MATERNAL DEATH SURVEILLANCE & RESPONSE

ANNUAL REPORT 2016

Directorate of Reproductive & Child Health
Ministry of Health & Sanitation

Table of Content

Foreword

Pregnancy is a normal, healthy state, which most women aspire to at some point in their lives. Yet this normal, process carries with it serious risks including death and disability in extreme cases. In Sierra Leone, the estimated lifetime risk of a woman dying of maternal causes is currently 1 in 17. Most of these deaths can be averted if preventive measures are taken, and adequate care is available and provided. For every woman who dies, many more suffer complications that may affect them for the rest of their lives.

Maternal mortality offers a litmus test of the status of women, their access to health care, and the adequacy of the health care system in responding to their needs. It is important that findings emerging from the MDSR report are acted upon to help improve access to and quality of care, and are not merely seen as a data collection tool.

Most deaths of pregnant women in the African region take place in the first week of life after delivery especially in the first 24 – 48 hours and are directly related to the quality of care and the health workforce.

Community factors including delay in seeking care, non-recognition of danger signs, delay in referral to the appropriate level of care and socio-cultural factors contribute to the high mortality. Yet, most of these deaths could have been avoided if preventive measures such as comprehensive antenatal, postnatal, and skilled care during delivery were made available.

The Ministry of Health and Sanitation hopes that information from this report will be used to improve service delivery for women and new-borns, and call upon all stakeholders to join efforts to reduce the needless loss of mothers and children in Sierra Leone.

Honourable Dr. Abu Bakarr Fofanah
Minister of Health and Sanitation

Acknowledgements

The annual MDSR Report (January - December 2016) is an eye opener to the estimated number of maternal deaths in Sierra Leone. As the MoHS and partners continue to collaborate in reducing maternal mortality, the MDSR report will be a reliable data source that will be useful for policy, planning, decision making and advocacy.

The review process could not have been possible without the contribution of important stakeholders within and outside the MoHS. The MoHS is indebted to the contribution of the World Health Organisation (WHO) and the United Nations Population Fund (UNFPA), who provided both technical and financial support to this review.

Many thanks and appreciation to the Programme Manager Reproductive Health and Family Planning (RH/FP), Dr Sulaiman G. Conteh whose passion towards reversing the trend of maternal mortality in this country is laudable. I also recognize the contribution of the leadership of The Directorate of Disease Prevention and Control.

Moreover, the MoHS lauds the contribution of the District Health Management Teams (DHMTs) who have worked so hard in conducting maternal death reviews and reporting to the national level. Their efforts have resulted in a document which will be used to bring a turnaround in the status of maternal deaths in Sierra Leone.

My sincere thanks to the report writing team: Mr Hailu Binyam Getachew (WHO), Sr Margaret Mannah (UNFPA), Alimamy Kamara (MoHS/RHFP) and Zainab Julehbah Tarawally (MOHS/DRCH).

I wish to use this opportunity also to thank all those who are contributing in diverse ways to improving the maternal health of women in Sierra Leone.

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Acronyms

APH	Antepartum Haemorrhage
ANC	Antenatal Care
CI	Confidence Interval
CRVS	Civil Registration and Vital Statistics
CS	Caesarean Section
DHS	District Health Sister
DMO	District Medical Officer
DHMT	District Health Management Team
DPC	Directorate of Disease Prevention and Control
DSO	District Surveillance Officer
HMIS	Health Management Information System
ICD	International Statistical Classification
IDSR	Integrated Disease Surveillance and Response
IPH	Intra-partum Haemorrhage
MD	Maternal death
MDG	Millennium Development Goals
MDR	Maternal Death Review
MDSR	Maternal Death Surveillance and Response
MI	Midwife Investigator
MS	Medical Superintendent
MOHS	Ministry of Health and Sanitation
PIH	Pregnancy Induced Hypertension
PPH	Postpartum Haemorrhage
RCH	Directorate of Reproductive and Child Health
SLDHS	Sierra Leone Demographic & Health Survey
SDG	Sustainable Development Goals
TBA	Traditional Birth Attendants
TFR	Total Fertility Rate
WHO	World Health Organization
UN	United Nations

Executive Summary

According to the recent population estimate, Sierra Leone has an estimated total population of 7 million (Statistics Sierra Leone, 2015) with a life expectancy of 46 years at birth. Close to 39% of the population resides in urban settings.

Access to quality health care is a major public health concern, attributable to inadequate financial and human resources for health, and issues surrounding drug and medical supplies, shortage of appropriate health infrastructure, among others.

Sierra Leone has the world's highest estimated maternal mortality ratio of 1,165 (95% CI: 951-1379) deaths per 100,000 live births (DHS, 2013). The World Health Organization (WHO) recently estimated the maternal mortality ratio at 1,360 (80% CI: 999-1980) deaths per 100,000 live births. Women in Sierra Leone have a 1 in 17 lifetime risk of dying due to pregnancy or childbirth (WHO, 2015). Maternal deaths accounted for 36 percent of all deaths among women age 15-49 (DHS, 2013).

Most maternal deaths are preventable through cost-effective public health measures. Having learned lessons from the Millennium Development Goals (MDGs) (WHO, 2015), Sierra Leone is aligned with the aspirations of the world to eliminate maternal deaths as part of the Sustainable Development Goals (SDGs).

According to the SDGs, countries with very high maternal mortality need to bring down their maternal mortality ratio to 140 maternal deaths (MD) per 100,000 live births (WHO, 2015). In view of this, Sierra Leone has adopted the institutionalization of Maternal Death Surveillance and Response (MDSR) into the national health system by developing guidelines, conducting capacity building, and establishing local and national structures for MDSR. This annual report was developed with an aim to provide information to stakeholders on the current status of MDSR in the country, and to share key challenges and initiatives to strengthen the system and avert the needless loss of maternal lives.

This report was prepared by the Ministry of Health and Sanitation (MOHS) Reproductive and Child Health Directorate. Data for MDSR was collected mainly from the District Health Information System (DHIS), District Maternal MDR report, District Health Management Team (DHMT) case based form (line listing), and Weekly Disease Surveillance Report from the Directorate of Disease Prevention and Control (DPC) for the period from January to December 2016.

All records of reported maternal deaths through the Integrated Disease Surveillance and Response (IDSR) system and regular line listings for the reporting period were reviewed. Due to a multitude of challenges surrounding reporting and quality of the data, it is important to note that the report does not provide a complete picture of maternal deaths in the country but it does provides useful information for strengthening major areas of intervention for MDSR.

For the period under review, a total of 218,818 live births were reported in the health facilities in Sierra Leone. Of the reported births, 5,608 babies were stillborn giving a stillbirth rate of 25.7 per 1,000 live births. Among the stillbirths, 55% were macerated stillbirths, while 45% were fresh stillbirths. A total of 706 maternal deaths were reported, 663 (94%) of which were reviewed by district maternal death review committees.

Extrapolating from the estimated maternal mortality ratio from the 2013 Demographic and Health Survey, of 1,165 (95% CI: 951-1379) deaths per 100,000 live births, there should have been about 2,941 maternal deaths during 2016. Only 20-29% of the expected number of deaths, 2941 (95% CI: 2,401 – 3,481) were reported signalling a need for improving the reporting of maternal deaths, or revisiting the current maternal mortality estimates for the country.

Most of the reported maternal deaths were from facilities (80%), while 13.5% occurred in the community, and 5.6% of deaths were in transit to a health facility. There is likely a substantial underreporting of maternal deaths in the communities, signalling a need for further studies to understand the nature, scale, and magnitude of the problem. The direct causes of maternal deaths were largely bleeding {postpartum haemorrhage (PPH), intrapartum haemorrhage (IPH), and antepartum haemorrhage (APH)}, pregnancy induced hypertension (PIH), sepsis, and abortions. The indirect causes of death were mainly anaemia and malaria in pregnancy.

Though substantial progress has been seen in the area of MDSR, multiple challenges persist in reaching optimum quality of the MDSR program implementation. Some of the major challenges of the MDSR system were:

- Limited practices in verification of all deaths among women of child-bearing age to rule out maternal deaths
- Low levels of community participation and ownership
- The reluctance to report maternal deaths at both community and health center level, possibly because of a fear of punitive measures
- Only a few number of MDSR committee members trained on MDSR
- Limited verification of deaths among women of child-bearing age
- Poor quality of maternal death investigation and reviews given poor recording of obstetric information and lack of review guides
- Non-adherence to standard classification of causes of maternal deaths
- Limited institutionalization of MDSR at the grass roots level
- Non-harmonization of maternal death data at district and national levels
- Limited integration of the MDSR system with the Civil Registration and Vital Statistics and "call 117" system
- Poor data quality and management owing to poor documentation and reporting of maternal deaths on arrivals (DOA), and poor documentation of investigation reports
- Limited response to findings and recommendations of MDSR committees at national and district level
- Limited communication of findings from MDSR to wider stakeholders for actions

Understanding the challenges and lessons learnt from MDSR, the MOHS Directorate of Reproductive and Child Health (RCH) plans to strengthen MDSR through a set of key actions:

(i) Enhancing community mobilization and creating awareness of the need for maternal death reporting at all levels;
(ii) Improving community ownership and participation in MDSR;
(iii) Removing bylaws or conditions which might be creating a hindrance to community level maternal death (MD) reporting;
(iv) Improving the quality of MDSR investigations and reviews through training and capacity building for MDSR committee members

(v) Improving clinical documentation
(vi) Strengthening data quality and use of MDSR findings
(vii) Investing in provision of quality of care during pregnancy and childbirth
(viii) Enhancing access to blood transfusions
(ix) Strengthening targeted feedback and dissemination of MDSR findings to relevant stakeholders

1. Introduction

1.1. Background

Sierra Leone has an estimated total population of 7 million with an annual growth rate of 3.5% (SSL, 2015). Sierra Leone has made a drastic improvement by improving the life expectancy of the population from 43 to 50.9 between 2005 and 2014 (UNDP, 2015). The sex ratio at the national level for 2015 is 96.8 males per 100 females, compared with 94.7 in 2004 (SSL, 2015). According to the World Bank, Sierra Leone has a crude birth and death rate of 35.45 and 13.27 per 1,000 populations respectively (World Bank, 2015). About 42% of the youth in Sierra Leone are below age 15 years (WHO, 2013).

Close to 41% of the population resides in urban areas, while 59% are in rural settings, (SSL, 2015) with an urbanization rate of 2.75% (World Bank, 2014). Nearly 30 percent of the population ages 10 years and above are in a polygamous marriage, 13% are in a monogamous marriage and 46% percent were never married. The total fertility rate (TFR) is estimated at 5.2 children per woman (SSL, 2015).

More than 16 percent of children in Sierra Leone have lost both parents, while 4.3 percent and 18.0 percent had only a father or mother alive respectively (SSL, 2015). The child birth registration practice was also reported to be 78% (UNICEF, 2015). However, data from the national census revealed that out of the total household population, 43% have birth certificates, 45% for males and 41% for females (SSL, 2015).

The literacy rate among the population of age 10 years and above was 52% (SSL, 2015). According to UNICEF, the literacy rate of ages 15-24 years was 61% (UNICEF, 2015). With regard to the enrolment rate, the Gross Enrolment Rate (GER) for primary level was 105%, whilst the Net Enrolment Rate (NER) was 65%. The same report indicated that gross enrolment in pre-primary education stood at 7% (UNICEF, 2015). The literacy rate for women was also 36% (DHS, 2013).

Sierra Leone is one of the poorest sub-Saharan African countries with nearly half of the working-age population engaged in subsistence agriculture (61%). In recent years economic growth had been driven by mining, but the Ebola outbreak combined with falling global commodities prices, caused a significant contraction of economic activity in all areas. According to a recent report, Sierra Leone has a total gross domestic product (GDP) of $9.966 billion which has slightly contracted from $12 billion in 2014 (Oindex Mundi, 2016). The unemployment rate which is an important economic predictor was estimated to be 8.9% with 83% of the population being self-employed.

Access to safe water and sanitation was very limited with 28% of households depending on unprotected water sources. Only 36.3% of households use pipe-borne water and 35.7% use other protected sources of water as a main source of drinking water. For household purposes, about two-thirds of households (64.8%) use protected sources of water while 35.3% use unprotected sources (SSL, 2015). In contrary to the SSL data, UNICEF reports that only 5% of the population used pipe-borne water while 55% rely on other protected sources for drinking

water (UNICEF, 2015). With regard to sanitation facilities, the census revealed that 73.8% of households use pit latrines, 8.6% flush toilets, 12.9% communal bushes and river beds, and 2.6% ventilated pit latrines. According to UNICEF, 13% of the population utilizes improved sanitation facilities while 28% utilize open defecation practices (UNICEF, 2015)

1.2. Status of Maternal Health in Sierra Leone

Sierra Leone was hit hard by the outbreak of Ebola which damaged the existing health system. Access to quality health care remains one of the major public health concerns attributed to inadequate human resources for health, limited health expenditure, and problems associated with the breakdown of the drug and medical supply chain. The WHO recommends a critical threshold of 23 skilled healthcare providers (doctors, nurses, and midwives) per 10,000 population, however, the country suffers from extreme shortages of trained healthcare providers, having only 2 skilled providers per 10,000 populations (MoHS, 2015).

Sierra Leone has a high Maternal Mortality Ratio (MMR) of 1,165 (95% CI: 951- 1379) deaths per 100,000 live births (DHS, 2013). In 2015, the UN estimated, that the MMR was 1,360 (95% CI: 999- 1980) deaths per 100,000 live births. Women in Sierra Leone have a 1 in 17 lifetime risk of dying due to pregnancy or childbirth. Maternal deaths account for 36% of all deaths among women ages 15-49 (WHO, 2015).

According to the 2013 DHS, Sierra Leone also has very high child mortality; 156 deaths per 1,000 live births. The same report indicated that the infant mortality rate (IMR) and neonatal mortality rate (NMR) were as high as 92 and 39 per 1,000 live births, respectively. Recent UNICEF estimates for CMR, IMR, and NMR revealed rates of 161, 107, and 44.3 per 1,000 live births (UNICEF, 2015)

In Sierra Leone, 97% of mothers received one antenatal care (ANC1) visit, and 76% received 4 visits (ANC4), during their pregnancy. Fifty-four percent had deliveries in a health facility, and 72% of mothers received postnatal care from health personnel within two days of delivery. Anemia in women ages 15-49 is prevalent, with approximately 45% of women classified as having any type of anemia in both DHS survey periods. The prevalence of HIV in Sierra Leone was 1.5% among ages 15-49 years. The prevalence among women was 1.7%. Fifty-three percent of pregnant women reported sleeping under an insecticide-treated net (ITN) the previous night (DHS, 2013).

