and maternal mortality in Liberia. However, two studies conducted in Nigeria show a higher incidence of first and second delays among young women. Nevertheless, the socio-economic status was a confounder since the young mothers were at the same time from lower socio-economic class. The same studies demonstrated that the mothers from lower socio-economic status were less likely to seek care during the labor (62).

#### **3.1.4 Parity**

The Lancet Global Health on maternal mortality by age 2014 reported that, women with high parity and nulliparous have increased risk of adverse maternal outcome (63). Also, studies have shown that, reduction in fertility and number of children among reproductive age mothers reduces the risk of maternal deaths (64). However, studies have shown that parity alone does not have an independent effect on maternal death but its link with age. According to their findings, older and younger women with first pregnancy and high parity have higher risk of maternal mortality (5,64). In Liberia, 50% of the deaths occurs among women who have had 1-4 children, 22.1% among women with 5-10 children, 13.6% among women with no children, and 3.5% among women with 11 or more children (46). However, the total number of pregnancies among each age group was unclear from the study.

#### **3.1.5 Cultural factors**

Cultural practices, taboos, religious beliefs and use of traditional medical care have a significant impact on maternal health outcomes in Africa, especially in rural areas (65). In Liberia, tradition depicts that men and mothers-in-law are responsible to make decisions on behalf of women in case of obstetric emergency. This lack of decision-making power results in delays and contributes to maternal deaths (66). The MIS 2016 shows that 66.2% of the heads of households in Liberia are male (20). Therefore, 66.2% of females may have limited decision-making power for seeking obstetric care. There was no study about direct link between maternal mortality and cultural factors in Liberia identified in our review. However, a study demonstrates that, in Liberia the women living in a female-headed household had significantly higher usage of ANC and institutional deliveries compared with those with

males as heads of households (41). Moreover, the 2017 maternal deaths reviews in Liberia show that 35% of maternal deaths occurred among women either married or living together (46). A secondary analysis of Liberia DHS 2007 shows that married women and women who suffered from gender-based violence were less likely to use the health services comparing to women with decision-making power (67). A cross-sectional study conducted in 2009 in rural north-central region, Liberia shows that 16.9% of women who delivered at home was due to family traditions and religions (68). Although the traditional religions may lead to traditional beliefs, it accounts for less than 0.4% of followers in Liberia (20).

The above findings suggest that, education, economic factors and limited decision-making power among women may be contributing more to maternal deaths compared to the age, parity and religion in Liberia. The economic factors, education and limited decision-making power among women are influencing negatively the maternal health services utilization in Liberia. However, additional studies are required to determine the direct link between the factors and maternal mortality. The direct link was found in other similar African countries (57,62). It was unclear the influence of age and parity. Most of the deaths in Liberia do not occur in the extreme ages, in nulliparas, and grand multiparas as suggested by WHO to be the high-risk groups.

## **3.2 Access to health facilities**

### **3.2.1 Geographical location**

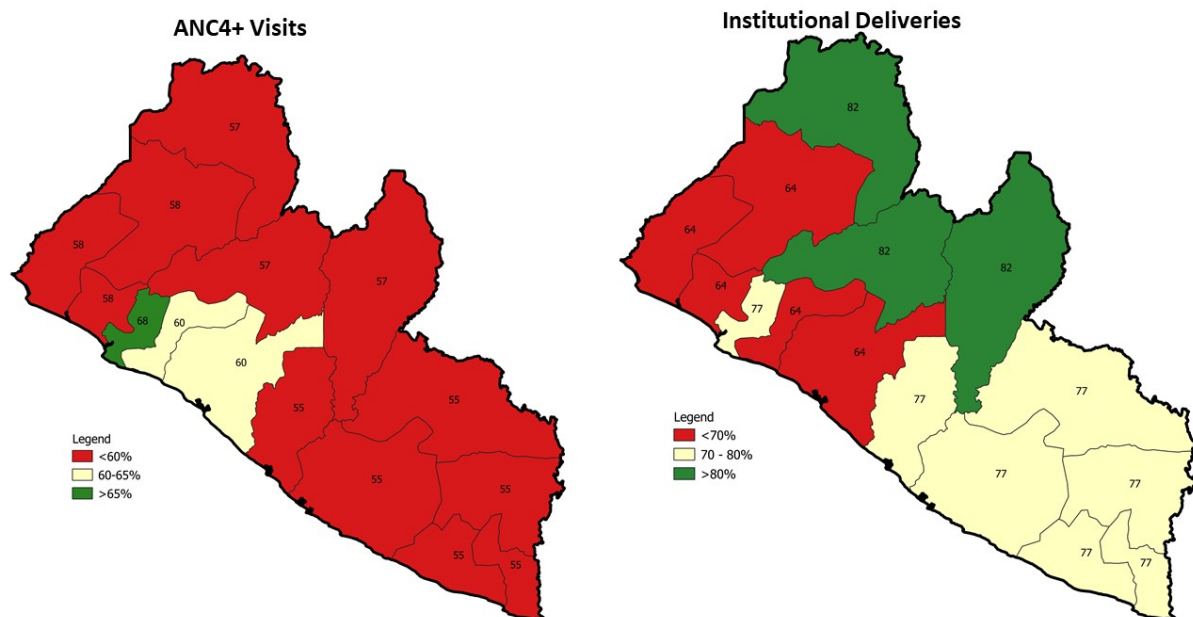
According to the WHO 2018 global report on maternal mortality, women living in rural and poorer communities mostly experience more deaths from obstetric complications compare to women living in urban and rich communities (5).

