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Assessing risk factors of maternal mortality using community based maternal death review in Koinadugu District, Sierra Leone

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An abstract of

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Abstract

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By **André Gilbert Boredison**

Background:
The 5th Millennium Development Goal (MDG) aspires to reduce by three quarters the maternal mortality ratio (MMR) by 2015. Each day about one thousand women die worldwide because of complications related to pregnancy and childbirth. Developing countries account for 99% of the deaths and have the highest MMR. The vast majority of these deaths would be avoidable if their causes were known. In the absence of good vital registration, measuring causes of maternal mortality is a challenge for most developing countries. Many models of tools, including maternal death review and verbal autopsy, have been used to determine the causes of maternal mortality.

Objective:
This study aims to assess predictors and risk factors of maternal mortality among women in Koinadugu District using the community-based maternal death review model.

Methods:
Verbal autopsy, a quantitative in-depth interview, was used for collecting data at seven chiefdoms. Five of those used CARE's data collection form and two MOHS's form. Primary data were obtained through the interviews with the relatives and close neighbors of the deceased. Secondary data were obtained by reviewing maternity records at primary health units. Inclusion and exclusion criteria were based on the level of involvement of the respondents in providing care during pregnancy, delivery, and after delivery.

Results:
82 maternal deaths were investigated. 48.8% were attributed to direct causes and 42.7% to indirect causes. Hemorrhage (29.3%), eclampsia (12.2%), and anemia (37.8%) were identified as the main causes of deaths. 52.9% of the deceased women were younger than 25 years old and the age range was between 13 and 42 years old. The majority of the deaths (89%) occurred from the third trimester of pregnancy to up to 42 days after birth. The 4 delays were the non-clinical causes of maternal death: recognizing the problem, decision making about seeking medical care, reaching the health care facility, and receiving prompt and appropriate care at the health facility.

Discussion:
This study provides reliable information about maternal death in Koinadugu district. The study reveals the challenges in measuring the cause of maternal mortality in community-based maternal death review. The lack of a second interviewer and a cause-of-death classification system are the major limitations of the study.

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I.   – Introduction

The fifth Millennium Development Goal (MDG 5) is improving maternal health with a target of reducing the maternal mortality ratio (MMR) by three-fourths between 1990 and 2015. While some countries have made substantial progress, several countries in sub-Saharan Africa, including Sierra Leone, have made little or no progress. Accurately measuring progress on MDG 5 is challenging because of poor vital registration systems and inaccurate attribution of cause of death. Accurate methods for measuring maternal mortality are needed that recognize the realities of health infrastructure and communications in countries that are struggling to meet the MDG.

In developing countries with scarce resources, it is very important to have a reliable understanding of causes of maternal death to establish priorities for the interventions. Having knowledge of these factors will help to build a sustainable program at the national, local and community levels. Understanding the determinants of maternal mortality is a complex task, in part because maternal deaths are influenced by many different categories of events or conditions [McCarthy, 1997]. The approach largely used is to identify the sequence of events that leads to maternal death (pregnancy, complication and death) and to make causal pathways between these events with intermediate factors (health and reproductive behavior, health status, access to health services, etc.) and distant factors (socio-economic status). A framework for assessing and analyzing maternal health was developed by UNICEF in 1999 (**Figure 1**).

Figure 1: Conceptual framework for maternal and neonatal mortality and morbidity [UNICEF, 1999]

Maternal and neonatal mortality and morbidity

Outcomes

Congenital factors

Obstetric risks including complications of abortion

Diseases and infections

Inadequate dietary intake

Direct causes

Lack of education, health information and life skills

Insufficient acces to maternity services- including emergency obstetric and newborn care

Inadequate maternal and newborn health practices and care seeking

Insufficient access to nutritious food and essential micronutritients including early and exclusive breastfeeding

Poor water/sanitation and hygiene, and inadequate basic health-care service

Underlying causes

Quantity and quality of actual resources for maternal health - human, economic and organizational - and the way they are controlled

Inadequate and/or inappropriate knowledge, discriminating attitudes limit household access to actual resources

Basic causes

Potential resources: environment, technology, people

Political, economic, cultural, religious and social systems including women status, limit the utilization of potential resources