Most maternal deaths are preventable through cost effective public health measures. Having learned lessons from the Millennium Development Goals (MDGs) (WHO, 2015), Sierra Leone is aligned with the aspirations of the world to eliminate maternal deaths as part of the Sustainable Development Goals (SDGs). According to the SDGs, countries with very high maternal mortality need to bring down their maternal mortality ratio to 140 maternal deaths per 100,000 live births (WHO, 2015). With the aim of averting considerable numbers of maternal and child deaths, the President's Recovery Priorities (PRP) plan aims to save the lives of 600 more women and 5,000 more children over the next 10-24 months, through huge investments in the health sector.

To achieve the above objectives, key strategic priorities in the plan include rolling out an enhanced Community Health Worker (CHW) programme that will support pregnant women to access services; delivery of essential drugs such as antimalarials to children; upgrading 29 facilities to care for pregnant women and newborns (25 'basic' and 4 'comprehensive' facilities) by upgrading standards including sanitation and hygiene; improving emergency obstetric services, and strengthening the MDSR system (PRP, 2015). This report aims to demonstrate the efforts that were put in place to realize a functional MDSR system and structure in the country.

1.3. Maternal Death Surveillance and Response

The Maternal Death Surveillance and Response (MDSR) model is a surveillance system that tracks the numbers of maternal deaths and provides information about the underlying contributing factors and how they can be tackled. The MoHS began conducting maternal death reviews on an ad hoc basis in 2005, as a strategy to reduce maternal deaths in health facilities. However, repeated attempts to institutionalise the conduct of Maternal Death Reviews (MDRs) in district health facilities to improve on the quality of care had resulted in only minimal success. A key challenge identified was the gross under reporting of maternal deaths nationwide. Low capacity to coordinate MDR processes also constrained the progress required to establish and operationalise non-punitive and effective MDRs (MoHS, 2015).

In order to adequately address the issue of MDs, the MoHS adopted and developed national technical guidelines to strengthen systems and structures for MDSR in July 2015. The MDSR system capitalized on understanding maternal deaths from the perspective of the three phases of Delays model that are attributed to multiple factors.

> **Delay I**: Lack of information and adequate knowledge about danger signals during pregnancy and labour; cultural/traditional practices that restrict women from seeking health care; lack of money
> **Delay II:** Difficulty reaching health facilities; poor roads, communication networks, and community support mechanisms
> **Delay III:** Unskilled birth attendants; poorly motivated staff; inadequate equipment and supplies; weak referral systems and procedural guides

The development of the national guideline led to the establishment of national and district MDSR committees nationwide as well as the integration of MDSR into the national public health integrated disease surveillance and response (IDSR) system. In order to institutionalize MDSR down to the district and local structure, the RCH directorate conducted a capacity building training for district and national MDSR committees members, mobilized communities and health workers through awareness campaigns, produced necessary tools to support maternal death investigations and verbal autopsies, and ensured functionality of the MDSR system at the district level.

Though several challenges persisted in creating a strong MDSR system, commendable results have been achieved since the development of the national technical guidelines. The key achievement and challenges are portrayed in the findings and challenges section of the report.

2. Purpose of the Report

The National Maternal Death Surveillance and Response guideline recommends that maternal mortality review processes be established and national maternal mortality reports be published on an annual basis at the national and district level. The report is intended to:

- Highlight the efforts that were put in place to strengthen MDSR in the country.
- Provide information to stakeholders on the current status of implementation of MDSR in the country.
- Provide an overview of maternal deaths from collated information for the period January to December 2016.
- Inform stakeholders on existing challenges and planned strategies for MDSR to strengthen the existing system including fostering collaboration and partnership to reduce maternal deaths.

3. Methodology

This report was prepared by the Ministry of Health and Sanitation, Reproductive and Child Health Directorate, which is responsible for supervising, planning, implementation, monitoring and evaluating maternal and child health programs in the country.

Data for MDSR was collected mainly from the DHIS2, the District MDR report, the Hospital monthly programmatic report, the DHMT line listing, and the Weekly Disease Surveillance Report from DPC for the period from January to December 2016. Ad hoc and formal supportive supervision reports were utilized to generate the annual MDSR report.

In collecting the relevant information, all records of reported maternal deaths through the IDSR system and regular line listings were reviewed for the reporting period. Data including live births, stillbirths, ANC attendance, and delivery information were obtained from routine health facility HMIS report from all functional and reporting health facilities.

In writing the reports, the findings from field supportive supervision done by the RCH Directorate to all districts were also included. The report was developed by a team of experts from the Ministry of Health and Sanitation, Reproductive Health and Family Planning program.

Hospital data that is maintained by the RCH directorate of Family Planning and Reproductive Health Program was also included, since hospitals have not yet started reporting in the routine DHIS system. Data that were collected from the RCH Directorate database and DHIS 2 were cleaned and analysed based on the identified national MDSR indicators using Excel and SPSS version 16. Data were summarized using standard descriptive statistics of categorical and numerical variables.

HMIS data were reviewed to analyse some maternal and child health indicators. The data were checked for quality through analysing the reporting rate from the existing reporting facilities in the country. The overall reporting rate was found to be 93.58%, with Western Area Urban having the lowest reporting rate of 80.65%.

Table 1 Reporting Rate from Routine DHIS2

District Name	Jan to Mar	Apr to Jun	Jul to Sep	Oct to Dec	Total
	%	%	%	%	%
Bo	91.9	91.9	91.6	92.6	92.00
Bombali	92	95.1	91.4	70.9	87.35
Bonthe	86.8	87.3	89.4	76.7	85.05
Kailahun	95.6	95.2	97.6	96	96.10
Kambia	96.2	96.7	97.1	96.7	96.68
Kenema	100	100	100	99.5	99.88
Koinadugu	94.5	94.5	91.8	90.4	92.80
Kono	96.6	94.3	97.3	93.1	95.33
Moyamba	98.3	98.3	99.7	95.3	97.90
Port Loko	94.5	95.8	97.3	96.4	96.00
Tonkolili	100	100	100	100	100.00
Pujehun	89.8	90.4	90.6	91.2	90.50
Western Area Rural	100	100	99.3	94.1	98.35
Western Area Urban	80.4	80.9	80.9	80.4	80.65
Total	94.1	94.4	94.6	91.2	93.58

The process of registering maternal deaths starts from the place of death where thorough

information is collected and documented in the maternal death investigation forms by midwife investigators and district surveillance officers. Investigation reports, MDR review minutes, and maternity registers were all checked for quality and consistency, but challenges in documentation as well as availability of some relevant data affected the analysis of certain indicators in this report.

4. Finding

4.1. MDSR System and Structure

Progress was made in ensuring the appropriate system and structure for MDSR through establishing and training national and district MDSR committees. National and district MDSR committees were established in each district and terms of references were developed, shared and also incorporated in the national guideline. The composition of the national and district MDSR committees were clearly determined and used in the establishment of the committees.

The MOHS also designated maternal death as a notifiable event and maternal deaths were captured and reported on weekly surveillance and reporting systems. The MDSR system also employed the use of the Civil Registration and Vital Statistics (CRVS) system as well as the 117-call system for reporting of maternal deaths, irrespective of where they occurred. Improvements in the area of MDSR at national and district levels started being noticed during 2016.

Though training for key members of the MDSR committees were provided in late 2015 and early 2016, it was not possible to realize the establishment of fully functional MDSR committees until May and June 2016 in some districts. Initially, only three members of the MDSR committees were trained according to the MDSR guidelines - the midwife investigators (MI), District Surveillance Officers (DSO) and MDSR coordinators who are the District Health Sisters (DHS).

Likewise, although there were no clear guidelines in establishing facility level MDSR committees, encouraging results were noticed when MDSR was introduced. District hospitals were able to establish MDSR committees that were composed of medical superintendents, midwives, Matrons and other key hospital staff members. This was important because facility level MDSR committee members are needed to develop the term of reference and, determine the composition of committees and training needed. Currently, community health centers (CHCs) that serve as Basic Emergency Obstetric and Neonatal Care (BEmONC) centres do not have established MDSR committees - it is the hope that these committees are introduced soon.

Currently every district except one has a functional MDSR committee that meets on a regular basis at the district level. The newest district (Western Rural) which was created towards the end of 2016 is in the process of establishing MDSR committees. All the districts have a district MDSR coordinator that plans, implements, supervises, monitors and evaluates the successful implementation of MDSR in their respective districts. The District Health Sisters are the focal persons for MDSR in each district.

It is clearly stipulated that MDSR committee needs to meet at least monthly, chaired by the District Medical Officer (DMO) with the overall aim of conducting maternal death reviews, reviewing plans for MDSR, following up on action items as well as disseminating district

findings to wider stakeholders and using the information to improve the overall health system. The monthly meetings were happening in most districts, but some districts had irregular meetings with poorly documented minutes. In most cases, the DMO's were noted to not be chairing the MDSR meetings even at times when they were within the district, because of competing priorities. It was also observed that Hospital MDSR committee meetings were happening but meetings were not documented and minutes and recommendations were not shared. Documentation was also affected by attrition of staff, and staff replacements were unaware of previous exercises due to lack of proper handover and poor documentation practices.

It was envisaged that strong synergy and collaboration would occur between district and hospital MDSR committee members. However, the involvement and collaboration of the district MDSR committee and hospital MDSR committee on the area of investigation, review, planning, implementation, monitoring and evaluation were very weak. Neither of the team members participated in one another's review meetings in the majority of the cases. In most cases, reviews were done in isolation – this was observed to be a common practice, especially in the Western Area district.

In 2016, significant achievements were made in ensuring monthly review meetings in the majority of the districts. Though inconsistent, MDSR meetings were happening in all of the districts. However, in some districts, the review committees did not include the participants recommended in the national guideline, possibly hampering the quality and depth of MDSR discussions. Occasionally here the MDSR review team was much larger than recommended, affecting quality due to time management and limited content reviews.

At the national level, MDSR was embedded in the regular EmONC/MDSR technical working groups which required revitalization of the national MDSR committee, in order to come together and regularly monitor and supervise the national MDSR activities. Though the national MDSR committee was expected to meet on quarterly basis, it was not possible to realize this objective as set out in the national guideline.

National level supervision of MDSR in districts initially occurred mostly on an ad hoc basis. However, since 2016, there have been significant progresses in ensuring regular supervision of MDSR using standardized tools and including dissemination of findings. With regard to monitoring and evaluation, the MoHS had already developed tools for investigation, verbal autopsies and reporting which were distributed to every district. MDSR reporting was also integrated in the national DHIS system. Challenges included consistent reporting and uploading of relevant data in the DHIS system, incompleteness of data, non-reporting of data, and delays in reporting. The DHIS system was also not yet routinely used in all districts.

Regular monitoring, analysis and feedback mechanism required intensive strengthening at the national and district level. Recommendations from district MDR teams were sometimes not clear, specific, measurable, attainable, or time bound, affecting quality monitoring and targeted disseminations to relevant stakeholders.

Due to the lack of strong monitoring and evaluation systems needed to track the process

indicators for MDSR, it was difficult to capture some of the indicators shown in the table below. For instance, percent of recommendations that were implemented during the reporting period were not captured. Effort will be made to ensure these indicators are captured in the future.

Table 2: Maternal Death Surveillance & Response Indicators

Indicator	Target	Achievement
Overall system indicators		
Maternal death is a notifiable event	Yes	Yes
National maternal death review committee exists	Yes	Yes
– that meets regularly	Yes	No
National maternal mortality report published annually	Yes	Yes
% of districts with maternal death review committees	100%	100%
-that meet regularly	100%	100%
% of districts with MDSR Coordinator	100%	100%
Identification and notification		
Health facility:		
All maternal deaths are notified	Yes	No
– % within 24 hours	>90%	Data Not Available
Community:		
% of communities with 'zero reporting' monthly	100%	Data Not Available
% of community maternal deaths notified within 48 hours District:	>80%	Data Not Available
% of expected maternal deaths that are notified	>90%	26%
Review		
Community:		
% of verbal autopsies conducted for suspected maternal deaths	>90%	73%
% of notified maternal deaths that are reviewed by district:	>90%	95%
% of districts with a review committee	100%	100%
District maternal mortality review committee exists	Yes	Yes
– and meets regularly to review facility and community deaths	At least monthly	95%
– % of reviews that included community participation and feedback	100%	Not Available
Data Quality Indicators		
Cross-check of data from facility and community on same maternal death	100% of deaths cross-checked	100%
Sample of WRA deaths checked to ensure they are correctly identified as not maternal	100% of WRA rechecked	Not Available
Response		
Facility:		
% of committee recommendations that are implemented		Not Available
% quality of care recommendations	>80%	Not Available
% of other recommendation implemented	>80%	Not Available
Community:		
% of committee recommendations that are implemented	>80%	Not Available
Reports		
National committee produces annual report	Yes	Yes
District committee produces annual report	Yes	In process
Impact		
Quality of care (requires specific indicators) District maternal mortality ratio	Reduced by 10% annually	Not Available
Hospital maternal mortality ratio/lethality rates	Reduced by 10% annually	Not Available

4.2. Surveillance, Identification and Notification

The MOHS designated maternal death as a notifiable event and maternal deaths were captured and reported on weekly surveillance and reporting systems. The MDSR system also employs the use of the Civil Registration and Vital Statistics (CRVS) as well as the 117 call system for reporting of maternal deaths irrespective of where they occurred. Promising results had been seen in this regard despite the numerous challenges faced in ensuring synergy between all these mechanisms.

The MDSR system was heavily reliant on the IDSR system and the DPC was fore front in reporting suspected maternal deaths through this existing platform. The partnership and collaboration between the DSO and the DHS (MDSR Coordinator) at the district level were very important in strengthening the MDSR system. More effort at the national level, between

the RCH and the DPC, need to be created to ensure nationwide coordination and leadership of MDSR activities by removing barriers and bottlenecks affecting surveillance, notification, and reporting.

As part of this effort, integrated supportive supervision between RCH Directorate and DPC were initiated and will be intensified further. For 2016, the IDSR system captured 618 suspected maternal deaths from all districts. However, data inconsistencies at national and district level caused a 14% discrepancy, as the MDSR system reported 706 maternal deaths through the line listing mechanism. This discrepancy is likely secondary to poor documentation, delays in reporting, problems with data entry, and a lack of feedback mechanism.

Maternal death is a notifiable event, but unfortunately, not all maternal deaths are reported throughout the continuum of care from communities to hospitals. At facility level, midwives or maternal health care providers were not consistently notifying IDSR focal persons in the facility, who were responsible for notifying the DSO's using paper-based reporting. Records of mothers in registers were also sometimes not available, affecting the routine tracking and monitoring system.

Likewise, some cases where mothers where believed to have died on arrival (Death on Arrival) were not reported or documented and therefore were taken from the facility without being registered in the relevant registers. In some cases, deaths happening within one day of admission were improperly documented as a death on arrival instead of being categorized correctly as a facility death. Paper based notifications were also not consistently being utilized which affected reporting accountability at different layers of service.