In Liberia, 47.7% of the people live in rural areas, 28% of them in hard to reach areas. The percentage of people living in hard-to-reach areas accounts for 13% of the total population in the country including both rural and urban areas (13). A study conducted in rural Nimba county in Liberia shows an average distance to health facilities of 7.2Km. The people usually walk about 136 minutes to reach the health facilities. The same study shows that 32% of the people in Nimba county had no access to health care facilities (47). Another study conducted in Liberia confirmed that the fewer ANC visits and institutional deliveries are also associated with residences being far away from health facilities (69). The MIS 2016 data shows that Liberian women living in rural areas also use 46% less ANC services and have 55% fewer institutional deliveries compared to women living in urban areas (41). A cross-



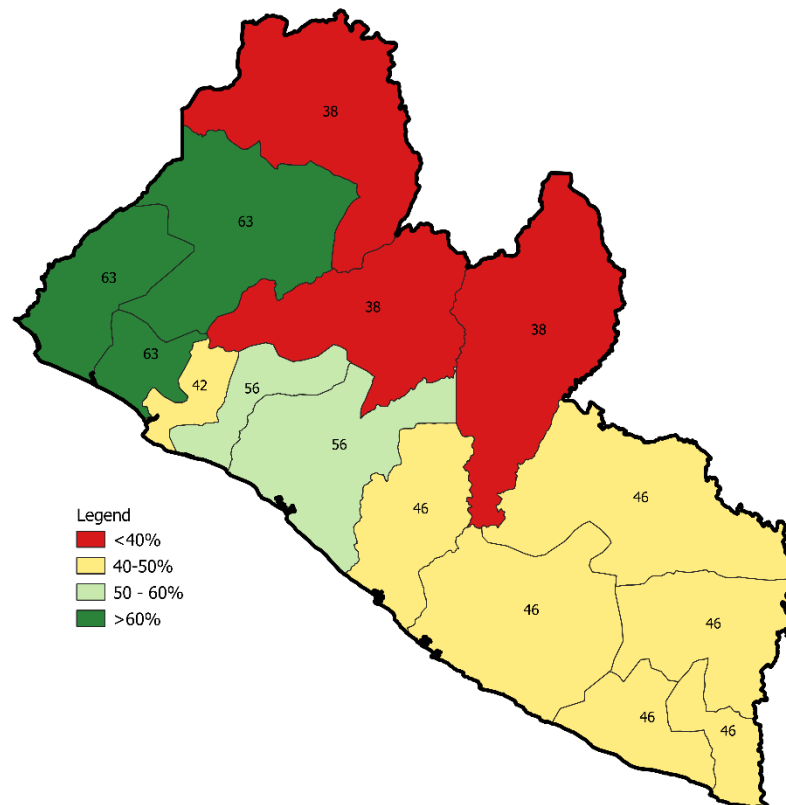
sectional study conducted in rural north-central region in Liberia shows that 31% of women delivered at home due to shorter time from onset of labor to deliver, associated to long distance to health facilities (68).

The socio-economic situation of the country makes the people migrate from rural to urban areas looking for job opportunities. Monrovia, the capital of Liberia is actually overcrowded with 21% of the entire Liberia population and a density of 1,500 people per square mile. Considering that 83% of the health facilities in Monrovia are private for profit, the free public referral hospitals are usually crowded since most of the population cannot afford to seek care in private health facilities. Together with Monrovia, the urban areas of Nimba, Bong, Lofa, Grand Bassa and Margibi counties make above 75% of the population of Liberia (13). This makes the 38 referral hospitals in the country overcrowded, with implications to quality of services, including obstetric care. This leads to low institutional deliveries and poor post-natal care coverage in Monrovia despite the accessibility demonstrated by high ANC visits (12). The opposite is observed in hard-to-reach counties where, despite the low ANC visits, institutional deliveries and post-natal care are equal or higher than urban Montserrado county including the capital Monrovia (Fig 5 and 6) (12).



**Fig 5:** Antenatal care and Institutional deliveries by region in Liberia (12). The Montserrado county (in green on the left map), the urban county where the capital Monrovia is located has the highest ANC4+ visits in Liberia. However, the map on the right shows that

institutional deliveries in Montserrado is equal or lower than majority of the counties, including all the hard-to-reach southeastern counties.



**Fig 6:** Post-natal care and Institutional deliveries by region in Liberia (12). The pos-natal care is also lower in Montserrado county, including Monrovia than the hard-to-reach southeastern and Gbarpolu county.

### 3.2.2 Transportation Means and cost

A mix-method analysis conducted in all 15 counties in Liberia reported that to access health facilities, 32% of the respondents indicated using commercial transportation, 9% walked and 9% used motorbike as a means of transport (46). A study conducted in a remote area in Liberia shows that 70% of women usually walk more than two hours to the nearest health facility for obstetric care, while the motorbike fee paid is around \$7.87USD (70). The cost is high considering that 42% of Liberians being classified as poor or poorest people (12). A cross sectional community-based study conducted in North-central Liberia also identified transportation cost as one of the main barriers for seeking care. As mentioned in the study,

31.5% of the women reported delivering at home because of the cost of transportation (68). A qualitative study conducted in 11 of the 15 counties in Liberia shows that poor transportation system to the health facilities was one of the reasons for home deliveries (46). Moreover, Liberia is characterized by very bad conditions of majority of the roads, affecting access to the health facilities (71). A maternal deaths reviews conducted in 2017 in Liberia show that 12% of the deaths occurred on the way to the health facilities, although not clear the distance taken from the house to the place of death (46).

The findings suggest that, both geographical location and transportation influence the high maternal mortality in Liberia. The two factors influence negatively the use of antenatal care and institutional deliveries. However, no studies were found in our review linking directly the maternal mortality with the geographical location and transportation in Liberia, although the link is suggested by the WHO global report 2018.

### **3.3 Quality of Care at Health Facility**

According to WHO, there are two key medical functions being recommended in managing obstetric emergencies. Comprehensive emergency obstetric neonatal care (CEmOC) is implemented at hospital and health center level while the emergency obstetric care (BEmOC) is recommended for clinic level. BEmOC include administration of antibiotics, uterotonic drugs, anticonvulsants for pre- eclampsia and eclampsia, manual removal of placenta, removal of retained products, assisted delivery and neonatal resuscitation. CEmOC include all the BEmOC functions plus the performance of surgery (c-section) and transfusion of blood (72).