It is evident that maternal and newborn mortality are determined by interrelated factors such as direct factors defined as proximate (individual level), underlying factors (household, community and district levels) and basic factors (societal) [UNICEF, 1999]. Factors at one level influence other levels. Most maternal deaths are related to obstetric complications – including post-partum hemorrhage, infections, eclampsia and prolonged or obstructed labor – and complications of abortion. Most of these direct causes of maternal mortality can be readily addressed if skilled health personnel are on

hand and key drugs, equipment and referral facilities are available. In addition to the direct causes of maternal mortality, there are a number of underlying factors called indirect causes that contribute to a mother's risk of dying. They include lack of education and knowledge, inadequate maternal health practices and care seeking, and insufficient access to adequate nutrition. Indirect causes are not unique to pregnancy but may be exacerbated by pregnancy and childbirth. Assessing the indirect causes of maternal deaths helps determine the most appropriate intervention strategies for maternal and child health [UNICEF, 1999]. There are also basic factors such as poverty, social exclusion, and gender discrimination that underpin both the direct and underlying causes of maternal mortality and morbidity. The ability of women to command resources and to make independent decisions about their fertility, their health, and healthcare also has an impact on maternal mortality. Where women are afforded a low status in society, their health needs are often neglected, and existing health facilities may not be accessed by women in need. Access to institutional facilities and skilled health personnel at birth are also important factors. Additionally, lack of education and understanding around health-related issues can contribute to delays in seeking care when it is needed or to the inappropriate management of life-threatening pregnancy complications. Many sources reported that maternal deaths mostly occur from the third trimester of pregnancy to the first week after birth.

Poverty undermines maternal health. It can heighten the incidence of direct causes of mortality, such as maternal infections and malnutrition, and discourage care seeking or reduce access to health-care services. It can also undermine the quality of the services provided even when they are available [UNICEF, 1999].

The Demographic and Health Survey in Sierra Leone (SLDHS) estimated 857 maternal deaths per 100,000 live births in 2008 (970 per 100,000 estimated by the World Health Organization), which is one of the highest MMRs in the world. Sierra Leone is considered by WHO to be one of the twenty-three countries in sub-Saharan Africa that

have not made sufficient progress in reducing MMR toward MDG 5. The annual average change in MMR was less than 2% between 1990 and 2008 (WHO, 2010). Without a new approach, the country will not reach the reduction of MMR by three quarters in 2015 (**Figure 2**). As of 2008, the country had not developed strategies for effective interventions nor improved the measurement of maternal mortality and the systems to obtain better information about underlying causes of maternal deaths.

Figure 2: Estimated MMR Globally, sub-Saharan Africa and Sierra Leone for 2000, 2008 and 2015 (source: WHO, 2010)
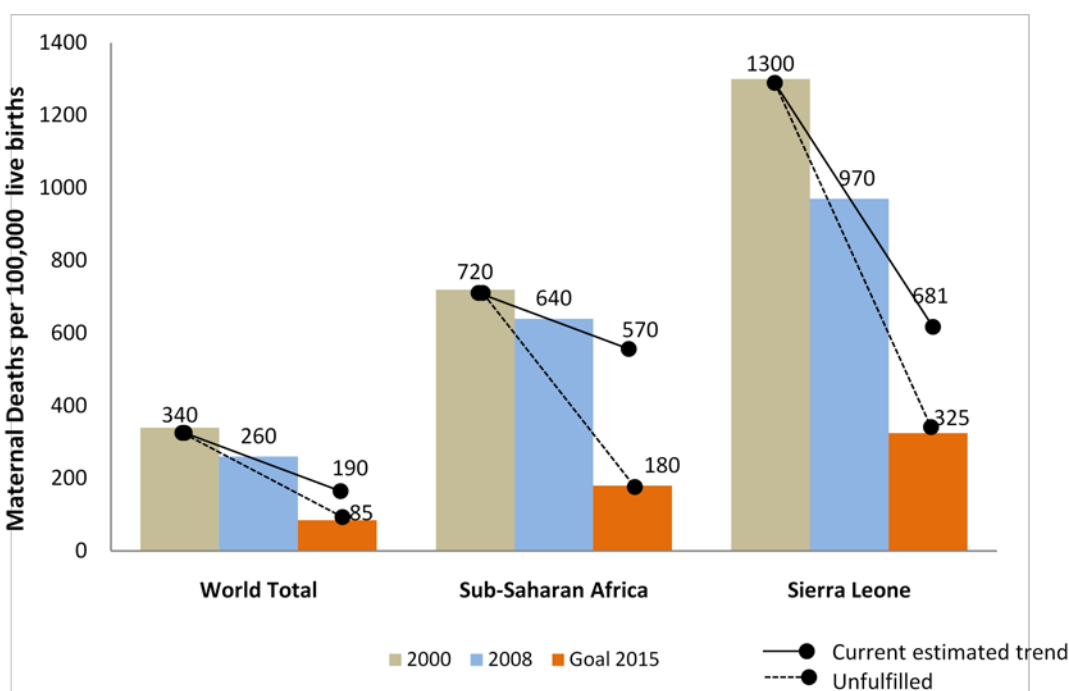
The currently available data on maternal deaths in Sierra Leone are based on the less than 20% of all deliveries in the country that take place in functioning health facilities [MICS, 2005]. While it is known that most of the clinical causes of maternal death in Sierra Leone include complications of pregnancy and childbirth (hemorrhage, anemia, eclampsia, obstructed labor, and unsafe abortion), little is known about the non-clinical causes of maternal deaths. Moreover, when it comes to non-clinical or underlying causes of maternal death, no systematic analyses have been done in Sierra Leone. Thus there is no picture of the reasons behind maternal deaths or the typical pathway to