At community level, the notification and reporting of maternal deaths was one of the biggest challenges identified. The community failed to report maternal deaths in particular and deaths of all categories in general, for numerous socio-cultural reasons. In some discussion with community members of the Health Development Committee (HDC), it was revealed that maternal deaths did occur but were not reported because of fear of repercussion by community members. Also, some punitive measures implemented as result of local bylaws enacted by community member in PHUs might have contributed to communities' lack of participation in MDSR. For example, it was revealed in some communities that households were expected to pay a Le 50,000 to Le 100,000 fine if it was discovered that a pregnant woman delivered at home. More efforts need to be put in place by the national directorate of primary health care, the RCH Directorate, and the Health Education and Promotion Unit to ensure community ownership and participation in MDSR and activities for the prevention of maternal death. It is also important that relevant feedback is communicated to the various community structures on a regular basis by the relevant units at the national and district levels.

On another note, the linkages and partnerships between MDSR, CRVS, and the 117 call system were inadequate, and this might have contributed to the low notification and reporting of maternal deaths. In most cases, reports from the 117 call system, IDSR, MDSR and CRVS were not harmonized and aligned. Regular meeting between these four sectors allowing exchange of information, and sharing and harmonization of data were rarely practiced. Furthermore, it is clearly stipulated that all deaths happening among women of reproductive age should be

screened as a suspected maternal death. However, this was rarely practiced in all districts, which contributed to the overall under-reporting of maternal deaths.

Though the guideline clearly stipulates that all facility and community level maternal deaths should be reported within 24 and 48 hours of occurrence respectively, several challenges like communication, hindered timely reporting of deaths to districts. It was also difficult to verify the time of notification as notifications were heavily dependent on verbal communications. The number of communities reporting maternal deaths including zero deaths on a regular basis, was unknown. This was mainly due to lack of the community based surveillance system in many of the districts. Despite these challenges, data obtained from the surveillance systems are presented below.

There was a significant improvement on the maternal death notification and reporting from 2014 to 2016. The total number of maternal deaths that were reported in 2014 and 2015 were 226 and 456 respectively, compared to 706 deaths reported in 2016. A 54% improvement in maternal death reporting was observed during 2016 compared to 2015. Western Area, Port Loko, Kenema, and Bo made significant improvements in maternal death reporting compared to other districts. Kailahun continued to report a similar number of cases while Bombali showed a decline.

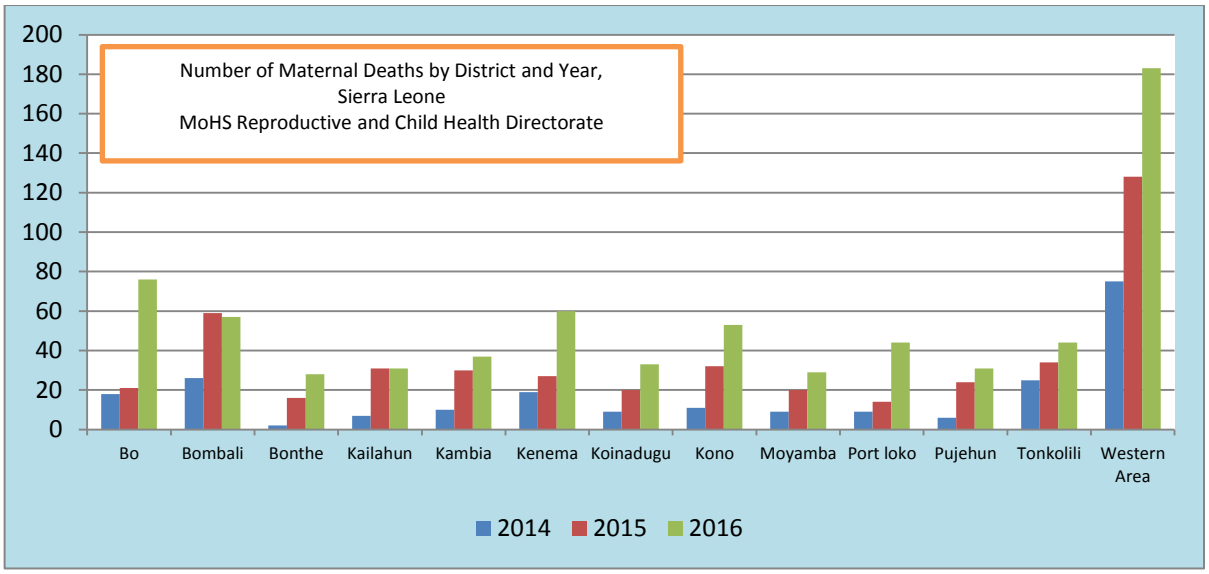

Figure 1 Notified number of maternal death trend by district, 2014-16.

4.2.1. Characteristics of births

4.2.1.1. ANC, Delivery, Live births

Based on global pregnancy population estimates (IAWG, 2010), 4.1% of the population in Sierra Leone are pregnant women, which translated to 290,777 pregnancies for the year 2016. Based on the DHIS data for 2016, the total number of pregnant women that visited health facilities for routine ANC1 and ANC4+ were 98.2% and 72.6% respectively (See Table 3).

Nearly 74% of pregnant women delivered in a health facility. Of all the health facility deliveries, 6% were in hospitals and 94% in the PHU's. The total number of health facility deliveries reported through the DHIS2 is higher than the DHS estimate of 54.4% for the year 2013 (DHS, 2013).

Table 3: Key maternal Health Indicator, Jan-Dec, 2016

District	Pregnant women	ANC1		ANC4+		Facility Deliveries	
	≠	≠	%	≠	%	≠	%
Bo	23,595	28,671	121.5%	25047	106.16%	31,237	132.4%
Bombali	24,868	18,900	76.0%	14028	56.41%	15,335	61.7%
Bonthe	8,232	8,218	99.8%	5806	70.53%	5,277	64.1%
Kailahun	21,582	15,656	72.5%	13785	63.87%	13,531	62.7%
Kambia	14,164	16,532	116.7%	11036	77.91%	11,483	81.1%
Kenema	25,006	27,798	111.2%	20943	83.75%	22,900	91.6%
Koinadugu	16,784	16,876	100.5%	10505	62.59%	9,914	59.1%
Kono	20,750	14,308	69.0%	9261	44.63%	8,818	42.5%
Moyamba	13,062	17,357	132.9%	14051	107.57%	13,988	107.1%
Port Loko	25,230	26,696	105.8%	18869	74.79%	18,145	71.9%
Tonkolili	21,789	14,240	65.4%	11393	52.29%	12,397	56.9%
Pujehun	14,205	30,309	213.4%	23127	162.81%	19,876	139.9%
Western Area Rural	18,215	0	0.0%		0.00%	12,533	68.8%
Western Area Urban	43,295	49930	115.3%	33343	77.01%	21,244	49.1%
Total	290,777	28,541	98.2%	211,194	72.63%	216,678	74.5%

According to DHIS2 data, between January and December 2016, there were 218,818 live births recorded in the health facilities in Sierra Leone. The figure is 14% lower than the 253,188 estimated based on the national crude birth rate of 3.57 births per 1,000 populations (DHS, 2013).

During the period under review, reported births at health facilities varied across districts with Western area, Kenema, Tonkolili, and Bo having the highest numbers of live births relative to other districts. This might be attributed to their respective population size, reporting rate, coverage of functional health facilities, institutional delivery patterns, etc.

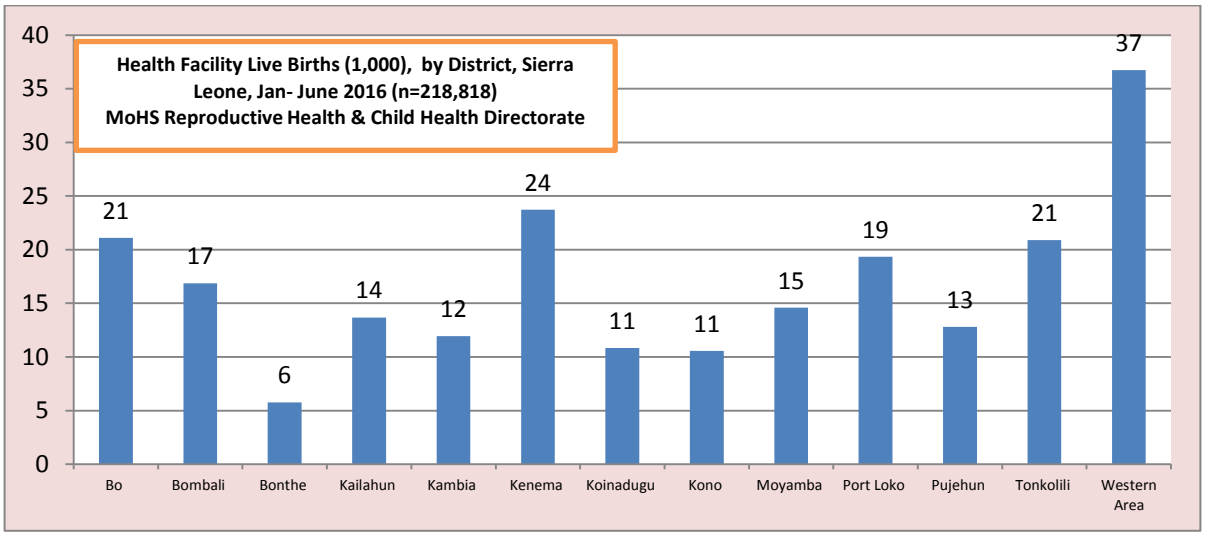

Figure 2: Distribution of live births across the 13 districts, Jan-December, 2016

4.2.1.2. Stillbirths

According to the 2009 estimated stillbirth rate for Sierra Leone (30 per 1,000 live births) (WHO, 2013), a total of 7,596 stillbirths were expected during the period under review. However, only

5,608 stillbirths were documented from all facilities, giving a stillbirth rate of 25.6 stillbirths per 1,000 live births. The report also revealed that the system captured 74% of the estimated stillbirths in the country. Disproportionately high stillbirth rates were reported in Bo, Moyamba, and Western Area compared to other districts.

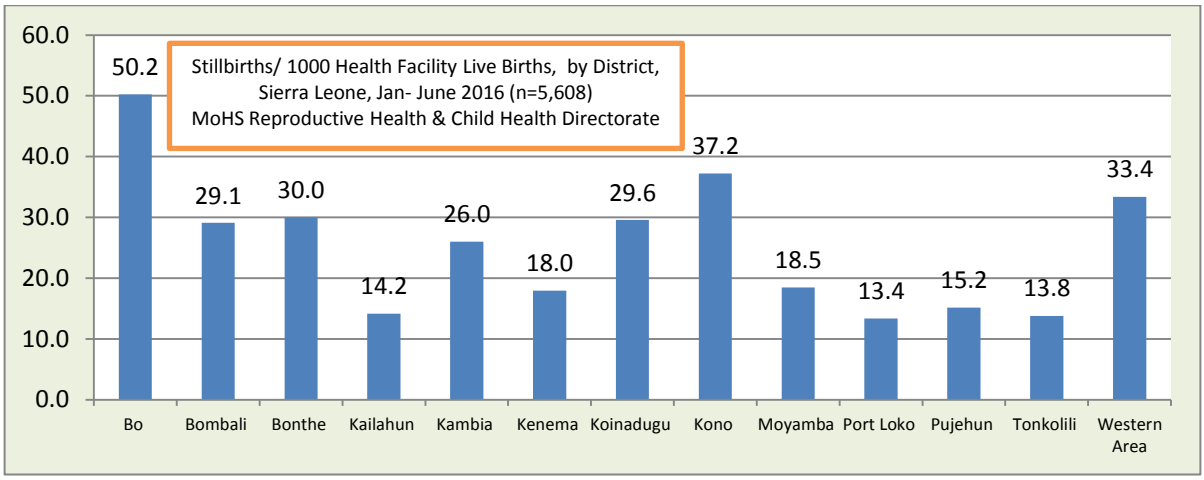

Figure 3: distribution of stillbirth across the district, Sierra Leone, Jan-Dec, 2016

Of the 5,608 stillbirths that were reported through the DHIS2 system, a total of 3,118 (55.5%) were macerated stillbirths while the rest 2,490 (44.5%) were fresh stillbirths. Bo, Western Area and Kono were found to have a higher stillbirth rate compared to the national estimate, contributing to the high burden of stillbirths in the country. The high proportion of macerated stillbirths may require further evaluation to reveal underlying causes.

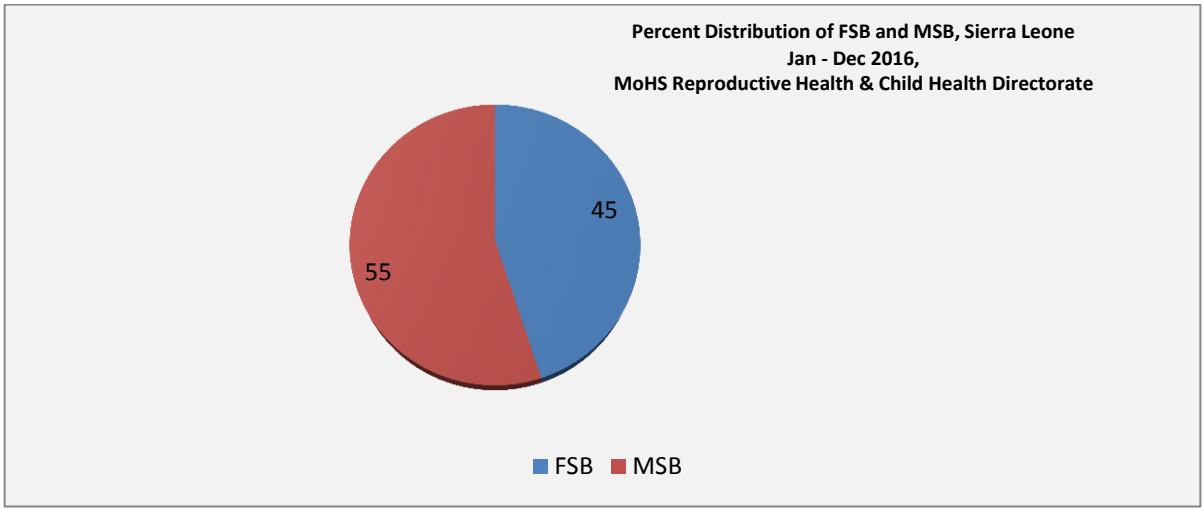

Figure 4: Distribution of type of stillbirth, Sierra Leone, Jan-Dec, 2016

It was also observed that four districts (Bonthe, Kailahun, Kambia, and Tonkolili) had disproportionately high numbers of fresh stillbirths compared to the other districts. Huge variation in the rate of macerated and fresh stillbirths were observed in four districts (PortLoko, Moyamba, Koinadugu, and Kono)

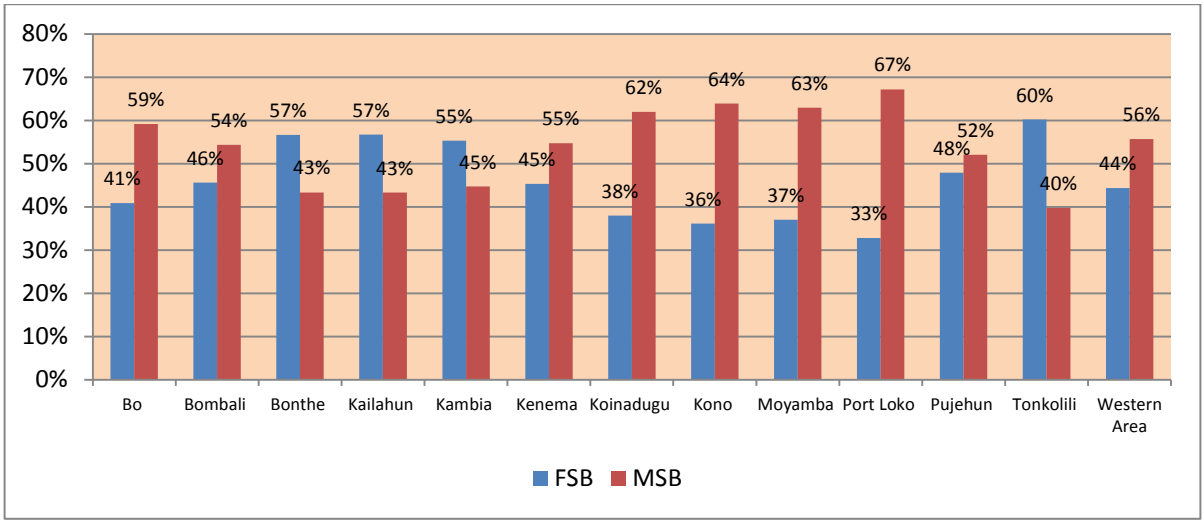

Figure 5: Percent distribution of type of stillbirth by district, Sierra Leone, Jan-Dec, 2016

Attempts were also made to analyse the correlation between maternal death and outcome of delivery among women who delivered before they died. Of the 350 records reported, 54.3% of the neonates were live births while 45.7% were stillbirths.