According to SARA report, Caesarean section is currently being done in 89% of the hospital and 12 % percent health centers. Blood transfusion is done in 89% of the hospital and 18% of the health centers (73).

The maternal deaths reviews conducted in 2017 show that about 75% of the maternal deaths occurred in the health facilities. However, the same reviews demonstrated that 56% of the women who died did received any care by skilled birth attendant and 29% of the deaths occurred in less than 24 hours after deliver (46).

#### **3.3.1. Availability of drugs and supplies**

A cross-sectional study conducted in sub-Saharan Africa show that hemorrhage, hypertension, sepsis and obstructed labor are the leading causes of maternal deaths (74). Thus, availability of drugs, supplies and equipment to early diagnose and treat these

conditions can prevent the majority of the maternal deaths. Postpartum hemorrhage (PPH) remains one of the leading causes of maternal deaths also in Liberia (75). WHO recommends uterotonic drugs such as oxytocin and misoprostol to be used in managing PPH (76). Current report shows that, the health sector in Liberia is experiencing shortages of these essential drugs in health facilities. The report shows that in 2018, 78% of the health facilities had no misoprostol available, while 41% had no magnesium sulphate and 9% had no oxytocin available (73).

Currently in Liberia, 90% of the health facilities are offering ANC service of which 62% are not fully capacitated to deliver ANC services due to lack of diagnostic tools, guidelines and limited trained staffs among other (28).

### **3.3.1 Availability of skilled health workers**

Besides the drugs, supplies and equipment, the availability of health workers with skills to prevent and manage obstetric complications is also crucial to prevent maternal deaths. The 2010 national human resource census, reported 411 certified midwives (CMS) of the total 8476 health workers recorded in the country, which shows shortages of CMs compared to other cadres of nurses 1387 and physician assistants (PAs) 1583 (77). However, the increase in the number of midwives has been observed over the years from 411 in 2010 to 659 in 2015. Hence, current report shows that, only 15% of the health facilities had at least a staff member trained in ANC care over the past two years (28). The ratio of midwife/population in Liberia is actually one/23,000 people, below the WHO standard of one/5,000 people (10). A qualitative study conducted in 11 counties in Liberia demonstrated that staff inadequately trained and overwhelmed reduces the quality of care provided to peripartum mothers. In addition, staff attrition, staff absent and difficulties in reaching them when requested to attend obstetric emergencies were also reported in the same study (46). In Liberia, the prereferral health facilities, including maternities, are not operational 24/7, especially in rural and remote areas (78). A few studies conducted in Liberia have identified neglect of patients and poor workers attitude as a barrier to seeking care in the health facility (26,46). Health workers treating the peripartum mothers and family members without courtesy, with negligence, sometimes with verbal and physical abuse was reported in a qualitative study conducted in 11 counties in Liberia. In the same study, the health workers justified the attitude as a frustration due to lack of working conditions (46).

### **3.3.3 Referral System**

A good referral system is crucial for transportation of emergencies from peripheral to referral hospitals, most especially in rural areas. However, a study conducted in Monrovia shows deficient referral mechanism within the city and in county overall. The study shows that only 3% of the patients were successfully referred from clinics to the hospitals through the system due to deficient communication, protocols and documentation available. More than 60% of the patients had to use commercial or private transportation from clinics to referral health facilities (79). Similar findings were described in a study conducted in southeast of Liberia, considering rural and hard to reach area. The study shows that 47% of the health facilities had no access to ambulance for referral (80). Additionally, the 2018 Service availability readiness assessment (SARA) reported that 11% of the 773 health facilities had functional ambulance/vehicle for emergency services. This reflect that, 2.4 ambulance/vehicle is being used to serve 100,000 population (73). A cross-sectional study conducted in 11 out of the 15 counties in Liberia show that ambulance was used for referral of obstetric emergencies in 46.2% of the cases, while the 55.8% used either private or commercial transportation or went walking to the referral hospital (46).

Our findings suggest that the unavailability of essential drugs and supplies, skilled staff and poor referral system are the main contributing factors to the high maternal deaths in Liberia. This highlights the deficiencies of Liberian health system to deliver obstetric emergency care at the facility level. Among these three factors, one of the studies show a direct link between poor quality of care and maternal deaths in Liberia (46). However, the exact number of maternal deaths due to individual contribution of lack of skilled staff, poor referral system and lack of essential drugs and supplies remain unclear from our review. Therefore, additional studies are required to determine the direct link between these factors and maternal mortality in Liberia in order to prioritize the interventions. Similar findings were observed in other African countries with high maternal mortality. For instance, Nigeria also reported inadequate skilled staff, equipment and supplies, and poor referral system as some of the contributing factors for high maternal mortality (81). Insufficient skilled staff and poor quality of care were also reported in Zimbabwe (82). A study conducted in Nigeria show that 40% of the maternal deaths occurred due to third delay, and the poor attitude of the health workers was one of the reasons of the delay (83,84). The challenges of stock out of essential drugs and diagnostic materials in most of the facilities in Liberia affects the diagnostic capacity to detect for obstetric complications (73).

## **Chapter Four: Strengths and weaknesses of existing maternal health interventions in Liberia**

This chapter presents information on Liberia maternal health existing policies, strategies and interventions including their strengths and weaknesses.

Liberia has developed policies to ensure that maternal health is prioritized. They include the National Fistula Guidelines, National Adolescent Reproductive Health Strategy, Reproductive Health Commodity Security Strategy, Maternal and New-born Death Surveillance and Response Guideline July 2015, and National Sexual, Reproductive, Maternal, New-born, Child and Adolescent Health (SRMNCAH) Policy, July 2015(10).