maternal death. To fill these gaps, the Ministry of Health in Sierra Leone (MOHS), supported by its partners, launched "Maternal Death Review" (MDR) at all levels in the health system in 2008. MDR is a qualitative and quantitative in-depth investigation of clinical, socio-economic and cultural causes surrounding maternal death. CARE Sierra Leone, as one of the MOHS's implementing partners, conducted pilot MDR research in Koinadugu District. This research action pilot program, called LIFT UP, is aiming to inform the MDR process of the MOHS as well as to provide data to policy-makers about the causes of maternal mortality.

This paper presents results from quantitative data collected during the implementation of the pilot community-based MDR. The recommendations are supported by the review of the qualitative findings. A literature review was conducted and the methodology used for collecting data is described in the methods chapter. The next section discusses the use and limitations of the community-based MDR approach, with an emphasis on the importance of scaling up and sustaining effective maternal health programs.

The goal of this study is to assess predictors and risk factors of maternal mortality among women in Koinadugu District, Sierra Leone.

Specific aims:

- To identify why women are dying from pregnancy-related factors using two data separate sources (CARE and MOHS).
- To assess the capabilities of the service providers and determine the use of the service providers related to cost, socio-cultural barriers, distance and accessibility (4 delays).
- To assess the reliability of the community-based MDR method.

II.   – Literature review

Maternal death, as defined in the *International Statistical Classification of Diseases and Related Health Problems, Tenth Revision* or (ICD-10), 1992, is the death of a woman while pregnant or within 42 days of termination of pregnancy, irrespective of the duration and site of the pregnancy, from any cause related to or aggravated by the pregnancy or its management but not from accidental causes [WHO, 2005].

This universal definition requires "cause-of-death" information so that incidental causes can be excluded [Graham et al., 2008]. Incidental causes include deaths unrelated to a pregnancy, also termed non-obstetrical maternal deaths, e.g. deaths from violence against women or injuries. Late maternal death, excluded in the definition above, is the death of a woman from direct or indirect obstetric causes more than 42 days but less than one year after termination of pregnancy.   Factors that contribute to a higher risk of maternal mortality can be divided into two groups based on their causes as direct or indirect.

Direct causes:

Direct obstetric causes are well recognized and comprise those resulting from obstetric complications, from interventions, incorrect treatment, or from a chain of events resulting from any of the above [WHO, 2005]. Direct causes include hemorrhage, sepsis, eclampsia, obstructed labor and complications of abortion.

Indirect causes:

An indirect obstetric death is defined as death resulting from previous existing disease or disease that developed during pregnancy and which was not due to direct obstetric causes, but was aggravated by physiologic effects of pregnancy [WHO, 2005]. Indirect

causes include such conditions as HIV and AIDS, malaria, anemia and cardiovascular diseases.

The number of maternal deaths in a population is essentially the product of two factors: the risk of mortality associated with a single pregnancy or a single live birth and the number of pregnancies or births that are experienced by women of reproductive age [WHO, 2008]. These numbers are often gathered into one component and allow the calculation of the maternal mortality ratio (MMR) and the maternal mortality rate (MMRate).

The MMRatio is defined as the number of maternal deaths in a population divided by the number of live births; thus, it depicts the risk of maternal death relative to the number of live births (**Box 1**) [WHO, 2008]. By contrast, the maternal mortality rate (MMRate) is defined as the number of maternal deaths in a population divided by the number of women of reproductive age; thus, it reflects not only the risk of maternal death per pregnancy or per birth (live birth or stillbirth), but also the level of fertility in the population.