Table 4: Outcome of delivery among maternal deaths, Jan – Dec, 2016

Outcome of Delivery	Frequency	Percent
Live birth	190	54.3
Stillbirth	160	45.7
Total	350	100

4.2.1.3. Maternal Deaths

From January to December 2016, there were 706 maternal deaths recorded from all districts. The Western Area district followed by Kenema and Bo, had the highest number of maternal deaths during the period under review. The lowest numbers of maternal deaths were reported in Bonthe, Pujehun, and Kailahun. Variations in the reported numbers of maternal death between districts were secondary to differences in the mortality rate, the population size, and the reporting of maternal deaths.

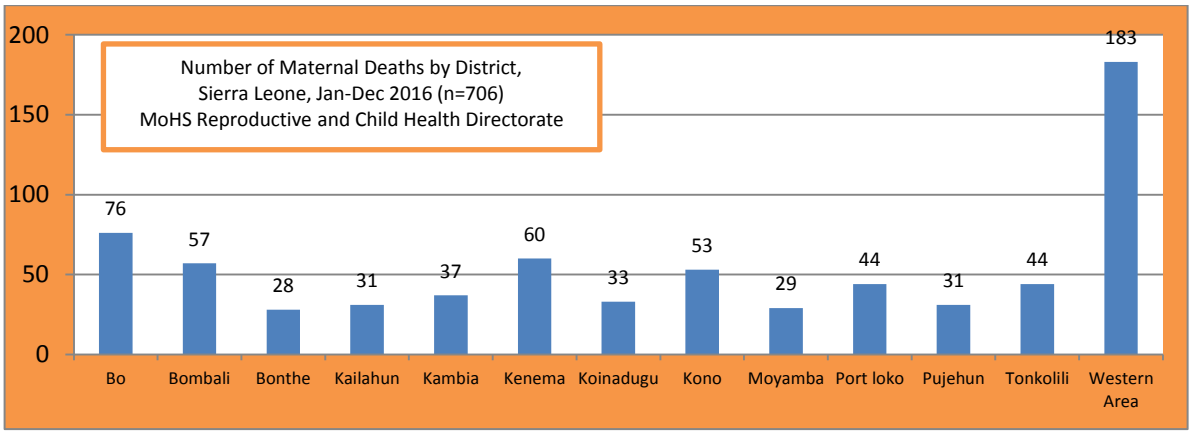

Figure 6: Distribution of Maternal Deaths by district, Sierra Leone, Jan-Dec, 2016

The number of maternal deaths captured by MDSR is far lower than the expected number of maternal deaths in the country. The 2013 DHS estimated a MMR of 1165/100,000 live births, which translates to 245 maternal deaths per month, or a total of 2,941 maternal deaths each year.

The current report captured 706 deaths which were only 24% of the expected cases. These numbers indicate that maternal death under-reporting might be as high as 76%. When the lower or upper confidence interval of the MMR estimate (DHS, 2013) was used, a total of 200 or 290 maternal deaths were expected every month. With this estimate, the under-reporting was found to be 70% and 80% respectively.

This indicates that the under-reporting of maternal deaths in the country could be very large, demanding a need for significant investments to address challenges surrounding under-reporting at various levels. There is also a possibility that the current maternal mortality estimates are over-estimating the actual number of maternal deaths in the country. A combination of under-reporting of deaths and over-estimation of mortality ratios might also account for the discrepancies.

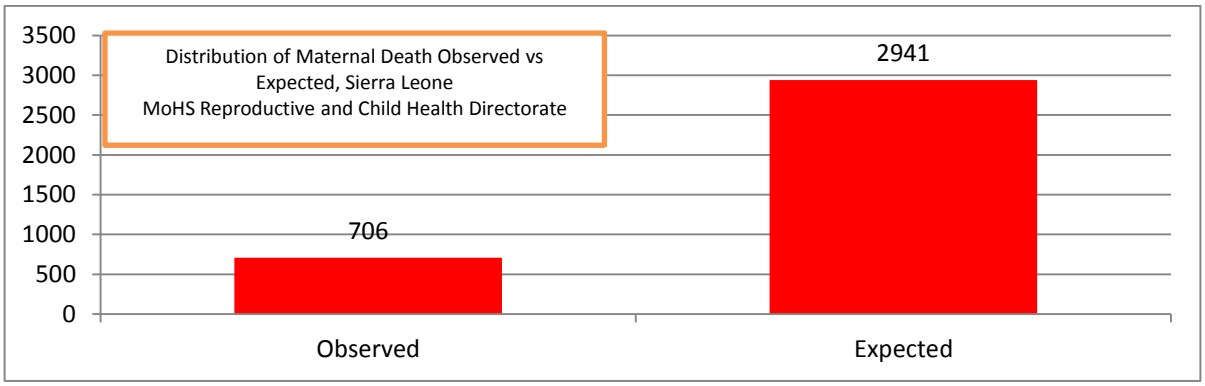

Figure 7: Distribution of Expected and Observed Maternal Deaths by Month, Sierra Leone, Jan-Dec, 2016

Despite the under-reporting, the overall number of reported maternal deaths painted a fluctuating trend. A sharp increase and decline were observed during the month of June and December respectively. Otherwise, the average number of maternal death reported remained between ranges of 40-60 during the entire year under review, except for the month of December.

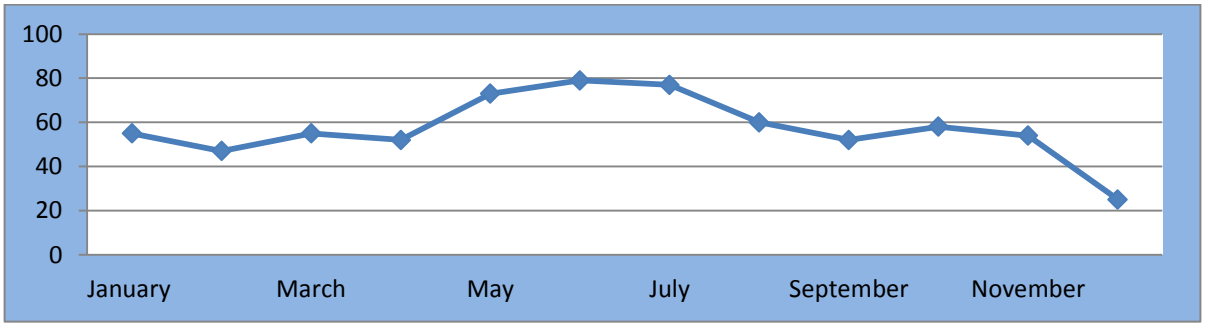

Figure 8: Distribution of Maternal Deaths by Month, Sierra Leone, Jan-Dec, 2016

Of the 706 maternal deaths that were reported, the place of death was known for only 669 records. Of these deaths, 81.8% occurred in a health Facility, and 14.1% occurred in the community. Deaths reported as death in transit to the health facility were 4.2%.

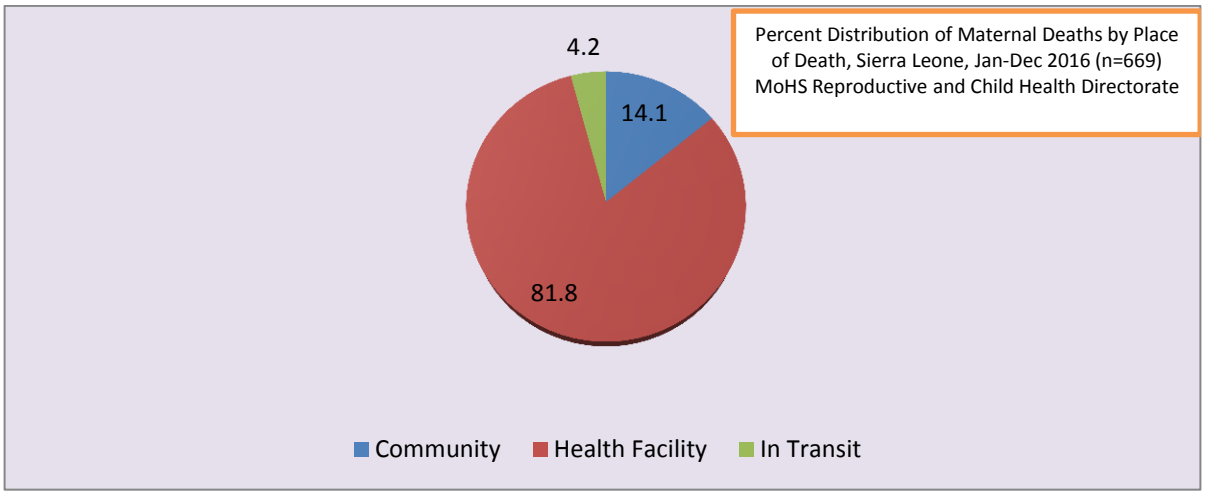

Figure 9: Distribution of Maternal Deaths by Place of Death, Sierra Leone, Jan-Dec, 2016

MDSR reporting showed that most deaths happened in health facilities, but under-reporting of community deaths might have significantly contributed to the variance. Extreme caution needs to be made when interpreting the data as these deaths might represent only 24% of the estimated deaths that occurred in the country during the review period.

As health facilities have made positive progress in reporting maternal deaths, capturing the deaths that had been under-reported in the community will allow a better picture of understanding of the actual place of death. More effort need to be put in place to encourage reporting of maternal deaths at all levels through a multitude of approaches.

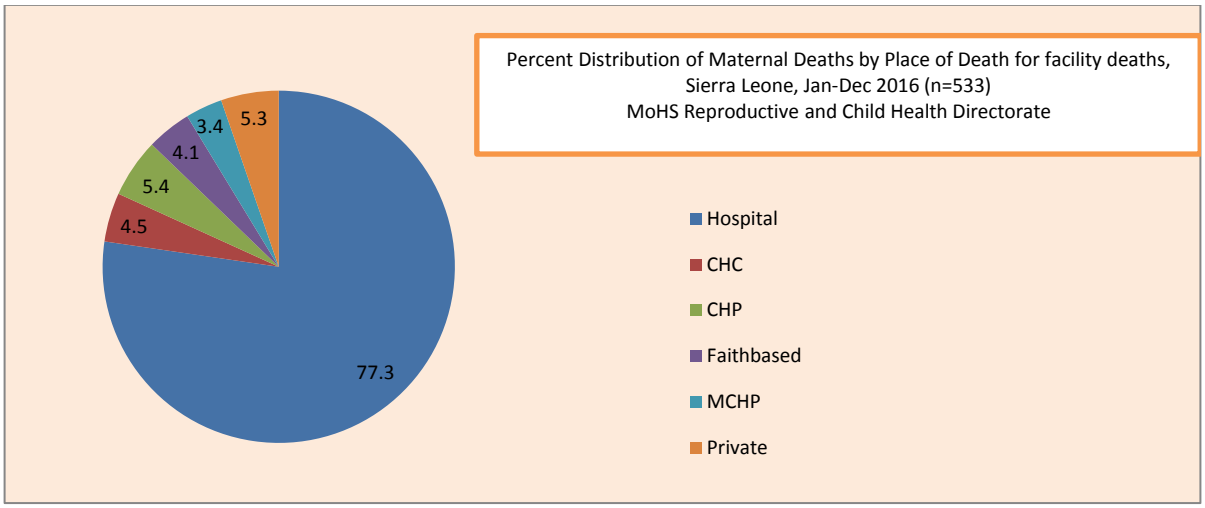

Figure 10: Distribution of Maternal Deaths by level of reporting facility, Jan-Dec, 2016

The above reported maternal deaths indicated that the majority (77%) of the facility deaths occurred in hospitals, while CHC's and CHP's accounted for nearly 10% of the cases. The higher number of maternal deaths reported in hospitals were linked to late referral by PHU's but were also linked to significant quality of care issues that were present in the hospitals.

4.3. Investigation

Any suspected maternal death reported to the RCH unit at the DHMT necessitated the immediate conduct of a death investigation to ascertain and confirm whether or not the death was maternal, as well as to understand the factors associated with the cause of deaths if the death was confirmed as maternal. Maternal death investigation were done by a team from the DPC, RCH and/or Hospitals represented by the DSO, DHS and Midwife Investigator (MI). In each district, the majority of maternal death investigations were done regularly and in a timely manner.

Despite improvements in the area of investigation, challenges like DSO's alone being involved in maternal death investigations, entire MDSR teams going for investigations, and other logistic challenges, likely jeopardized the efforts. In some communities, MDSR investigations were viewed in a negative light, as it appeared to be policing rather than helping the communities avert future deaths from similar circumstances.

Attempts were also made to review investigation reports of all deaths in each district, however, reports were sometimes lost, misplaced, or damaged. Some reports were in good condition, but the level of information filled and made available were very poor - some were missing clinical data from health facilities, there was poor documentation, loss of patient information or records, and lack of ANC cards, to name a few issues. Many of the information in the investigation tools were missing and investigation teams were dependent on health worker verbal autopsies to reach certain conclusions.