In addition, the National Reproductive Maternal New-born, child and Adolescent Health (RMNCAH) investment case was developed to be implemented from 2016-2020 and serves as the national strategic roadmap to improve maternal health. As a response to the SDGs, it aims to ensure deliverance of quality RMNCAH services across the country (10). The ministry of health is implementing the roadmap in collaboration with key maternal health partners. They include united states agency for international development (USAID), World Bank and the global fund for AIDS, TB and Malaria (GFTAM) (10). USAID is providing financial support through the ministry of health for community health assistant (CHAs) incentives, performance-based financing approach and training of midwives and lab technicians in six out of 15 counties in Liberia. Global found, is providing support for human resources, drugs and supplies, health information management, logistic, blood safety, equipment for the reference lab and light renovations to hospital and clinic in the country (10). An analysis of factors contributing to maternal mortality reduction in developing countries demonstrated that interventions in the health sector contributes in 50%, while other sectors contribute to the other 50%. The contribution to the health sector came from areas like wealth, environment, especially improvement on water and sanitation, improvement in infrastructure including electricity and road conditions density, education and gender equality (85).

### **4.1 Main maternal health interventions in Liberia**

In keeping with WHO recommendations, the current RMNCAH strategic roadmap 2016-2021, prioritizes key areas such as Antenatal Care services, Labor and Delivery and community-based activities in order to improve maternal health in Liberia (10).

#### **4.1.1 Antenatal care (ANC)**

With regards to antenatal care services, key activities include ensuring the availability of at least two train health professionals in each facility for ANC care, procurement and distribution of drugs and medical supplies. Also, strengthening of facilities and community relationships through Community Health Assistants (CHAs) and Trained Traditional midwives (TTM) network meetings were prioritized. In addition, the country planned to empower pregnant women in hard to reach areas through voucher system and provide in-kind gift/cash incentives to TTMs to create demand for ANC services (10).

**Strengths:** Antenatal care provides an opportunity for early detection of pregnancy related complications among women and girls at risk and facilitates appropriate management (86). Thus, contributes to the reduction of maternal morbidity and mortality (87). In addition, WHO recommends that, provision of ANC care should be used to create a platform for other health care action such as health promotion, disease prevention and screening and diagnosis (86).

**Weaknesses:** Due to the lack of accommodation facilities, transportation, limited career opportunities and low salaries makes it difficult for the country to retain the midwives trained to provide ANC care in the rural facilities (88).

The coverage of ANC four or more visits in Liberia is already 80% (12), therefore, not being among the most important contributing factors for high maternal mortality in the country. However, the quality of services provided during ANC visits considering the limited number of staffs trained available in rural facilities, needs to be look at. Other African countries like Nigeria also demonstrated that ANC visits was not a contributing factor for high maternal mortality (84). There was no also link between ANC visits and institutional deliveries in a study conducted also in Nigeria (62). In addition, a systematic review with meta-analysis on maternal mortality in African countries show that increasing ANC does not itself necessarily lead to increase in institutional deliveries (89).

#### **4.1.2 Provision of emergency obstetric care**

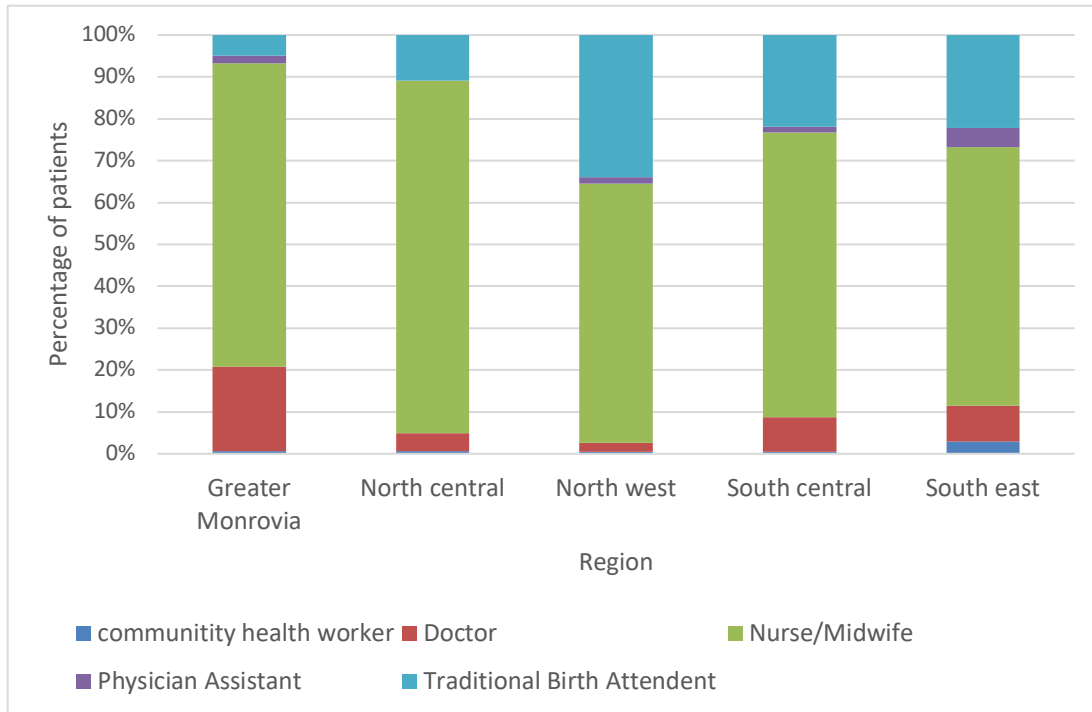
The proposed plan captures upgrading health facilities to deliver basic and comprehensive emergency care services to facilitates access to quality services among pregnant women. The current adjusted standard for emergency obstetric care in Liberia is, 200,000 population to five BEmONC and one CEmONC facilities due to the size of the population and their distribution. This is different from WHO standard of 500,000 population to five BEmONC and one CEmONC facility (10). Key interventions captured in the roadmap are Provision of

adequate EmONC supplies and equipment, deployment of skilled health professionals, introduction of performance-based financing as motivation and retention strategy, prevention of post-partum hemorrhage (PPH) through routine distribution of misoprostol at community level and ensuring adequate storage and management of oxytocin through integration with the expanded program on immunization (EPI) (10). Also, other activities include upgrading of midwifery institutions in rural part of the to enhance the quality of maternal care (35), improving clinical practices for pre-service education (90) training midwives in health facilities on EmONC services and (91,92) and task shifting of midwives to perform advanced obstetric procedures (93).