Box 1

Maternal Mortality Ratio (MMR) $= \dfrac{\text{Number of Maternal Deaths}}{\text{Number of Live Births}} \times 100{,}000$

Maternal Mortality Rate (MMRate) $= \dfrac{\text{Number of Maternal Deaths}}{\text{Number of Women Aged } 15-49 \text{ years}} \times 100{,}000$

Adult Lifetime Risk of Maternal Mortality (LTR) $= 1 - (1 - \text{MMRate})^{35}$

Proportion Mortality among Deaths of Women of Reproductive Age (PMDF)

$\text{PMDF} = \dfrac{\text{Number of Maternal Deaths in a Period}}{\text{Number of death Women Aged } 15-49 \text{ years in the same period}} \times 100{,}000$

The LTR is defined as the probability of dying from a maternal cause during a woman's reproductive lifespan, and PMDF reflects the contribution of maternal deaths to overall mortality among women of reproductive age. Because it is expressed in terms of the

course of a female's life, the lifetime risk is often preferred to the MMR or MMRate as a summary measure of the impact of maternal mortality. [John Wilmoth, 2008]

Ascertaining progress in the efforts to reduce maternal mortality is problematic because maternal mortality is difficult to measure and rare [AbouZahr et al., 2001]. Maternal deaths may be underreported in countries that lack good administrative statistics or where many women give birth outside the formal health system. The registration systems are known to routinely fail to identify correctly a proportion of maternal deaths [Atrash et al., 1995]. The deaths most often misclassified in routine reporting include those associated with abortion (especially where it is illegal); early pregnancy deaths (resulting from ectopic or molar pregnancy); indirect maternal deaths (e.g. due to malaria, anemia, tuberculosis, hepatitis, or cardiovascular disease); and deaths that occur sometime after the end of pregnancy, especially where the death occurs in a non-obstetric hospital ward, for example, or in an intensive care or other specialized unit [Turnbull et al., 1989]. Previous studies of maternal mortality suggested that only 56% of women in developing countries are attended in childbirth by a trained midwife or doctor. So, the use of the MMR as the sole indicator of maternal mortality is no longer considered appropriate in settings where survey techniques have to be used [AbouZahr et al., 2001].

In countries that are less statistically developed, errors in both numbers of deaths and attribution of cause may result in misclassification measures of maternal mortality when derived from vital registration. Even if such deaths were recorded, the woman's pregnancy status may not have been known, and the death would therefore not have been reported as a maternal death even if the woman had been pregnant [WHO, 2005]. The identification of the true numbers of maternal deaths may require additional special investigations into the causes of deaths. There are a variety of approaches used to estimate MMR: civil registration, household surveys, sisterhood methods,

reproductive-age mortality studies (RAMOS), verbal autopsy, and censuses. Each of these methods has limitations in estimating the true levels of maternal mortality (**Box 2**).

Box 2: *Approaches for measuring maternal death* [adapted from WHO, 2005]	
Civil registration systems	This approach involves routine registration of births and deaths. Ideally, maternal mortality statistics should be obtained through civil registration data. However, this approach can lead to misclassification in the absence of active case-finding.
Household surveys	Where civil registration data are not available, household surveys provide an alternative method. Limitations of household surveys may include misclassification of maternal deaths. They require large sample sizes, which are expensive and may create uncertainty (wide confidence intervals).
Sisterhood methods	Sisterhood methods obtain information by interviewing a representative sample of respondents about the survival of all their adult sisters (to determine the number of ever-married sisters, how many are alive, how many are dead, and how many died during pregnancy, delivery, or within six weeks of pregnancy). The Demographic and Health Surveys (DHS) use a variant of the sisterhood approach (direct sisterhood method). This approach reduces the sample size, but wide confidence intervals remain a problem.
Reproductive-age mortality studies (RAMOS)	This approach involves identifying and investigating the causes of all deaths of women of reproductive age in a defined area/population by using multiple sources of data (e.g. interviews of family members, vital registrations, health facility records, burial records, traditional birth attendants). This approach provides a fairly complete estimation of maternal mortality (in the absence of reliable routine registration systems) and could provide sub-national MMRs. Limitations of RAMOS may include an underestimation of maternal mortality.
Verbal autopsy	This approach is used to assign cause of death through interviews with family or community members where medical certification of cause of death is not available. Records of births and deaths are collected periodically among small populations (typically in a district) under demographic surveillance systems maintained by research institutions in developing countries. Misclassification of maternal death may characterize this approach because it fails to identify the cases with early pregnancy (e.g. ectopic, abortion-related) or deaths caused by indirect causes (e.g. malaria).
Census	A national census, with the addition of a limited number of questions, could produce estimates of maternal mortality; this approach eliminates sampling errors (because all women are covered) and hence allows trend analysis. This approach allows identification of deaths in the household in a relatively short reference period (1–2 years). The limitation is that it is conducted at 10-year intervals.

Most maternal deaths can be averted with known, effective interventions, but countries require information about which women are dying and why, and what can been done to prevent such deaths in the future. Given the difficulty of measuring maternal mortality in countries where resources are limited, the MDR methods have been developed as an alternative approach.