Likewise, for deaths occurring in the facility, the investigation was done only in that particular facility and further inquiry to what contributed to the deaths were left unanswered from the referring facility or communities. This caused incomplete investigation processes in many cases. There were also challenges from knowing the correct residential address of the households to allow proper investigation.

Despite all the challenges in the health system, the MDSR team put in relentless efforts to understand who, where, why, and when maternal deaths were occurring. They compiled all relevant information and produced a summary report of each maternal death investigated, before the district level MDSR team maternal death reviews. Once the investigation report was completed, certain information from the investigation report was updated on the maternal death line listing which was used to analyse the data for better understanding of risks and contributing factors.

The analysis in this report summarizes the findings from the investigations and provides information on the risk factors for maternal deaths.

4.3.1. Maternal Death by Age

Of the 706 maternal deaths that were reported, 699 had age information captured. Of these, 16.7% were in teenagers. The majority of the deaths were reported in women ages 25-35 years, as that group represented the age range when the largest proportion of women have children in Sierra Leone. Age-specific mortality rates could not be calculated as the DHIS2 does not provide ages for each woman who delivers or made ANC visits in a health facility - only aggregated data for the number of deliveries is reported from each facility. The youngest and oldest ages reported were 14 and 48 years respectively, with a median age of 27 years.

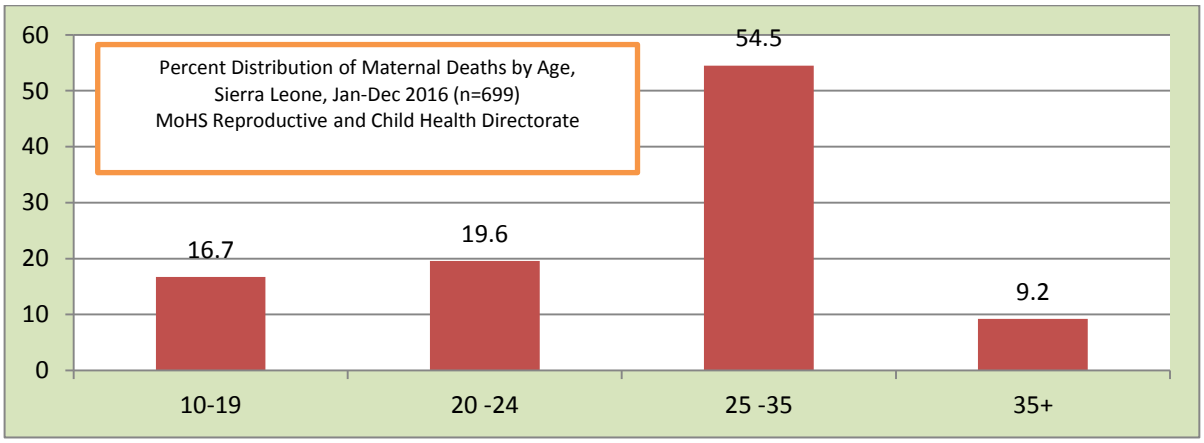

Figure 11: Distribution of Maternal Deaths by age, Jan-Dec, 2016

4.3.2. Maternal Death by Gravidity

A review of the obstetric history of the 571 women with obstetric records showed that nearly 24% of them were in their first pregnancy. Twenty-five percent of them were grand multigravidas, having more than five pregnancies.

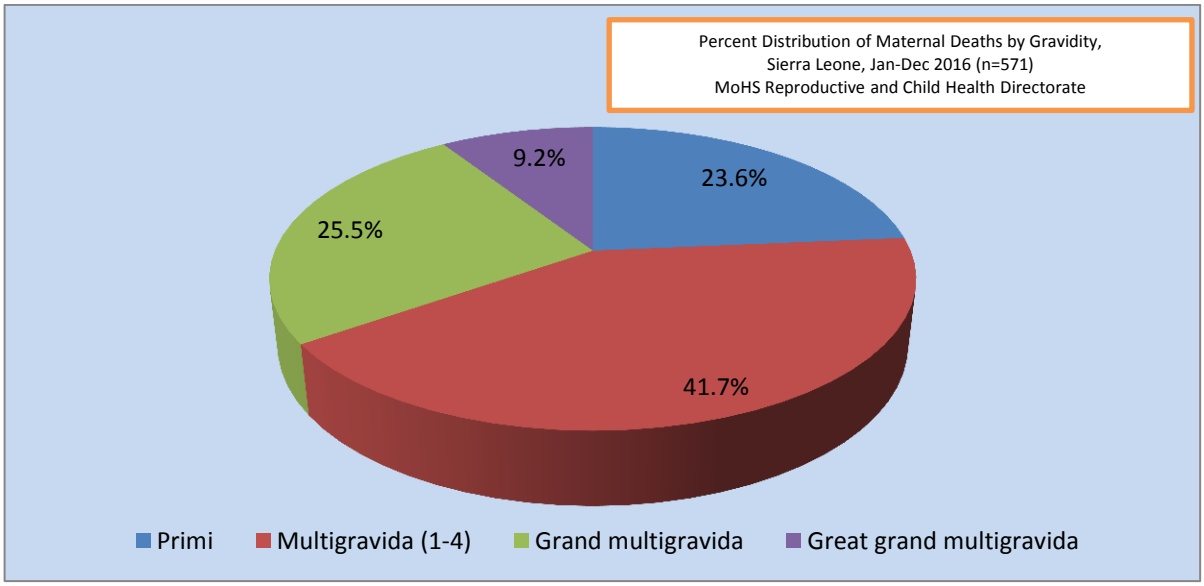

Figure 12: Distribution of Maternal Deaths by gravidity, Jan-Dec, 2016

4.3.3. Maternal Death by Parity

Parity was recorded in only 475 maternal deaths. As the graph below shows, the majority of the women who died were multiparous. Of the 475 Mothers who died during the review period,

52.2% of them were multiparous and 19% were primiparous.

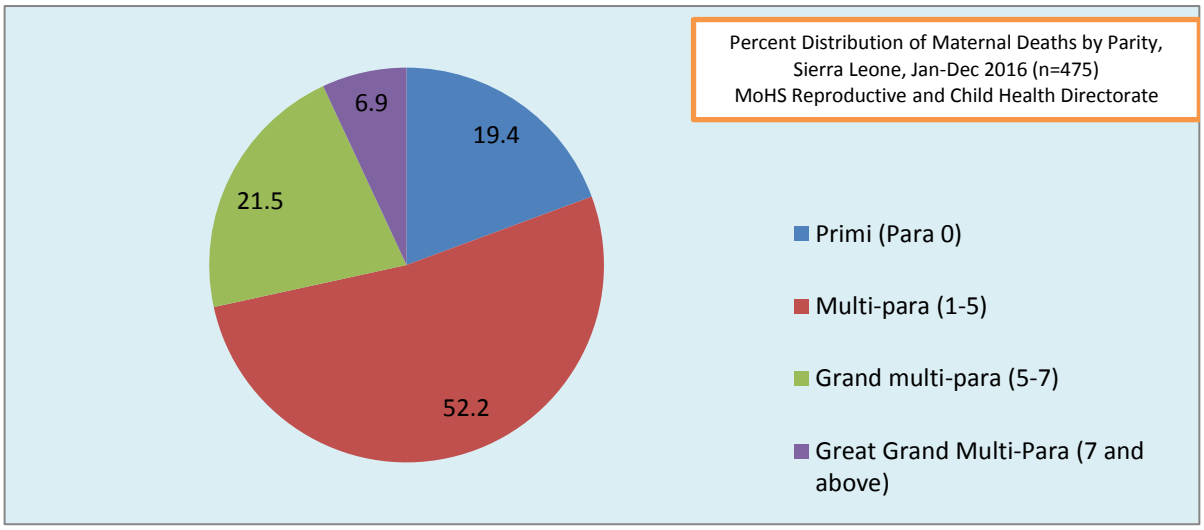

Figure 13: Distribution of Maternal Deaths by parity, Jan-Dec, 2016

4.3.4. Maternal Death by ANC

The top three priorities for the reduction of maternal mortality ought to be universal access to family planning services, quality antenatal care and skilled attendance at every birth, and prompt access to emergency obstetric care when the need arises. Antenatal care services contribute immensely to newborn survival. Access to antenatal care services will contribute to the prevention of maternal deaths, but the impact on the reduction in maternal mortality depends on how well health workers screen for and manage pre-eclampsia/eclampsia, malaria and HIV infection (WHO, 2016).

Of the 389 maternal deaths reported with information about ANC, 86.9% had at least one antenatal visit. Only 13.1% of them did not have any antenatal care during their pregnancy. Twenty percent of the mothers had more than four ANC visits during their pregnancy. More than half of the mothers who died had made at least two ANC visits during their pregnancy.

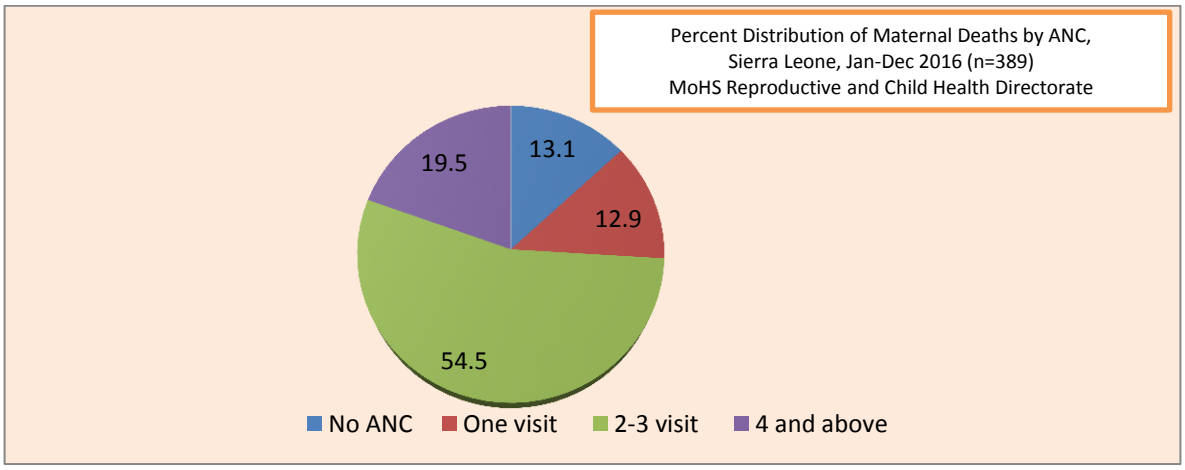

Figure 14: Distribution of Maternal Deaths by ANC visits, Jan-Dec, 2016

Extreme precaution needs to be taken in interpreting the above result as it does not nullify the need and impact of ANC on maternal and neonatal outcomes. This analysis is based on the reviews of the mothers who died during their pregnancy; and is not attempting to make comparisons with the mothers whose lives were saved as a result of the routine ANC programs.

This observation doesn't indicate that ANC programs are failing to save the lives of mothers; however, it indicates the need for an evaluation of the quality of care provided during ANC visits, as well as the adherence of women to positive health practices encouraged during their antenatal visits.

4.3.5. Maternal Death by Stages of Pregnancy

Further evaluation of maternal death by the stage of pregnancy was performed in order to better understand causes of mortality, and better tailor future interventions. A significant proportion of the mothers (62%) died after delivery, 29% died during pregnancy, and 8% died during delivery.

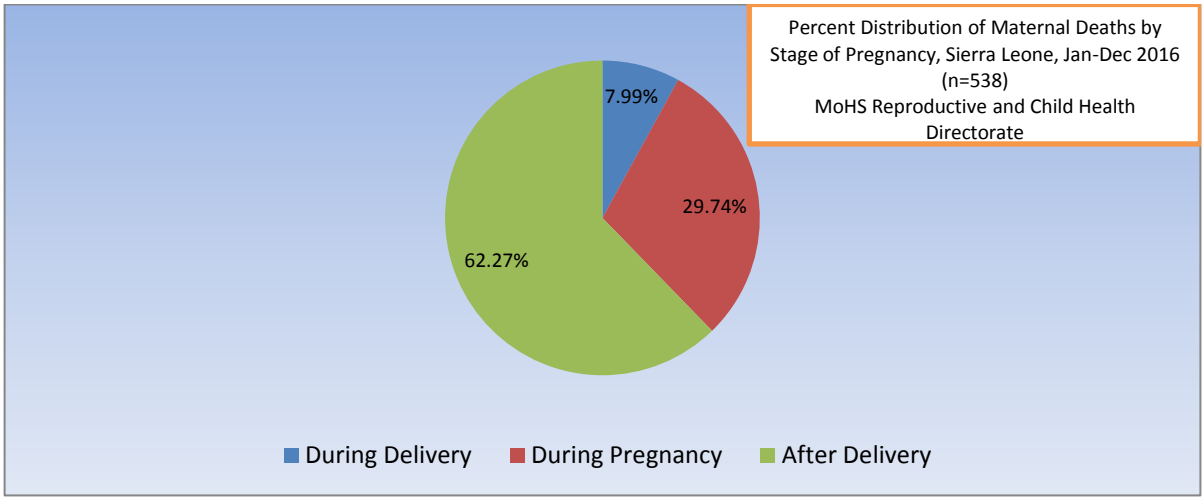

Figure 15: Distribution of Maternal Deaths by Stages of Pregnancy, Jan-Dec, 2016

4.3.6. Maternal Death by Mode of Delivery

Of the maternal deaths reported during the review period, 391 records had information about the mode of delivery. Of these 391 maternal deaths, nearly 67.6% died after spontaneous vaginal deliveries (SVDs), and 29.9% died after caesarean sections. Very few women (2.5%) delivered by assisted vaginal delivery methods. In 2013, 2.9% of women in Sierra Leone delivered by caesarean section (DHS, 2013). The proportionately high number of deaths after caesarean delivery in this report indicates that further evaluation of the circumstances around caesarean delivery is indicated, and that emphasis needs to be given towards improving pre-operative and intra-operative procedures, and post-operative monitoring for caesarean sections.