**Strengths:** Availability of emergency obstetric care enables the health facilities to have capacity to respond to obstetric emergencies and therefore prevent maternal deaths (94). For Liberia, the availability of medicines, supplies and equipment in the health facilities are the main factor influencing the utilization, with less influence of respectful treatment provided (95). In addition, providing resources and improving the health conditions of the staff may likely reduce the frustration and improve the treatment provided to the patients (46).

**Weaknesses:** According to the joint annual health report 2016, of the 602 health facilities in the country that year, 65% were in readiness to provide basic obstetric care. Out of 48 hospitals and health centers, 57% had one tracer commodities to provide comprehensive emergency obstetric care (96). While all the referral hospitals provide basic emergency obstetric care (EmOC) in Liberia, the peripheral health facilities have limited access to the services. A study conducted in Nimba county in Liberia show that 67% of health centers and none of the peripheral clinics provided EmONC. This is despite 67% of the rural population having peripheral clinics as the most accessible health care facilities (47). Although in Monrovia 20% of the patients are seen by a doctor after delivering, in all the other regions more than 60% of the post-natal care is provided exclusively by nurses and midwives. Moreover, in hard-to-reach areas, the percentage of post-natal care provided exclusively by traditional birth attendants increases, being more than 20% in north west, south central and south east regions (Fig 7) (12). One of main challenges contributing to low EmONC services are shortages of essential drugs in 55% of the health facilities (96), medical equipment and late detection of pregnancy complications (10). However, the exact number of deaths occurred due to inadequate obstetric care in Liberia still unclear.





**Fig 7:** Qualification of the staff providing post-natal care by Region in Liberia (12).

#### 4.1.3 Community based activity

In order to improve maternal health outcomes, the RMNCAH captures three key interventions that are implemented by CHA and trained traditional midwives (TTMs) at community level for population living beyond 5-kilometer radius. They include home-based visits, referral of pregnant women for facility delivery, and post-delivery follow-up visits. Key activities delivered during these visits include health education and promotion on nutrition, importance of ANC, identification of dangers signs in pregnancy, birth preparedness and referral package, delivery and postnatal care (10). The government is implementing the CHA program in selected counties, with support from donors (97). In Liberia, the policy prohibits TTMs to conduct normal vaginal delivery at the community level. From 2012 to 2015, the program was piloted in Liberia and the CHAs provided free services to the population. The CHAs also collaborated with the TTMs for referral of pregnant women to the maternal waiting homes. The program also paid the TTMs monetary compensation for each pregnant woman referred to the health facility for deliver (10).

**Strengths:** The preliminary impacts of the project showed a significant increase in institutional deliveries comparing to communities without the project.

**Weaknesses:** There was no significant impact of the intervention in ANC and post-natal care (98). There is no referral mechanism in place at community level making it difficult for pregnant women to be referred to the nearest facility (97).

In addition, there was no study conducted to determine the direct impact of the CHA project on maternal mortality.

#### **4.1.3.1 Incentives for traditional midwives for patient referral**

In order to increase the institutional deliveries, the government of Liberia and partners provided non-monetary incentives (Lapa, rice, T-shirts and other goods) for TTMs who refer patients to the health facilities for delivery. However, from 2014, the funds and support from partners decreased, compromising the initiative. It led to a decrease in Institutional deliveries, making some counties to restart the initiative with support from local authorities (46). The counties started giving cash to TTMs per referred women. Since it was an initiative from the local government, financial constraints lead to a failure of the approach. The contribution by the patients to pay the TTMs was introduced and has being successfully piloted (46).

**Strengths:** More patients can be referred to the health facilities by the TTMs receiving incentives. This might also help to reduced homes deliveries conducted by TTMs considering that they are still being compensated when they referred the women.

**Weaknesses:** Providing monetary or non-monetary incentive to the community health workers may not be sustainable. Instead, awareness to communities about the importance of institutional deliveries with the involvement of traditional midwives may be a most sustainable approach. The community may contribute by providing non -cash support for TTMs for the community work provided, including referrals (46).

#### **4.1.3.2 Maternal waiting homes**

Several studies documented the implementation of temporary houses for pregnant women who lives far away from the health facilities to shorten their distance during labor. The houses are referred to as maternal waiting homes which are usually attached to a health facility.

**Strengths:** A satisfaction among the pregnant women attending maternal waiting homes was reported in Bong County in Liberia (99).

The institutional deliveries were significantly higher and maternal deaths significantly lower in communities implementing the strategy comparing to the communities without the strategy (42,100). Maternal waiting homes strategies is also successfully being implemented

in other African countries with significant improvement in their maternal health indicators (101,102).

The intervention demonstrated to be a cost-effective approach, especially in longer term, although the set-up costs may be higher (103,104).

**Weaknesses:** The strategy is being implemented only in six out of 15 counties due to partner interest in selected counties with no mechanisms in place for the maintenance of these homes (105).

#### **4.1.4 Other initiative by partners**

##### **4.1.4.1 Breeding after birth program**

In 2016, Liberia started the helping mothers survive – breeding after birth (HMS-BSB) program in the main hospital of the country, the John F. Kennedy hospital in Monrovia. The program consists of practical training for midwives and other staff providing obstetric care, using simulators related to obstetric complications. Although 92% of the midwives have been trained and with improved the skills, the impact of the program in maternal deaths has not been yet studied (106).