Maternal Death Review – refers to a qualitative and in-depth study of the causes of maternal death with the primary purpose of preventing future deaths through changes or additions to programs, plans and policies. A maternal death review provides a rare opportunity for a group of health staff and community members to learn from a tragic – and often preventable - event. The purpose of a maternal death review is to improve the quality of safe motherhood programming to prevent future maternal and neonatal morbidity and mortality. In 2004, UNHCR and WHO defined two main methodologies for reviewing maternal deaths: community-based Maternal Death Review and facility-based Maternal Death Review.

Community-based maternal death review is a method of finding out the medical causes of death and ascertaining the personal, family or community factors that may have contributed to the death of a woman who died outside of a medical facility.

Facility-based maternal death review is a qualitative, in-depth investigation of the causes of and circumstances surrounding a maternal death at a health facility; the death is initially identified at the facility level, but such reviews are also concerned with identifying the combination of factors at the facility and in the community that contributed to the death and which ones were avoidable

Where MDRs have been implemented, they have contributed to reducing maternal deaths and improving quality of maternal care, especially when the process was supported by political and legislative instruments. In some African countries when MDR has been tested, it is less institutionalized and often done in an ad hoc manner, and reporting is incomplete [Pearson, L. et al. 2009].

As of 2005, only 25 of the 192 countries in the world had a death registration system that was considered of high quality [Mathers et al., 2005]. In this context, the need to seek alternative methods of ascertaining the cause(s) of death is of immense importance. As a

result, verbal autopsies are now widely used to estimate cause-specific mortality and as a tool for disease surveillance [Setel et al., 2005].

In a study conducted in Mexico, 6% of maternal deaths were attributed to infection, while 35% were attributed to hemorrhage. Cause of death was re-examined for the same sample using verbal autopsy, and wide margins were reported. One percent to 19% of deaths were reclassified as deaths due to infections and 14% to 52% were attributed to hemorrhage [Sloan et al., 2001].

Within the health community, attempts are being made to complement facility-based maternal death reviews with verbal autopsies in order to improve the quality of maternal health care. A recent study in Ethiopia identified both facility-based factors (quality of care) as well as community factors (health seeking behavior and lack of transportation) as main contributors to maternal death. When results from maternal and neonatal death reviews are effectively used, they tend to improve the quality of care in maternal and perinatal care, and they also serve as tools to facilitate accountability within the health system and reduce maternal and neonatal deaths.

A study led by E. J. Kongnyuy et al. (2009) in Malawi tried to determine the causes and characteristics of maternal deaths that occurred in health facilities. They analyzed data from 43 cases in 9 hospitals from January to December 2007. The 9 hospitals provide health care service for 2.8 million people, but only 40% of all deliveries take place in hospital. Data were collected from the Maternal Death Review report. The reviews were conducted within 2 months after maternal death. Only deaths which occurred in the health facility were taken into account. Before each review meeting, all information surrounding the maternal death was collected and distributed to the Maternal Death Review Committee. Usually, sources of information included medical records and additional information from family members. During the review meeting, the

committee agreed on the primary cause and the factors that contributed to death. A specific review form was completed.

For the 43 cases, the mean age was 28.6 years (standard deviation = 7.3 years), the median parity was 2 (range = 0 to 11) and the median gestational age was 38.0 weeks (8 to 42). Almost seventy percent (69.8 %) died during the post partum period. The major direct causes identified were PPH (25.6%), postpartum sepsis (16.3%), ruptured uterus (7.0%), APH and eclampsia (4.7% each). Indirect causes identified were HIV/AIDS (16.3%) and anemia (7.0%). Also there were 4 non-clinical factors that contributed to the maternal deaths: health worker factors, administrative factors, traditional birth attendant factors and patient or family factors.

A similar study was conducted by Dumont et al. in Senegal (WHO, 2006). The study aimed to assess the effect of a facility-based MDR with a 12- month baseline and a 3-year intervention period from January 1997 to December 1999. Pregnant women admitted to the Roi Baudouin Hospital or referred within 24 hours by another facility were included in the study. During the study, 153 maternal deaths were recorded. Of these deaths, 91% were associated with avoidable factors. The maternal mortality rate dropped from 0.83 % (baseline) to 0.41% (year 3). However, the overall proportion of avoidable factors did not change significantly. The MMR related to hemorrhage and hypertensive disorder decreased. The authors stated that these changes might be caused by the implementation of specific interventions recommended by the audit committee.

Mbakuru et al. (Oxford University, 1995) stated in their retrospective study performed in Tanzania that MDR reduced the average of MMR from 849 per 100,000 live births for the period 1984 – 1986 to 275 per 100,000 for the period 1987 – 1991.

If used appropriately, health facility MDR is a useful tool to improve obstetrical care in the hospital. It will help the manager and the staff to identify "the avoidable factors"

which contribute to maternal death. However, the cases captured during the review should not be taken as the picture of maternal deaths in general because only 40% of pregnant women delivered in a hospital. The authors pointed out that shortages of staff was also a challenge. Because of an insufficient number of personnel, staffs are always busy or are often transferred to another posting so that it is difficult to have the same persons attend the MDR. Another problem is maintaining anonymity during the review. The review of the case may be seen as blame or judgments against medical staff.