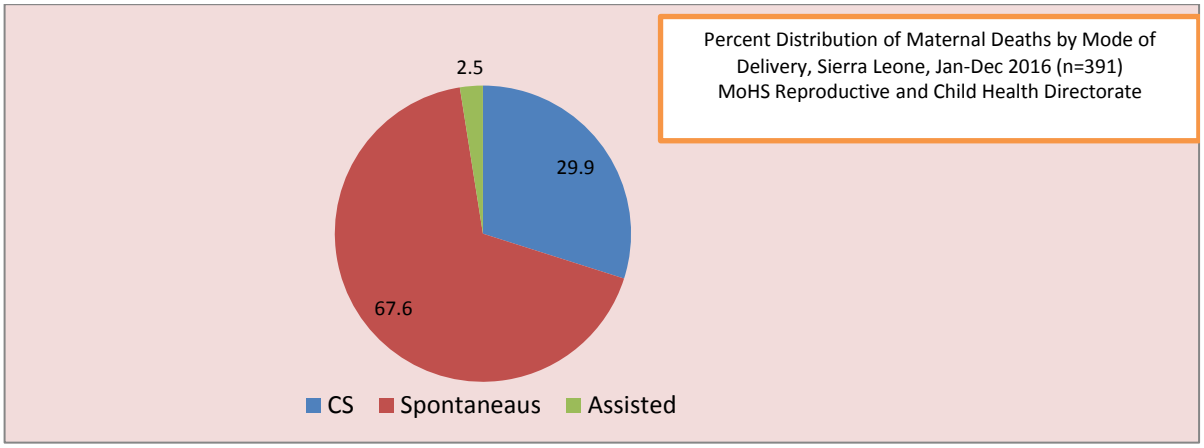

Figure 16: Distribution of Maternal Deaths by mode of delivery, Jan-Dec, 2016

Evaluation of the average length of stay in hours in the facility provides an understanding of the time frame available for interventions to save the lives of women when they get to the facilities. The data was obscured by the inconsistent understanding and use of the definition of death on arrival that hugely affected the hospital documentation. Some deaths that were considered death on arrival were not documented or reported at the facility. In this report 26% of maternal deaths were reported as death on arrival.

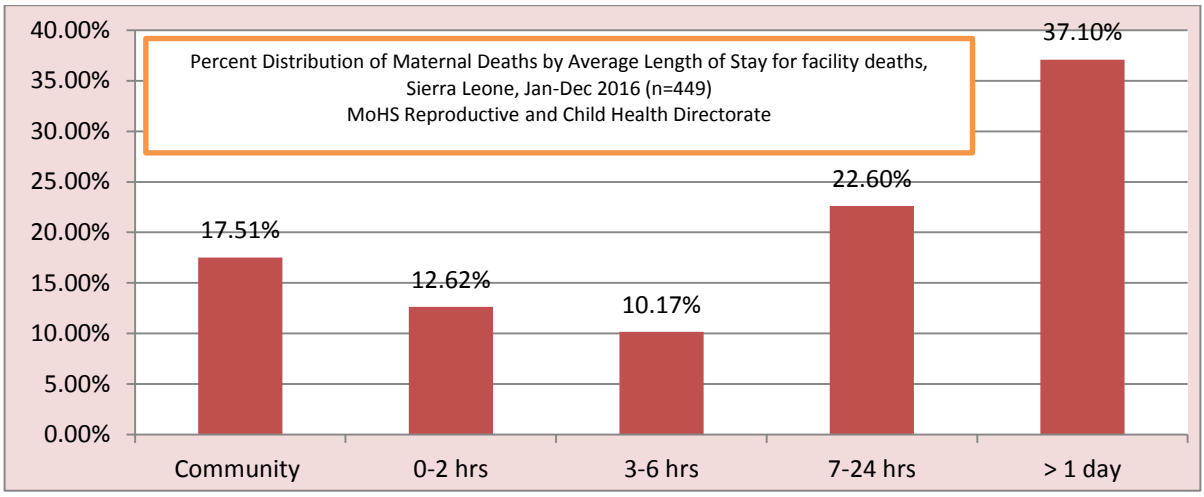

Figure 17: Distribution of Maternal Deaths by average length of stay, Jan-Dec, 2016

In the above graph, community death is included to reflect how many died before reaching to the facility. As the graph above indicates, more than 60% of the reported maternal deaths had stayed in the facility or were admitted for more than seven hours. This demonstrates that a large proportion of deaths were happening within the window of opportunity where they could have been saved. More than 37% of those who died were admitted for more than 24 hours, indicating that the hospitals or EmONC centers might be facing serious challenges in their ability to promptly respond to obstetric emergencies. Essential measures need to be taken to ensure that the hospitals are prepared to urgently triage and provide prompt treatment for obstetric emergencies and other major maternal complications at all times.

The graph below illustrates the patterns of death in the hospitals over a 24 hour span of the day. Deaths start to increase after 10:00 reaching a peak in the afternoon between 2:00 and 6:00 o'clock. The risk of death was below 8% during early morning hours and it constantly remains above 8% after 10:00 O'clock. Though it was not possible to determine the contributing factors for this variation, it might be linked to change of shift and rotation of staff, limited supervision, and issues with handovers.

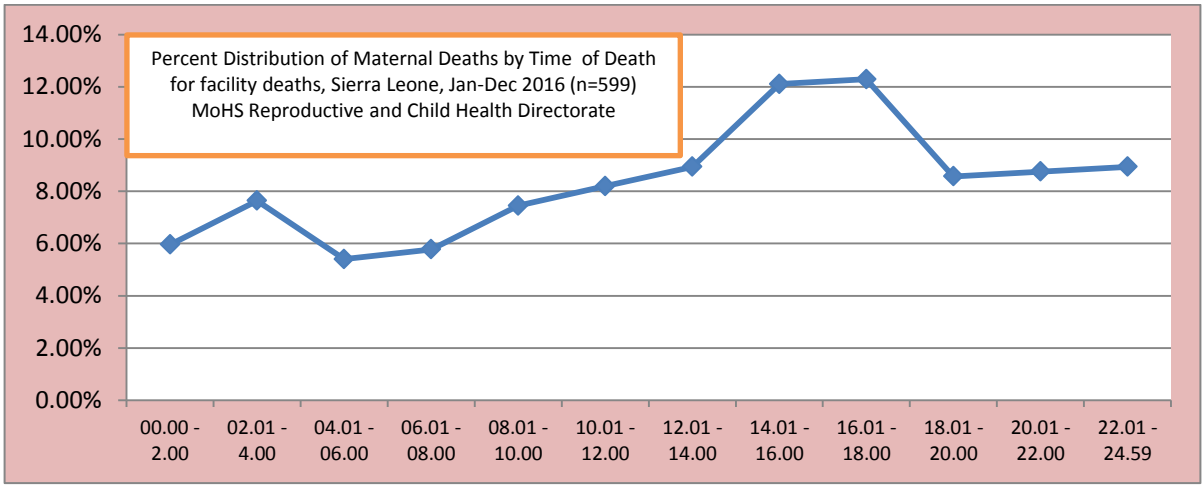

Figure 18: Distribution of Maternal Deaths by level of reporting facility, Jan-Dec, 2016

4.4. Review

Maternal Death Review (MDR) meetings were done by the district MDSR committees during their regular monthly meetings as well as on an ad hoc basis depending on the number of maternal deaths to be reviewed. The reviews were usually initiated by the MDSR coordinator after compiling the investigation report of all maternal deaths that are pending reviews. Ninety-five percent of maternal deaths were investigated and reviewed in an MDR meeting during the reporting period.

The reviews make an in-depth analysis of the causes and circumstances contributing to the death of the pregnant mother which largely depend on the findings of the investigation report. The team will also further analyse the delay factors that contributed significantly to the loss of that particular mother in order to drive specific, measurable, attainable, realistic and time bound (SMART) recommendations that address amenable factors, as well as communicate key actions to the different stakeholders. The expectation is that the majority of the recommendations need to be tailored towards addressing quality of care associated with 3rd delay, as that specifically covers issues in the health sector that can be urgently addressed by committee members.

The MDSR committee regularly monitors the implementation of recommendations and action points so as to better understand the reasons for the maternal death in order to reduce maternal deaths. The MDSR committee members aim to ensure that more that than 80% of their recommendations are implemented within the specified time period. Though a lot had been done during the review period, numerous challenges continued to affect the system to bring about a meaningful impact on maternal deaths.

Understanding the cause of death classification using the WHO standard was a major issue in the recording of accurate maternal mortality data. The WHO International Statistical Classification of Diseases and Related Health Problems, 10th edition (ICD-10), defines maternal death as 'the death of a woman while pregnant or within 42 days of termination of pregnancy, irrespective of the duration and the site of the pregnancy, from any cause related to or aggravated by the pregnancy or its management, but not from accidental or incidental causes (WHO 1992).

According to this standard, maternal deaths are subdivided into 2 categories: direct and indirect causes (Table 5). These categories divide the maternal deaths into those that result directly from complications of pregnancy or its management (direct) and those that are due to pre-existing or inter-current disease but where the disease progression was influenced by pregnancy (indirect). Deaths considered to be unrelated to pregnancy are classified as 'incidental'.

Table 5: Definitions of maternal death categories (WHO ICD-10)

Type of death	Definition
Direct maternal deaths[(a)]	Those resulting from obstetric complications of the pregnant state (pregnancy, labour and puerperium) from interventions, omissions, incorrect treatment or from a chain of events resulting from any of the above
Indirect maternal deaths[(a)]	Those resulting from previous existing diseases or diseases that developed during pregnancy, and which were not due to a direct obstetric cause, but were aggravated by the physiologic effects of pregnancy
Incidental maternal deaths	Deaths from unrelated causes, which happen to occur in pregnancy or the puerperium
Unclassifiable maternal death	Maternal death that were not possible to determine from the MDR

Understanding the above standard definition for classification of cause of Maternal Deaths, the data under review were checked for quality and consistency. Many causes of deaths determined by the district MDSR committees were incorrect, and necessitated the intervention of the RCH directorate to re-classify the cause of maternal deaths due to data incompleteness and misclassification.

The MDSR committees were responsible for developing actionable and SMART recommendations after each of the maternal death reviews. Attempts were made to review the recommendations developed by the committees and it was noted that majority of recommendations were vague, not action oriented, not measurable, not time bounded, and that they did not follow the delay models. This hampered the quality monitoring of high impact interventions that could have been solicited from the MDR findings. The model also checked systemic factors if the death was linked to human error, lack of a supportive environment, and late referrals etc., to help tailor strategic interventions.

The MDSR committee also reviews and checks the system to learn lessons and improve the way notification, investigation, reviews and responses are communicated, monitored and followed up. However, attempts were not always made to learn from and amend practice patterns that routinely hamper the overall MDSR processes and systems which might be attributed to lack of uniform understanding of the processes by the entire MDSR team members.

4.5. Causes of Maternal Deaths

During the period under review, a total of 668 maternal deaths were reviewed and attempts were made by the MDSR team to determine the cause of deaths. Bleeding and eclampsia were the top 2 causes of maternal deaths. Of those whose causes of deaths were determined, it was observed that more than 32% of them died of postpartum haemorrhage (PPH) followed by pregnancy induced hypertension (PIH) (16%). Forty-five percent of the maternal deaths were caused by all types of bleeding including abortion. Although anaemia is not a direct cause of maternal deaths, the team attributed anaemia as the cause of 12% of the maternal deaths.

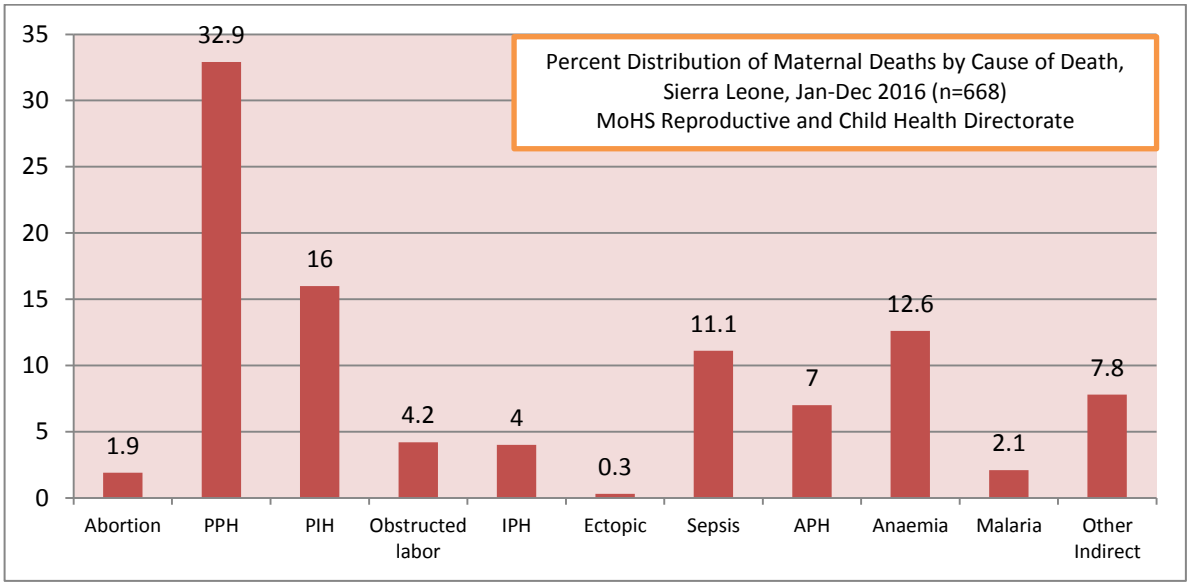

Figure 19: Distribution of Cause of Maternal Deaths, Jan-Dec, 2016

Comparison was made to assess the leading causes of death by districts. It was observed that PPH was the leading cause of death in each district except Kono and Kambia where sepsis and anaemia respectively were the causes of death. On contrary, more deaths from abortion, PPH, APH and anaemia were reported in Western Area which might be due to presence of a tertiary referral centre as well as the high number of maternal deaths reported compared to other districts (See Table 6).