**Strengths:** Increases the skills of the staff using practical approaches.

**Weaknesses:** Only one health facility in the country is implementing the program which the impact still unknown.

##### **4.1.4.2 Other interventions**

Other interventions currently ongoing in the country include the distribution of ambulances in three counties and training of midwives to promote health seeking behaviors among pregnant women and strengthen prompt referral (105).

**Strengths:** Provided immediate resource for transportation of obstetric emergencies from peripheral to referral health facilities.

**Weaknesses:** The presence of very bad conditions of majority of the roads, affects the referral of patients from peripheral to referral health facilities (71). This challenge suggests that only providing ambulances to the remote health facilities to support referral may not be enough if quality of care still poor. Instead, equipping the health facilities, providing drugs, supplies and skilled staff may have better benefits in a short time and should be prioritized. In addition, majority of these activities are implemented in targeted parts of the country according to availability of funds and partners to support (107).

#### **4.1.5 Health education through local media**

The health education through local media, especially radio station in rural areas has been proven to have positive impact on maternal health in Liberia. People living in rural areas usually have less access to information, education and financial resources (84).

**Strengths:** A secondary analysis of demographic and health surveys demonstrated that the women who listen to radio or watch television in Liberia have higher chances to deliver in the health facilities compared to the ones who do not listen to radio or do not watch TV (41).

**Weaknesses:** In Liberia, only 13% of women listen to radio at least once per week compared to men 60% higher (7).

#### **4.1.6 Distribution of incentives for mothers delivering in the health facilities**

With support from United Nations Population Fund (UNFPA), the government of Liberia is distributing non-monetary incentives from pregnant women delivering in the health facilities. The incentives are called mama and baby kits and are provided as a motivational factor for women to attend ANC and deliver in the facility. The kit is comprised of assorted items including baby hat, diaper, receiving blanket, Vaseline and other products (108).

**Strength:** This activity was one of the contributing factors leading to the increase in health facility delivery in the country (9).

**Weaknesses:** The provision of mama and baby kits may not be sustainable due to stockout of the Kits in facilities and constant discontinuations due to lack of support. In addition, the kits are only provided in six counties. There is no documented study about the impact of the intervention on maternal mortality in Liberia yet (108).

### **4.2 Best Practices from Other Countries**

#### **4.2.1 Distribution of misoprostol to communities**

Although Liberia is planning to implement the strategy, several other countries are successfully reducing the incidence of post-partum hemorrhage (PPH) by distributing misoprostol to the communities (109,110). Concerns on the misuse of misoprostol were raised before the implementation of the approach, in Ghana 98.3% of the misoprostol distributed to midwives were successfully tracked. In addition, 81% of the receivers returned the drug to midwives since they did not develop complications requiring its use

and the one who developed complication used the drug correctly (109). The use of misoprostol reduced the incidence of PPH also in India, and the tablets distributed were successfully tracked after a strong community engagement (110).

#### **4.2.2 Providing incentives to mothers delivering in health facilities**

While some countries are providing monetary incentives, other countries are providing non-monetary incentives to mothers delivering at health facilities. The main objective is to encourage the mothers with low socio-economic status to delivery in the health facilities. Uganda piloted the provision of non-monetary incentives, especially post-partum kits for mothers (mama kits) and babies (baby kits). Although the program led to an increase in institutional deliveries, the indicators decreased dramatically when the kits were not available (111).

India also implemented the same approach but are providing cash incentives to the mothers delivering in public health facilities as compensation for transport and feeding. The institutional deliveries increased significantly after the implementation of the approach. Unlike in Ghana, the program in India is more consistent since the funds are provided exclusively by central government and with decentralized management (112).

#### **4.2.3 Public-private partnership (PPP) in India**

Several developing, including African countries reported affordability as one of the barriers for seeking obstetric care, especially among the poor and rural populations (113).

The government of India is giving the private health facilities US \$45 for every delivery, including management of obstetric complications. The selected health facilities have usually good reputations, with skilled staff, equipment and supplies. According to the agreement, the private facilities must provide totally free obstetric care services to the poor populations. Within two years of the PPP approach implementation, more than 260 000 women in need have been assisted by more 800 experienced obstetricians. A dramatic increase in institutional deliveries was observed during this time (114).

#### **4.2.4 Implementation of motorbike-ambulances in Sierra Leone**

In order to strengthen referral of obstetric and other emergencies from community to primary health care level in Sierra Leone, motorbike ambulance system was introduced and piloted Kambia district, Sierraleone. With support from partners, the government of Sierra Leon distributed motorbike ambulances at primary clinic level in Kambia district (44). These

ambulances were easily accessible to remote areas and suitable for bad road conditions. The community acceptance of the services is documented to be high. Although the overall impact of the ambulances on maternal mortality has not yet been studied, a current study shows that it has been more effective in transporting cases of obstetric emergency from communities to health facilities. However, cost of fuel and maintenance are some of the challenges observed during the pilot (44).

#### **4.2.5 Midwives retention strategies in other African countries**

Different retention strategies of midwives in rural areas are being implemented in Africa (115). The regular supportive supervisions of staffs and provision of obstetric emergencies equipment to the health facilities being implemented in Nigeria. Other countries like Beni, Burkina Faso, Togo, Mali, Niger and Ivoire Coast are retaining their midwives in rural areas through the provision of career path approach. The career path includes master's degree program in midwifery in Burkina Faso and Beni (115).

## **Chapter five: Discussion, Conclusion and Recommendations**

This chapter presents key contributing factors of maternal deaths in Liberia, strengths and weaknesses of current interventions, suggested approaches, conclusion and recommendations.