Confidential enquiries into maternal deaths (CEMD) is one of the methods used anonymously to investigate all or a representative sample of maternal deaths occurring at the regional or national level which identifies the number, causes and associated avoidable factors. Confidential enquiries are recognized as a unique tool for collecting relevant information on maternal deaths (Saucedo, 2010). The conclusions of the CEMD are communicated to health staff and decision makers, and an assessment is made regarding (i) the underlying cause of death, (ii) whether the death is a maternal death and (iii) the quality of care provided. Inspired by the UK's CEMD model, other countries have developed such national enquiries, including the Netherlands, South Africa, Australia, and France.

In Tanzania, Sorensen et al. (2010) conducted research to identify clinical causes of maternal deaths at a regional hospital and to describe the reflections of hospital staffs about substandard care. Researchers collected all available information regarding maternal death and then used multiple techniques and sources to retrieve the data: (a) documentation from registers and case files supplemented by (b) participatory observations, and (c) interviews with staff. 108 maternal deaths were registered at the regional hospital between 2004 and 2008 from which 62 cases were included in the CEMD. Data for follow up were collected in 2007 and 2008 for the same period, between July and November. In addition, researchers observed some cases of maternal deaths and conducted in-depth interviews with some health-facility staff members. The

information was categorized under the main clinical causes of death: infections, complications from abortions, PPH, pregnancy-induced hypertension, obstructed labor and "others". Also, researchers estimated the time for the hospital to provide adequate emergency obstetrical care (EMOC). Then each case was assessed by three external reviewers who were consultants in obstetrics and gynecology. The three consultants worked independently, and then matched the findings to determine the causes of maternal deaths.

The study showed that the major clinical causes of maternal deaths between 2006 and 2008 were: infection (40%), abortion (25%), PIH (13%), PPH (12%), obstructed labor (6%) and others (4%). Using the CEMD approach, the external reviewers identified 74% of the cases of major substandard care compared to 26% identified by internal maternal death audits/reviews (MDR). Also, they found that at the regional hospital, the time to provide EMOC ranged between 15 minutes and 24 days with a median of 47 hours.

The reliability of the study was demonstrated by its high record of maternal deaths (85% of all maternal deaths were captured by this study) compared to other methods available. Another advantage of the study is that the majority of deaths in Tanzania happened at hospitals, so the study provided an accurate picture of the actual situation in maternal deaths.

In South Africa, the primary cause of deaths is hypertensive disorders (Moodley, 2010). Of this cause, eclampsia accounted for 55.3% (N=344) of the deaths in the period 2005 - 2007 and cerebral complications for 283 (45.5%). Almost 50% of deaths caused by eclampsia were young women (less than 24 years old), and 53% were primigravidas. Eleven percent of deaths were correlated to major administrative factors. Other factors identified include delay in transport from home to institution, barrier to entry, lack of accessibility, lack of health personnel, and lack of appropriately trained staff.

Many studies suggested that CEMD was more sensitive in identifying substandard care than MDR. This method will only be helpful if the majority of deliveries take place in the hospital.

Community-based MDR (CB-MDR) has never been conducted in a systematic way. However, a study called MADE-IN/MADE-FOR (Maternal Deaths from Informants/Maternal Death Follow on Review) using community informant networks was conducted and tested by IMMPACT team (Qomariyah and al., 2010) in two districts of Indonesia. According to the authors, the approach was developed to allow measurement of maternal mortality at the community level, along with analysis of the cause of death.

MADE-IN used two village informant networks: heads of neighborhood volunteers (NHV) who are responsible for between 10 and 40 households, and health facility volunteers (HFV) who are responsible for about 100 households. Each group was asked to report all deaths of women of reproductive age in the past two years. Two separate meetings were held for the two groups. MADE-FOR consisted of conducting "Verbal autopsy" with the relatives and neighbors of women who died of pregnancy-related causes identified from MADE-IN. The study evaluated the validity and efficiency of the two networks. The study was conducted in 708 villages and 72 sub-district health centers that provide services for 3 million people.

The study found that the NHV estimated more pregnancy-related deaths than HFV (respectively 85 % versus 71 %). Using the MADE-FOR results as the "gold standard", the HFV network is more accurate in identifying pregnancy-related death among women of reproductive age. The proposed approach costs $0.102 per woman-year risk of exposure ($ 0.056 for MADE-IN network and $ 0.046 for MADE-FOR visits). The conclusion of the study emphasized that the MADE-IN/MADE-FOR approach is more

cost effective than other household surveys, such as DHS, as a way to assess maternal mortality.