Table 6: Percent distribution of maternal deaths by cause of death and district, Jan – Dec 2016

District		Cause of Death											
		Abortion	PPH	PIH	Obstructed labour	IPH	Ectopic	Sepsis	APH	Anaemia	Malaria	Other Indirect	Total
WA	No	5	71	38	0	1	0	6	12	18	5	11	167
	%	3.0%	42.5%	22.8%	0.0%	0.6%	0.0%	3.6%	7.2%	10.8%	3.0%	6.6%	100.0%
	%	38.5%	32.4%	35.8%	0.0%	3.7%	0.0%	8.3%	27.3%	21.4%	35.7%	22.9%	25.4%
Bombali	No	2	15	10	3	4	0	4	1	10	2	5	56
	%	3.6%	26.8%	17.9%	5.4%	7.1%	0.0%	7.1%	1.8%	17.9%	3.6%	8.9%	100.0%
	%	15.4%	6.8%	9.4%	10.7%	14.8%	0.0%	5.6%	2.3%	11.9%	14.3%	10.4%	8.5%
Kambia	No	0	8	7	5	0	0	3	2	12	0	0	37
	%	0.0%	21.6%	18.9%	13.5%	0.0%	0.0%	8.1%	5.4%	32.4%	0.0%	0.0%	100.0%
	%	0.0%	3.7%	6.6%	17.9%	0.0%	0.0%	4.2%	4.5%	14.3%	0.0%	0.0%	5.6%
Koinadugu	No	0	8	5	1	1	0	4	3	8	2	1	33
	%	0.0%	24.2%	15.2%	3.0%	3.0%	0.0%	12.1%	9.1%	24.2%	6.1%	3.0%	100.0%
	%	0.0%	3.7%	4.7%	3.6%	3.7%	0.0%	5.6%	6.8%	9.5%	14.3%	2.1%	5.0%
Kono	No	0	9	7	1	7	0	17	4	0	1	6	52
	%	0.0%	17.3%	13.5%	1.9%	13.5%	0.0%	32.7%	7.7%	0.0%	1.9%	11.5%	100.0%
	%	0.0%	4.1%	6.6%	3.6%	25.9%	0.0%	23.6%	9.1%	0.0%	7.1%	12.5%	7.9%
Moyamba	No	0	8	5	4	1	0	5	0	3	0	0	26
	%	0.0%	30.8%	19.2%	15.4%	3.8%	0.0%	19.2%	0.0%	11.5%	0.0%	0.0%	100.0%
	%	0.0%	3.7%	4.7%	14.3%	3.7%	0.0%	6.9%	0.0%	3.6%	0.0%	0.0%	4.0%
Portloko	No	1	18	4	3	1	0	6	3	2	0	1	39
	%	2.6%	46.2%	10.3%	7.7%	2.6%	0.0%	15.4%	7.7%	5.1%	0.0%	2.6%	100.0%
	%	7.7%	8.2%	3.8%	10.7%	3.7%	0.0%	8.3%	6.8%	2.4%	0.0%	2.1%	5.9%
Tonkolili	No	0	15	3	1	1	1	7	6	3	0	10	47
	%	0.0%	31.9%	6.4%	2.1%	2.1%	2.1%	14.9%	12.8%	6.4%	0.0%	21.3%	100.0%
	%	0.0%	6.8%	2.8%	3.6%	3.7%	50.0%	9.7%	13.6%	3.6%	0.0%	20.8%	7.2%
Kenema	No	3	16	7	5	3	0	5	1	5	2	2	49
	%	6.1%	32.7%	14.3%	10.2%	6.1%	0.0%	10.2%	2.0%	10.2%	4.1%	4.1%	100.0%
	%	23.1%	7.3%	6.6%	17.9%	11.1%	0.0%	6.9%	2.3%	6.0%	14.3%	4.2%	7.5%
Bo	No	1	23	13	4	3	1	7	4	14	1	2	73
	%	1.4%	31.5%	17.8%	5.5%	4.1%	1.4%	9.6%	5.5%	19.2%	1.4%	2.7%	100.0%
	%	7.7%	10.5%	12.3%	14.3%	11.1%	50.0%	9.7%	9.1%	16.7%	7.1%	4.2%	11.1%
Kailahun	No	1	13	0	0	2	0	3	2	7	1	0	29
	%	3.4%	44.8%	0.0%	0.0%	6.9%	0.0%	10.3%	6.9%	24.1%	3.4%	0.0%	100.0%
	%	7.7%	5.9%	0.0%	0.0%	7.4%	0.0%	4.2%	4.5%	8.3%	7.1%	0.0%	4.4%
Pujehun	No	0	5	5	0	1	0	3	2	2	0	8	26
	%	0.0%	19.2%	19.2%	0.0%	3.8%	0.0%	11.5%	7.7%	7.7%	0.0%	30.8%	100.0%
	%	0.0%	2.3%	4.7%	0.0%	3.7%	0.0%	4.2%	4.5%	2.4%	0.0%	16.7%	4.0%
Bonthe	No	0	10	2	1	2	0	2	4	0	0	2	23
	%	0.0%	43.5%	8.7%	4.3%	8.7%	0.0%	8.7%	17.4%	0.0%	0.0%	8.7%	100.0%
	%	0.0%	4.6%	1.9%	3.6%	7.4%	0.0%	2.8%	9.1%	0.0%	0.0%	4.2%	3.5%
Total	No	13	219	106	28	27	2	72	44	84	14	48	657
	%	2.0%	32.9%	16.1%	4.3%	4.1%	0.3%	11.0%	6.7%	12.8%	2.1%	7.3%	100.0%
	%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

Table 7: Percent distribution of maternal deaths by cause of death and mode of delivery, Jan – Dec 2016

		Cause of Death										
Mode of Delivery		**Abortion**	**PPH**	**PIH**	**Obstructed labour**	**IPH**	**Sepsis**	**APH**	**Anaemia**	**Malaria**	**Other Indirect**	**Total**
CS	No	0	30	25	9	17	15	6	13	0	6	121
	%	0.0%	24.8%	20.7%	7.4%	14.0%	12.4%	5.0%	10.7%	0.0%	5.0%	100.0%
	%	0.0%	20.4%	46.3%	64.3%	89.5%	24.2%	33.3%	31.7%	0.0%	25.0%	31.3%
Spontaneous	No	2	113	25	5	2	47	12	28	3	17	254
	%	0.8%	44.3%	9.8%	2.0%	0.8%	18.4%	4.7%	11.0%	1.2%	6.7%	100.0%
	%	66.7%	76.9%	46.3%	35.7%	10.5%	75.8%	66.7%	68.3%	75.0%	70.8%	65.9%
Assisted	No	1	4	4	0	0	0	0	0	1	1	11
	%	9.10%	36.40%	36.40%	0.00%	0.00%	0.00%	0.00%	0.00%	9.10%	9.10%	100.00%
	%	33.3%	2.7%	7.4%	0.0%	0.0%	0.0%	0.0%	0.0%	25.0%	4.2%	2.8%
Total	No	3	147	54	14	19	62	18	41	4	24	386
	%	0.8%	38.0%	14.0%	3.6%	4.9%	16.0%	4.7%	10.6%	1.0%	6.2%	100.0%
	%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%

It is believed that high impact interventions like ANC, Caesarean section, and assisted vaginal delivery, have significant impact on reduction of maternal deaths. However, more than 24% and 14% of those who died of PPH and IPH had undergone caesarean operation. High prevalence of PPH was listed as the cause of death among mothers who delivered spontaneously. Intra-partum haemorrhage was also reported among maternal deaths that had undergone caesarean section compared to that of spontaneous and assisted vaginal delivery.

Table 8: Percent distribution of maternal deaths by age and cause of death, Jan – Dec 2016

Cause of death		Age				
		12-19	20-24	25-35	35+	Total
Abortion	No	3	4	5	1	13
	%	23.1%	30.8%	38.5%	7.7%	100.0%
	%	2.7%	3.1%	1.4%	1.7%	2.0%
PPH	No	20	42	130	26	218
	%	9.2%	19.3%	59.6%	11.9%	100.0%
	%	17.7%	32.1%	35.9%	44.1%	32.8%
PIH	No	23	21	55	8	107
	%	21.5%	19.6%	51.4%	7.5%	100.0%
	%	20.4%	16.0%	15.2%	13.6%	16.1%
Obstructed labour	No	3	7	15	3	28
	%	10.7%	25.0%	53.6%	10.7%	100.0%
	%	2.7%	5.3%	4.1%	5.1%	4.2%
IPH	No	3	4	20	0	27
	%	11.1%	14.8%	74.1%	0.0%	100.0%
	%	2.7%	3.1%	5.5%	0.0%	4.1%
Ectopic	No	0	0	2	0	2
	%	0.0%	0.0%	100.0%	0.0%	100.0%
	%	0.0%	0.0%	0.6%	0.0%	0.3%
Sepsis	No	15	20	34	5	74
	%	20.3%	27.0%	45.9%	6.8%	100.0%
	%	13.3%	15.3%	9.4%	8.5%	11.1%
APH	No	2	9	30	6	47
	%	4.3%	19.1%	63.8%	12.8%	100.0%
	%	1.8%	6.9%	8.3%	10.2%	7.1%
Anaemia	No	31	15	31	7	84
	%	36.9%	17.9%	36.9%	8.3%	100.0%
	%	27.4%	11.5%	8.6%	11.9%	12.6%
Malaria	No	4	2	8	0	14
	%	28.6%	14.3%	57.1%	0.0%	100.0%
	%	3.5%	1.5%	2.2%	0.0%	2.1%
Other Indirect	No	9	7	32	3	51
	%	17.6%	13.7%	62.7%	5.9%	100.0%
	%	8.0%	5.3%	8.8%	5.1%	7.7%
Total	No	113	131	362	59	665
	%	17.0%	19.7%	54.4%	8.9%	100.0%
	%	100.0%	100.0%	100.0%	100.0%	100.0%

The above table revealed that pregnant mothers found within the age range of 12-24 died of PIH, sepsis and anaemia, which accounted for more than 64% of the deaths. PPH was the leading cause of death among women aged 35 years and above which claimed for 44% of the deaths. It was also observed that all causes of deaths were pervasive among the age bracket of 25-35 years.

Table 8: Percent distribution of maternal deaths by ANC visits and cause of death, Jan – Dec 2016

Cause of Death		ANC Visits			
		ANC1	ANC (2-3) visits	ANC4+	Total
Abortion	N	6	2	0	8
	%	75.00%	25.00%	0.00%	100.00%
	%	6.20%	1.00%	0.00%	2.10%
PPH	N	23	60	36	119
	%	19.30%	50.40%	30.30%	100.00%
	%	24.00%	28.70%	49.30%	31.50%
PIH	N	11	31	9	51
	%	21.60%	60.80%	17.60%	100.00%
	%	11.50%	14.80%	12.30%	13.50%
Obstructed labour	N	7	12	3	22
	%	31.80%	54.50%	13.60%	100.00%
	%	7.30%	5.70%	4.10%	5.80%
IPH	N	7	13	3	23
	%	30.40%	56.50%	13.00%	100.00%
	%	7.30%	6.20%	4.10%	6.10%
Ectopic	N	1	0	0	1
	%	100.00%	0.00%	0.00%	100.00%
	%	1.00%	0.00%	0.00%	0.30%
Sepsis	N	6	30	4	40
	%	15.00%	75.00%	10.00%	100.00%
	%	6.20%	14.40%	5.50%	10.60%
APH	N	5	12	7	24
	%	20.80%	50.00%	29.20%	100.00%
	%	5.20%	5.70%	9.60%	6.30%
Anaemia	N	20	31	7	58
	%	34.50%	53.40%	12.10%	100.00%
	%	20.80%	14.80%	9.60%	15.30%
Malaria	N	3	5	1	9
	%	33.30%	55.60%	11.10%	100.00%
	%	3.10%	2.40%	1.40%	2.40%
Other Indirect	N	7	13	3	23
	%	30.40%	56.50%	13.00%	100.00%
	%	7.30%	6.20%	4.10%	6.10%
Total	N	96	209	73	378
	%	25.40%	55.30%	19.30%	100.00%
	%	100.00%	100.00%	100.00%	100.00%

Antenatal care services can effect a reduction in maternal mortality if health workers screen for and manage pre-eclampsia/eclampsia, malaria and HIV effectively during the antepartum period (WHO, 2016). Attempts were made to check correlation between the number of ANC visits and cause of death among pregnant women. The above data revealed that of those who died of PIH, more than 77% had already had at least two ANC visits. Of those pregnant women who died of anaemia and malaria, more than 79% and 65% had at least two ANC visits respectively.

Attempts were made to extract identified contributing factors from maternal death reviews reports of each district. The most common contributing factors identified from the review reports are presented below using the delay model approach.

A. Delay I: Decision to Seek care

- Cultural barriers that limit a woman's autonomy in making decisions including during emergencies

- Other family or household responsibilities that hinders mothers to make timely access to care
- Belief in use of traditional medicines and heavy reliance on TBAs
- Superstition and belief in fate controlling outcome
- Previous bad experiences or lack of trust with health-care system
- Cultural demand for unlimited child bearing
- High female illiteracy rate resulting in low awareness
- Gender inequality and sex discrimination leading to un-empowerment of women, including loss of control over her own body and health
- Poor nutritional practices leading to complications in pregnancy and child birth from high prevalence of anemia, cephalo-pelvic disproportion, micro-nutrient deficiencies etc.
- Poverty at individual and household levels

B. Delay II: Reaching Care – Access Factors

- Geographical isolation and poor road infrastructure especially in rainy season
- Inability to afford transportation when in labor
- Limitations in availability of ambulances
- Lack of emergency preparedness and complication readiness

C. Delay III: Quality of care

According to the review, the majority (67%) of maternal deaths occurred in hospitals and were related to poor quality of care. Key factors related to poor quality of care include:

- Inadequate numbers of skilled doctors, midwives, and nurses at health facilities
- Lack of availability of essential medications and supplies like blood pressure machines, reagents for laboratory evaluation, and other necessary pharmaceutical and non-pharmaceutical supplies at the health facilities and labor wards
- Blood for transfusion and other necessary materials were unavailable at hospital blood banks especially during emergencies
- Limited capacity to promptly handle obstetric emergencies like manual removal of the placenta and assisted delivery
- Limited capacity to perform urgent cesarean section and hysterectomy
- Ineffective mechanisms of referral for obstetric emergencies
- Lack of Standard Operations Procedures or protocols for managing various obstetric conditions
- Poor staff attitude towards patients coupled with inadequate or no supportive supervision
- Poor documentation and use of ANC records, patient care and referral notes
- Knowledge and skills gaps among health care workers

4.6. Preventability of Maternal Deaths

The district MDR report indicated that all maternal deaths reviewed were preventable with:

- Quality antenatal care during pregnancy

- Communities mobilized to develop a preference for facility deliveries
- Skilled intrapartum and postpartum care
- Access to essential surgery like cesarean section and hysterectomy, and safe blood transfusion services
- Prompt referrals for emergencies
- Prompt access to ambulance transport

4.7. Response

All maternal death reviews and findings need to be followed by strategic interventions addressing key concerns of the three delays with especial emphasis on continuous improvement and quality of care that pre-empts maternal deaths from similar causes. Though thorough planning, implementation, monitoring, evaluation, and recommendations need to be consistently checked, monitored and reported, it was impossible to verify the level of implementation of recommendation apart from the verbal reporting of the district MDSR coordinator. It was reported in one of the districts that almost 99% of the recommendation were implemented; however, quality, depth, and coverage of the implementation seriously affected a meaningful impact on reduction of maternal deaths. The following table illustrates examples of some of the recommendations that were drawn from MDR finding as were stated in the MDR minutes.

Table 9: Examples of recommendations from the districts MDSR review meetings, Jan- Dec 2016

Recommendation
• Availability of case definition for pre-eclampsia and eclampsia in facility
• Proper assessment of patient vital signs during ANC visits and while on admission
• Longer stay in hospitals for obstetric complications- Patients discharged too early post-surgery
• Re-evaluation of all BP machine to check if they are working well
• Close monitoring on quality of clinical and nursing care.
• MOHS to ensure availability of ANC cards to ensure follow-up of care for pregnant women during their ANC visit.
• MoHS to institute punitive measures to providers asking for user fees in health facilities.
• The District to advocate for the supply of standard equipment like BP machines.
• The DHS to advise all midwives to be rechecking the BP during physical examination.
• The RCH directorate to look at the case definition of Pre-eclampsia and eclampsia for modification and make available to all PHUs
• The midwife investigator to be exploring other sources of information to get a comprehensive data
• All community deaths should be investigated as early as possible
• A query letter is written to the facility in-charge by the DHMT for not attending the review meeting.
• The DHS to summon the health care providers and understand the reason for not managing the case according to set protocols
• The district to ensure that treatment protocols for obstetric emergencies
• All midwives present to discuss the case with other staff when they go back to their centers
• The district health sisters to map centers with midwives and attach other centers that without midwives
• Conduct technical advisory meeting with staff of the facility and discuss management flow from assessment to implementation of planed treatment.
• The DHS to ensure that all facilities without midwives be linked to those with midwives

As the above recommendations reveals, numerous problems can be detected as they are not SMART enough to monitor and report.