Our literature review suggests that the quality of care in both urban and rural areas, including the shortage of drugs and supplies in the health facilities and limited skilled staff are the main factors contributing to maternal deaths in Liberia (Fig 8). This is supported by the fact that 75% of maternal deaths occur in the health facilities, 56% of them occurring without receiving any care by skilled birth attendant (46). The three delays framework used in our review suggests that institutional deliveries is crucial for early identification and management of obstetric complications and avoid related maternal deaths. However, the same framework suggests that even with higher institutional deliveries, the maternal mortality cannot reduce if the quality of care is still poor. To minimize the problem, the country is making efforts to provide emergency obstetric care in all public health facilities, which includes drugs and supplies to respond to obstetric emergencies and skilled staff. However, the EmOC still not available in 35% of the health facilities in the country (96). The lack of retention strategy contributes to low availability of skilled staff in rural areas (46), despite the many training being conducted and other efforts made to implement EmOC in all the health facilities. The skilled staff trained to provide EmOC in the rural areas in Liberia, usually do not remain in their assigned areas after the training. They usually migrate to urban areas where the salaries are higher and with better accommodation and career opportunities (88). Strategies to reduce staff attrition, like increasing incentives, providing more career opportunities and better accommodation for staff in rural and remote areas might improve the availability of EmOC services in those locations. The introduction of master's degree in midwifery following the examples of Burkina Faso and Beni, can also be adopted and use as one of the retention strategies in Liberia (115). However, immediate approaches would be regular supportive supervision, provision of personal obstetric equipment and monetary incentives for midwives working in rural areas. The drugs and supplies management system still inefficient in Liberia. Despite the distribution of essential drugs, constant stock out still being reported (73). A better distribution and management of supplies can also strengthen the availability of essential drugs and supplies in all health facilities. Considering that PPH is the leading cause of maternal deaths in Liberia, the distribution of misoprostol in the communities following the example of Ghana should be considered (109). The community management of PPH prevention, will significantly reduce

the deaths due to first, second and third delays. However, this will be possible after improvement of stock management and distribution of the drugs.

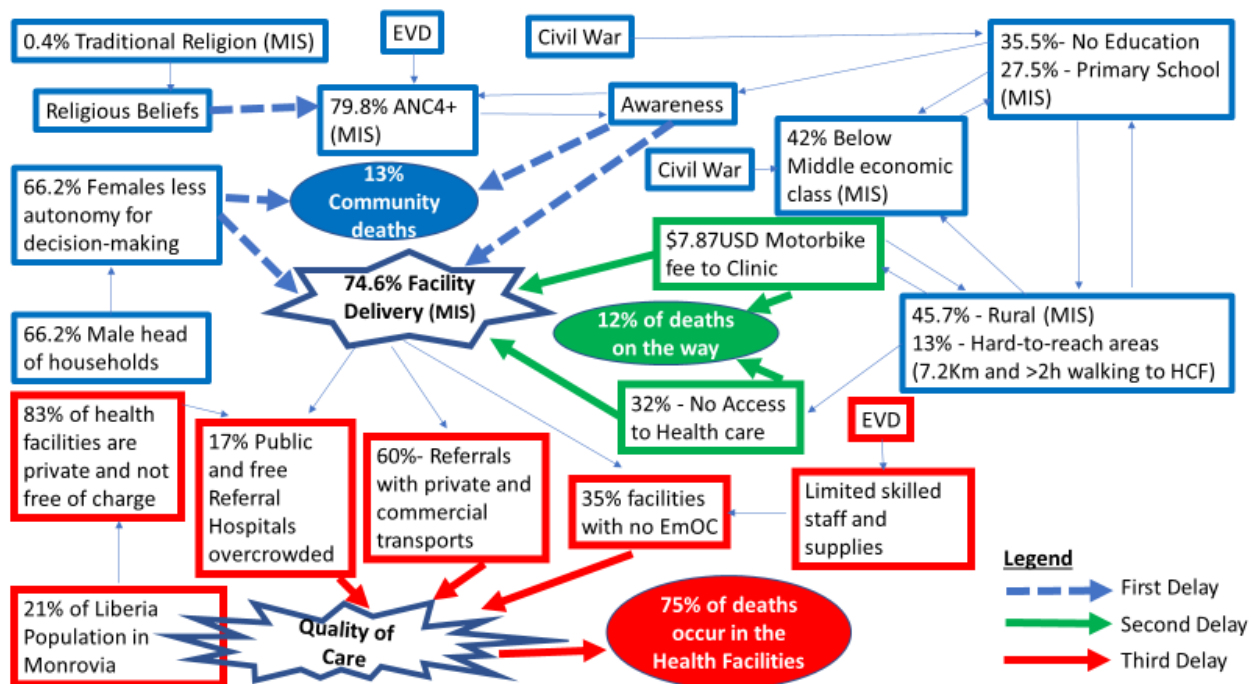
The rural health facilities are also penalized by poor referral system, including shortage of ambulances and poor communication system. With support from partners, the government of Liberia is providing ambulances to the rural health facilities. However, in 2018 the ambulances were available in only 11% of the health facilities, despite the distributions (73). This finding suggests that due to bad road conditions, the vehicles may not last long if good maintenance system is not in place. Instead, empowering the rural health facilities with skilled staff, drugs and supplies should be considered as the first approach. A second approach would be the implementation of motorbike-ambulances following the example of Sierra Leone (44). The approach has the advantage of strengthening the community involvement and ownership. However, the approach maybe more useful for transportation of patients from communities to health facilities, rather than from peripheral to referral facilities. A pilot of the system in Liberia would be required before the full implementation, to identify country specific issues related to the approach. In the capital Monrovia where 21% of the Liberian population are located, 83% of the health facilities are private, requiring payment for maternal services (29). This makes the public referral hospitals overcrowded since the majority of the population cannot afford to seek care in private facilities (16). A partnership public-private would be the best approach, following the example of India (112). However, this approach will require a strong commitment from central government and partners in order to make the funds permanently available. Providing free health service in private facilities will likely allow more patients to received better-quality obstetric care and reduce maternal mortality. However, this approach will benefit more the patients from urban areas where more private facilities are located. Although Liberia is offering free services in the public hospitals, the quality of care makes the peripartum mothers and families to not used the services as a first option (73). Due to lack of supplies and poor quality of care, the costs for informal payments and to buy supplies and drugs missing in the health facilities or to deliver in the private health facilities with better conditions may be high, especially among the poor population (46). Therefore, offering free but poor-quality services may not give the desirable impacts on reduction of maternal deaths in Liberia.