However, the tools cannot be used without a preexisting network to record deaths in the community. As the method depends on the memory and knowledge of informants (volunteers and family members), the accuracy of the results depend on the length of recall period and size of the area covered by informants. The authors recommended limiting the recall period to 2 years. Underreporting due to lack of knowledge of first trimester pregnancies or indirect causes and over-reporting of direct causes will be a great challenge for using the verbal autopsy method in MADE-FOR.

Most of the clinical causes of maternal death include complications of pregnancy and childbirth (hemorrhage, anemia, eclampsia, obstructed labor, and unsafe abortion). For each woman who dies, 30 others suffer permanent complications such as fistula and third stage of genital organs prolapsed due to pregnancy and child birth.

While it is essential to know clinical causes of death, non clinical causes are equally as important. But non clinical causes are difficult, if not impossible, to assess using existing methods of determining maternal mortality. For this reason, CARE has developed an innovative approach to assess maternal mortality at the community level called Community-based MDR. CB-MDR focuses on the delays model that identifies individual decision making, access to affordable services, and the provision of skilled personnel.

Phase 1 delay. Delay in decision to seek care

- Failure to recognize complications
- Acceptance of maternal death
- Low status of women

- Socio-cultural barriers to seeking care: women's mobility, ability to command resources, decision-making abilities, beliefs and practices surrounding childbirth and delivery, nutrition and education.

Phase 2 delay. Delay in reaching care

- Poor roads, mountains, islands, rivers.

Phase 3 delay. Delay in receiving care

- Inadequate facilities, supplies, personnel
- lack of training and motivation of personnel
- Lack of finances

Phase 4 delay. Delay in recognizing the problem

This fourth delay is an additional delay from the standard « 3 delays » that CARE wanted to include in their model. It includes lack of knowledge on the part of the woman and her family with regards to maternal health complications.

In practice these four phases of delay rarely operate in isolation, and delay leading to maternal death is often multifactorial. Indeed the factors are likely to be interactive and multiplicative. Thus barriers and poor care encountered at Phase 2 and 3 feed back into subsequent decision-making at Phase 1. Interventions to reduce maternal mortality must address each of the Four Delays in order to have the greatest effect. Thaddeus et al., (1994) stated in their article that while distance and cost are major obstacles in the decision to seek care, the relationships are not simple. There is evidence that people often consider the quality of care more important than cost. These three factors—distance, cost and quality—alone do not give a full understanding of the decision-making process.

The purpose of this thesis is to assess the newly developed method of CB-MDR that CARE initiated and tested in Sierra Leone.

III. - Methods

A. Introduction

The pilot study assessed predictors of maternal mortality among women in Koinadugu District who died as a result of pregnancy-related factors. A verbal autopsy tool was used for collecting data. The study was conducted by the CARE Sierra Leone (CARE SL) LIFT UP research program in collaboration with the Ministry of Health and Sanitation (MOHS) and other NGO partners, including the Medical Research Centre (MRC) and the International Rescue Committee (IRC) from July 2008 to June 2010. The study was designed for Koinadugu district and was undertaken using both quantitative and qualitative methods to gain in depth knowledge of the issues related to maternal death at the community level and the Maternal Death Review (MDR) process.

The desire to introduce MDR was primarily driven by recognition that MOHS did not have a system for keeping track of every maternal death occurring in the country. Documenting the causes of maternal death is critical for the MOHS and other stakeholders to identify appropriate interventions to reduce such deaths. The CARE SL community-based maternal death review used a participatory action research design. The findings of this research will feed into the wider MDR process headed by MOHS. Key structures for CB-MDR are outlined in **Appendix 1**.

B. Study population

A brief description of key trends and determinants will help define the state of maternal health outcomes in Sierra Leone.

Figure 3 - Sierra Leone administrative division
(source World Bank)

Sierra Leone is one of the smallest countries in Africa, covering an area of about 72,000 square kilometers (28,000 square miles) and located on the west coast of Africa. In 2009, the number of inhabitants was estimated to be about 5.7 million [World Bank, 2009]. Sierra Leone is divided into 3 provinces and one Western Area; the provinces are further divided into 12 districts, and the districts are further divided into chiefdoms. The capital is Freetown (in Western area). Over one decade (1991 to 2002), the country experienced civil war which exacerbated hardship and deprivation of social and economic opportunities. It is estimated that 70% of the population is poor, based on the threshold set by the national poverty line.