Attempts were made to analyse how MDSR was helping to reduce the overall maternal deaths in the country. The graph below indicated that there was no change in the trend of any of the causes of deaths. More efforts need to be put in place to closely monitor, disseminate and take concrete actions in strengthening case management at national, district and hospital level to have a better impact on maternal deaths.

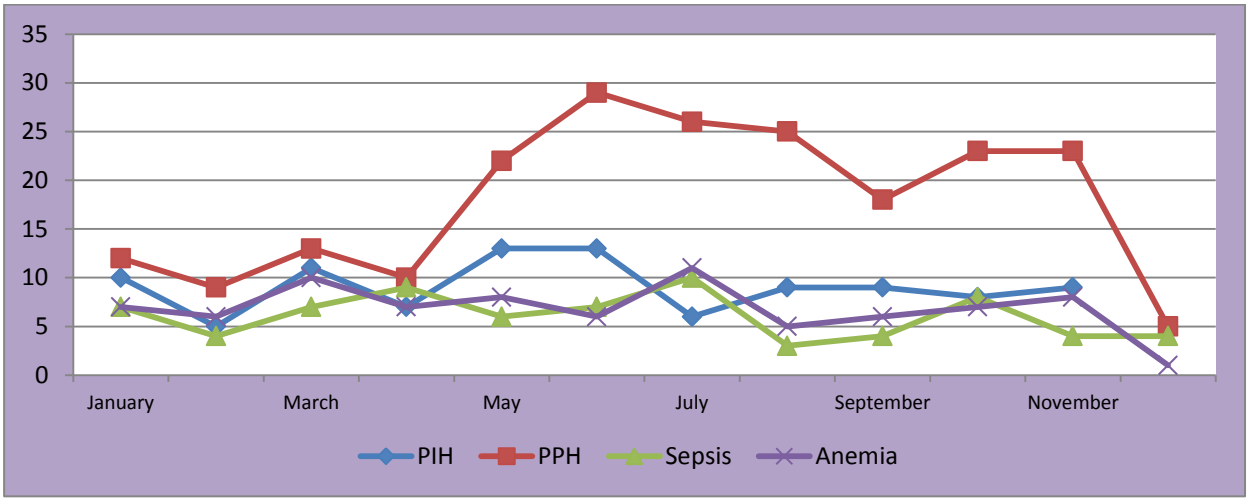

Figure 19: Distribution of Cause of Maternal Deaths by months, Jan-Dec, 2016

5. Challenges

Though multiple challenges affected the institutionalization of MDSR into the national and district health system, positive progress has been made since the development of the national MDSR technical guidelines in July 2015. However, there were challenges in the realization of optimum quality of MDSR program implementation. The main challenges identified are outlined below.

- The level of integration and coordination between CRVS, the 117 call system, DPC and RCH is not strong enough to improve maternal death identification, to allow prompt notification, reporting, data harmonization and validation, as well as to better streamline strategies to address bottlenecks in surveillance, identification, notification, and reporting,
- Notification of suspected maternal deaths were largely dependent on verbal reporting and paper-based notification, and documentation was inconsistently practiced by midwives, IDSR focal persons, and district surveillance officers
- MDSR was not institutionalized in the existing community structures which might have significantly contributed to the under-reporting of maternal deaths in the communities. Communities were not actively involved and not aware of the existing MDSR program in many of the cases.
- Community bylaws linked with punitive measures being developed and enacted by local level stakeholders with aiming goal of improving maternal health outcomes might actually be contributing to the reluctance in reporting of maternal deaths
- Screening of deaths among women of child-bearing age for suspected maternal death was rarely practiced.

- Hospitals were not included in the existing DHIS reporting system and relying on multiple forms of reporting affected the data quality management processes.
- Perception of health workers on matters related to death on arrival hampered the registration, documentation, and reporting of maternal deaths.
- Standard operational procedures and definitions on MDSR addressing need to be developed and disseminated to all health service delivering facility to improve documentation and reporting.
- District MDSR teams were not involved in hospital level MD investigations and reviews, affecting collaboration and partnership by creating unnecessary boundaries and territories within hospitals
- Hospital were not keeping records of investigation reports as well as review minutes which affected their ability to track progress made on MDR findings and to implement recommendations
- Investigations of maternal deaths were significantly jeopardized due to the paucity of clinical and obstetric information as well as the circumstances that contributed to her death. This ultimately affected the maternal death review process and the final diagnosis for causes of deaths.
- The existing excel database for reporting maternal deaths were not incorporated in the existing DHIS system and the old database will need to be replaced with the current tool to improve regular reporting, analysis, and feedback mechanisms.
- The quality of maternal death investigation and reviews were sub-standard
- Deaths that occurred during early pregnancy at facility and community levels continue to be poorly captured and reported. The limited practices in verification of all deaths among women of child-bearing age have significantly contributed to the under reporting of maternal deaths.
- The lack of capacity and non-adherence to standard classification of the cause of maternal deaths using ICD-10 classification significantly affected understanding of the real causes of maternal deaths.
- Due to lack of reporting tools or mechanisms, some indicators were not collected and captured in the existing reporting system. Revision of the existing tools and reporting systems are required.
- Many of the MDR recommendations were shallow and not specific, measurable, attainable, realistic and time bounded (SMART). Most of them were not strong enough to help the health system learn from current MDSR processes and findings affecting implementation and monitoring of outcomes and impact.
- Routine MDSR data analysis, reporting, use, and dissemination of findings were inconsistently practiced, affecting the use of data for decision makings. Regular monitoring of trends of cause of death was not practiced at district, hospital, or the national levels.
- Private sector institutions that were involved in the health delivery system were not included in the MDSR system.

6. Conclusion

Despite the challenges, roll-out of the MDSR system in Sierra Leone played a critical role in laying the foundation for reducing maternal mortality in the country. The Ministry of Health and Sanitation has responded to lessons learned from the MDSR roll-out to institute strategies to make MDSR a viable tool for informing strategic decisions for maternal death reduction. The MDSR system is being strengthened to remove barriers and bottlenecks, and focus on strategic priorities that will allow a meaningful impact on maternal health outcomes in Sierra Leone.

Strategic direction to strengthen the MDSR system at national, district, hospital, and CHC levels will be continued through capacity building, regular supportive supervision, exchange visits, and monitoring and evaluation. The scale and depth of implementing partner involvement will be strengthened both at national and district level in a pragmatic and systematic fashion.

Under-reporting and community involvement were one of the major areas of weakness that were noted as challenges in the existing system. A stronger collaboration with the health promotion directorate of the MOHS, intensifying community sensitization and involvement of communities during investigation and reviews, and improvements in communication and feedback will all be further strengthened.

The quality of investigations and reviews will be improved, and attempts will be made to involve the national MDSR committee members in some of the reviews done at hospital and district levels. Health workers will also be supported to improve documentation practices through regular supervision, mentoring, coaching, and training. ICD-10 training will be conducted nationally, so that all health workers who care for pregnant women can accurately classify maternal deaths.

Efforts will be made to institutionalize regular monthly data collection and analysis at the national, district, and hospital levels. The national MDSR committee members will also be reactivated and continuous oversight of the system will be made through regular meetings called by the Director of Reproductive Health. As review recommendations were not routinely communicated and disseminated well, efforts will be made to ensure periodic review and wider dissemination of results and recommendations to various stakeholders at all levels.

Under the guidance of the Director of Reproductive Health, the national MDSR committee will be charged with facilitating, tracking, and monitoring the recommendations summarized in this document, to ensure a unified and coordinated effort to combat maternal mortality. Specific solutions to areas of deficiencies noted in the MDSR system have been proposed in the tabulated response section of this document, with responsibility delegated to stakeholders who are expected to provide solutions by the agreed upon timelines. A concerted effort from communities, community leaders, local councils, Paramount Chiefs, government leaders, clinicians, DHMTs, and implementing partner organizations is needed in order to achieve substantial reductions in maternal mortality in Sierra Leone.

The findings from the 2016 MDSR report will be used to guide action towards decreasing the maternal and perinatal mortality in Sierra Leone. Emphasis will be placed on strengthening antenatal care to ensure the availability of resources to allow provision of quality care for women in

the antenatal period. The MOHS will expand training in emergency obstetrics and newborn care to ensure that health workers are better able to care for women during pregnancy and childbirth. Efforts will be made to strengthen the referral systems, ambulance network, and the availability of essential surgery and safe blood transfusion services to be better able to respond to obstetric emergencies and prevent unnecessary maternal deaths.

7. Recommendations

S.No	Recommendation	Responsible Directorate/Unit/Person	In collaboration with	Due Date
1	The current composition of district MDSR committees needs to align with the national technical guidelines (Composition and number of attendees should be limited to what is specified in the guidelines).	Directorate of Reproductive Health (RCHD)	DMO	30th April 2017
2	The national and district MDSR committee needs to ensure involvement of private sector health service providers in the current MDSR system.	Directorate of Reproductive Health (RCHD)	DMO	30th April 2017
3	Community participation and involvement needs to be ensured by engaging Paramount Chiefs, district councils and other community leaders to integrate MDSR into the existing community structure. These leaders can encourage facility deliveries and improved reporting of suspected maternal deaths from their communities, and discontinue punitive bylaws that hinder community participation in MDSR.	Directorate of Health Education and Promotion and Directorate of Reproductive and Child Health (RCHD)	Paramount Chiefs, District Councils and other Community Leaders	31st May 2017
4	Quarterly review meetings between national and district MDSR committee members needs to be arranged to facilitate exchange of experiences, challenges, and lessons learned	Directorate of Reproductive and Child Health (RCHD)	Partners	31st December 2017
5	The suspected maternal death notification and reporting system needs to be improved through forging strong collaboration and harmonization between IDSR, CRVS and the Call 117 system.	Directorate of Disease Prevention and Control	Directorate of Reproductive Health	30th April 2017
6	All members of MDSR committee need to be trained on best practices and standard operating procedures for MDSR.	Directorate of Reproductive Health (RCHD)	Partners	31st May 2017
7	Clinicians from all hospitals and PHUs who care for pregnant women should be trained in ICD-10 classification of maternal deaths to allow for accurate	Directorate of Reproductive and Child Health (RCHD)	Partners	30th August 2017

	classification of deaths in the MDSR system.			
8	Support for midwife investigators and other MDSR committee members need to be provided through quarterly supportive supervision and on-the-job training.	Directorate of Reproductive Health (RCHD)	Directorate of Hospital	31st December 2017
9	Paper-based notification of maternal deaths as well as regular data validation and verification need to be exercised by IDSR, CRVS, and RCH.	Directorate of Disease Prevention and Control	Directorate of Reproductive Health	30th April 2017
10	Mandatory screening of deaths of all women of reproductive age for suspected maternal death should be institutionalized at both facility and community levels.	Directorate of Hospital and Primary Health Care	Directorate of Reproductive Health	31st May 2017
11	Hospitals and PHUs need to improve documentation of demographic, clinical, and obstetric information in ANC cards, registers, patient note forms, and other clinical documents.	Directorate of Hospital and Primary Health Care and Directorate of Reproductive and Child Health (RCHD)	District Health Management Teams	30th April 2017
12	ANC cards that allow provision of standardized quality antenatal care should be made available and given to every pregnant woman in every location where antenatal care is provided.	Directorate of Reproductive and Child Health (RCHD)	Partners	30th April 2017
13	DHMTs should monitor the adequate disbursement ad use of ANC cards at all facilities.	District Health Management Teams	Directorate of Reproductive and Child Health (RCHD)	30th April 2017
14	Maternal death investigation teams need to gather information from various points of contact in the continuum of care, to better understand factors that contributed to the death.	District MDSR Committee	Directorate of Reproductive Health	31st May 2017
15	Documentation of investigation reports in each hospital and district needs to be enhanced.	Medical Superintendents and DMO	Directorate of Hospital and Laboratory, Directorate of Primary Health Care	30th April 2017
16	Documentation of notification reports should be strengthened at facility and district level.	Directorate of Disease Prevention and Control (DPC)	Directorate of Reproductive Health	30th April 2017
17	Documentation and dissemination of maternal death review findings (minutes) should be strengthened.	District Medical Officers (DMO)	District Health Sister (DHS)	30th April 2017
18	All hospitals and clinics need to establish a system of emergency triage	Directorate of Hospital and	Partners	31st December 2017

	and treatment for all pregnant women presenting to their facilities, to ensure that obstetric emergencies are assessed and treated in a timely manner.	Laboratory and Directorate of Reproductive and Child Health (RCHD)		
19	The quality of care to prevent, treat and manage emergency obstetric complications needs to be institutionalized at all levels.	Directorate of Policy Planning and Information (DPPI)	Directorate of Reproductive and Child health (DRCH)	30 September 2017
20	The availability of blood transfusion and other key supplies needed for provision of safe emergency transfusion services needs to be improved.	Directorate of Hospital and Laboratory	NPPU	31st May 2017
21	District and hospital MDSR committee members need to regularly monitor implementation and outcome of the MDSR review findings and recommendations.	Directorate of Reproductive and Child Health (DRCH)	Directorate of Hospital and Laboratory	30 June 2017
22	Baseline rates for maternal mortality and case fatality rates need to be tracked so hospitals can monitor their MDSR progress and outcomes.	Medical Superintendents	Directorate of Reproductive and Child Health (DRCH	31st May 2017
23	The data entry platform for reporting maternal death data on the national DHIS 2 system should be harmonised with the existing case based reporting template.	Directorate of Policy Planning and Information (DPPI)	Directorate of Reproductive and Child Health (DRCH)	30th April 2017
24	Regular data analysis and use of the MDSR line listing for strategic communication and decision making should be done.	Directorate of Reproductive Health and Child health (DRCH)	Directorate of Policy Planning and Information (DPPI)	30th April 2017
25	Conduct operational research to understand the socio-cultural dimension that hinder reporting of deaths	Directorate of Reproductive and Child Health (DRCH)	Directorate of Policy Planning and Information (DPPI)	30th December 2017
26	Conduct intensive surveillance of all maternal deaths in one district or chiefdom to get a better estimate of community maternal deaths and all maternal deaths in a specific area. This information can be used to help validate the accuracy of current maternal mortality estimates and the current MDSR system.	Directorate of Reproductive and Child Health (RCHD)	Partners	31st December 2017

8. References

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