The education, economic factors and limited decision-making power among women are also contributing to high maternal mortality in Liberia. The three factors cannot be addressed exclusively by health sector. However, different activities are being implemented by Liberia



Ministry of health and partners. The activities aiming to promote health-seeking behavior may be more sustainable. The health education through local media, besides targeting the women, the messages can also reach the males heads of households and community leaders. Therefore, the right messages can influence their decisions to allow the pregnant women to seek care at health facilities. The promotion of health seeking behavior done by TTMs during their home visits is also more sustainable due to trust between them and their communities. Provision of incentives for TTMs to refer the pregnant women to the health facilities may not be a sustainable approach as demonstrated in Liberia. Also, the provision of incentives for mother (baby and mama kits) is being used as a motivational factor for women to seek ANC care and facility delivery. However, this intervention is not sustainable and does not change the mentality of women of the importance of seeking care during the pregnancy.

Additionally, the findings suggest that, geographical location and cost of transportation are also influencing low utilization of maternal health services in Liberia. According to the conceptual framework, these two factors puts women at high risk of maternal deaths. These two factors cannot be addressed exclusively by the health sector but, calls for a multi-sectorial approach. Maternal waiting homes are being built in rural areas supported by partners in Liberia (99). This intervention is used to reduce the distance for pregnant women before labor who live beyond 5-kilometer distance away from the facility. However, the overall impact is not felt because this intervention is only being implemented in six out of the 15 counties in Liberia. Also, there is no clear maintenance mechanism of the feeding of the pregnant women. Giving the responsibility of maintenance of the homes to the communities, besides sustainability, may give more sense of ownership to the communities.



**Fig 8:** Summary of the main factors associated to maternal deaths in Liberia and relationship between each other (11,12,13,20,24,29,46,47,77,96)

The conceptual framework was relevant to analyze the factors contributing to maternal mortality in Liberia. However, the framework is focusing on three main group of factors affecting the three delays. Socio-economic factors, accessibility of facilities and quality of care. During our review, other sub-factors were identified and described accordingly. They include the education, age and parity within the socio-economic and cultural factors, geographical location and transportation means and costs under accessibility of facilities and availability of drugs and supplies, skilled health workers and referral system under the quality of care. The additional sub-factors give more details about the country specific contributors to the high maternal mortality.

**5.1 Conclusions**

The third delay is responsible for 75% of maternal deaths in Liberia, while the second delay accounts for 12% and first delay 13%. The maternal mortality remains high in Liberia despite the improvements in institutional deliveries and ANC visits. The poor quality of care, including limited availability of drugs and supplies, skilled staff and poor referral system is the most important factor contributing to high maternal mortality in Liberia. Other factors

include economic status, education and limited decision-making power among women, geographical location and difficulties in getting transportation to the health facilities.

The main gaps in interventions were:

- Encouraging pregnant women to seek care in the health facilities will not necessarily bring the desirable effects in reducing maternal mortality if the quality of care remains poor
- EmOC, which includes drugs and supplies to respond to obstetric emergencies and skilled staff, still not available in 35% of the health facilities in Liberia
- The lack of retention strategy and inefficient supply chain, stock of drugs management contribute to low availability EmOC in rural areas
- Providing monetary or non-monetary incentive to the community health workers may not be sustainable. Instead, awareness to communities about the importance of institutional deliveries with involvement of traditional midwives may be a most sustainable approach after improvement of quality of care in the facilities.
- Maternal waiting homes strategy is being implemented only in six out of 15 counties in Liberia.
- Providing ambulances to the remote health facilities to support referral as an isolated approach may not be enough if quality of care still poor. Instead, equipping the health facilities, providing drugs, supplies and skilled staff may have better short-term benefits and should be prioritized
- The provision of mama and baby kits may not be sustainable due to stockout of the Kits in facilities and constant discontinuations due to lack of support
- No mechanisms in place for the maintenance of maternal waiting homes, including feeding of the pregnant women.

In addition, maternal mortality in Liberia can be minimized but cannot totally be addressed by the health sector alone, requiring a multi-sectoral approach.

PPH is the leading cause of maternal deaths in Liberia. Due to difficult accessibility to health facilities, the distribution of misoprostol in the communities follows the example of Ghana and should be considered to prevent PPH. A study is required to determine the impact of the community projects and provision of incentives to the mothers on maternal mortality in Liberia.

## **5.2 Recommendations**

### **5.2.1 Quality of care**

The ministry of health needs to:

- Conduct regular trainings and strengthen supportive supervisions on drugs and supplies stock management in all the health facilities
- Define clear retention strategies which may include supportive supervisions, provision of equipment, monetary incentives, better accommodation and career path.

### **5.2.2 Accessibility of facilities**

The ministry of health needs to:

- Adopt the distribution of misoprostol in hard-to-reach communities to prevent PPH following example of Ghana. A strong community engagement should be done before.
- Pilot the use of motorbike ambulances to transport peri-partum women from the remote communities to the nearest health facility following the example of Sierra Leone
- Expand the maternal waiting homes to all the 15 counties
- Extend the community-based interventions to other health facilities, including rural areas.
- Include TTMs in government payroll

### **5.2.3 Multisectoral approach**

The ministry of health needs to:

- Involve other sectors in maternal health strategies and conduct regular meetings to identify needed interventions from each sector.

### **5.2.4 Research**

- Ministry of health to enforce the maternal deaths reviews for every maternal death with publication of findings on both grey and white literature. This will allow a follow up of findings from the previous reviews.
- Research on impacts of the community projects and provision of incentives to the mothers on maternal mortality in Liberia.

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