The study was conducted in Koinadugu district (in Northern Province). The selection of Koinadugu was based on the intensive presence of CARE in the area. Seven chiefdoms in Koinadugu were selected for implementation of the pilot study: Folosaba Dembelia, Sengbeh, Wara Wara Yagala, Kasunko, Dembelia Sinkunia, Neini , and Diang. In 2010, the seven chiefdoms accounted for about 179,425 inhabitants, with pregnant women estimated to be 4.4% of the population.

C.   Study design

Non-probability sampling was used as it allows for selecting the most reliable informant from the study population. The target for the research included all maternal deaths that occurred from January 2008 to August 2010 in the seven chiefdoms selected for the study. Since the sampling units were deceased persons, relatives, family and close neighbors of the deceased were selected as the respondents. Researchers used judgment sampling technique to select participants for interviews. Inclusion was based on how much the respondents were involved in the life of the deceased, so not every family member was eligible for an interview. Additionally, individuals outside of the immediate family members were also interviewed, including traditional birth attendants (TBA) and close friends of the deceased.   These individuals had been involved in providing care or at least were with the deceased up to the point of death.

D.   Data collection

Both quantitative and qualitative data were gathered for the study. Quantitative data were collected by completing a structured questionnaire, known as a verbal autopsy form. The form was developed by Royal Tropical Institute (KIT), in collaboration with CARE, IRC, MRC and the Reproductive Health Directorate of the MOHS. KIT developed guidelines on completing the verbal autopsy form. The MOHS form, known as the case investigation form, was also used to investigate community deaths.

Primary and secondary sources were used to collect data. Primary data were obtained through the interviews using a verbal autopsy questionnaire and focus group discussions. Secondary data were obtained by reviewing maternity records at primary health units (PHU) and Kabala government hospital.

Quantitative data collection

Tool Development: MOHS and CARE SL collaborated in developing tools for the quantitative segment of the research. The first draft of the MDR tool was developed in late 2008 and followed by the second draft one year later (September 2009). These drafts were validated and amended from a series of workshops that were held with the participation of several MOHS departments, NGOs, and UN agencies.

Based on the second version, the MOHS worked with UNICEF to finalize MDR tools, which resulted in the case investigation form and maternal death notification. The case investigation form had a provision for the death summary (which is done by the district MDR committee) and was also designed to investigate both facility and community maternal deaths.

CARE SL also reviewed the second draft of the MDR tools and organized a training of trainers (TOT) workshop for staffs, including MOHS staff. An important output of this exercise was the decision to further streamline the MDR tool into: a) two separate forms- a verbal autopsy form for investigating deaths in the community and a facility-based MDR form to investigate deaths that occur at health facilities; b) a summary tool, which MDR committees at the district and chiefdom levels would be expected to fill out, were further developed for both forms (VA and facility forms) to capture the key information; and c) a notification form.

The main tools used for investigating maternal deaths for this research in CARE SL sites were the verbal autopsy form and the summary form (**Appendix 2**), while in the case of MOHS sites, it was the case investigation form (**Appendix 3**). The VA form collected a range of data on the circumstances of maternal deaths including before labor, during and after labor, and demographic data. The MOHS case investigation form collected data on demographics, antenatal care, delivery and cause of death.

Preparation for Data Collection: Six CARE SL staff with considerable data collection experience were identified to conduct the verbal autopsies. Two CARE SL staff who had participated in the TOT workshop facilitated the training for the six data collectors in July 2010. Training focused mainly on the MDR process and methodology. Key topics covered during the training were: a) overview of MDR concept; b) MDR structures and responsibilities; c) understanding the MDR tools; and d) techniques in conducting interviews and moderating focus group discussions. As a result of the training, the staffs acquired adequate knowledge about the MDR process as well as improved understanding of the various data collection methods used for the study.

On the MOHS side, two data collectors, the Community Health Officers (CHOs), were identified by the District Medical Officer to conduct maternal death investigation in two chiefdoms. The CHOs, who are also zonal supervisors and actively participate in community sensitization exercises on MDR in the district, were initially trained by the Reproductive and Child Directorate with participation from CARE. The training focused on a) overview of MDR concept; b) MDR structures and responsibilities; and c) understanding the MDR tools. One day meeting was organized by CARE in July 2010, whereby plans for data collection were discussed with the MOHS data collectors and the MOHS tools were made available to them.

Collection of Field Data: Structured interviews were conducted at the community level using a questionnaire. The data collection started in August and ended in October 2010. At CARE SL study sites, the VA forms for the 70 maternal deaths reported in the five chiefdoms were completed by the 6 CARE SL staff trained for this purpose. Data collectors explained the purpose of the study and sought informed consent from interviewees before administering the form. In every community, data collectors were accompanied by a representative of the Chiefdom MDR committee to lead researchers into the community. The pigeon English, Krio, which is widely spoken by the majority of Sierra Leoneans, was used. When needed the Chiefdom MDR representative was on
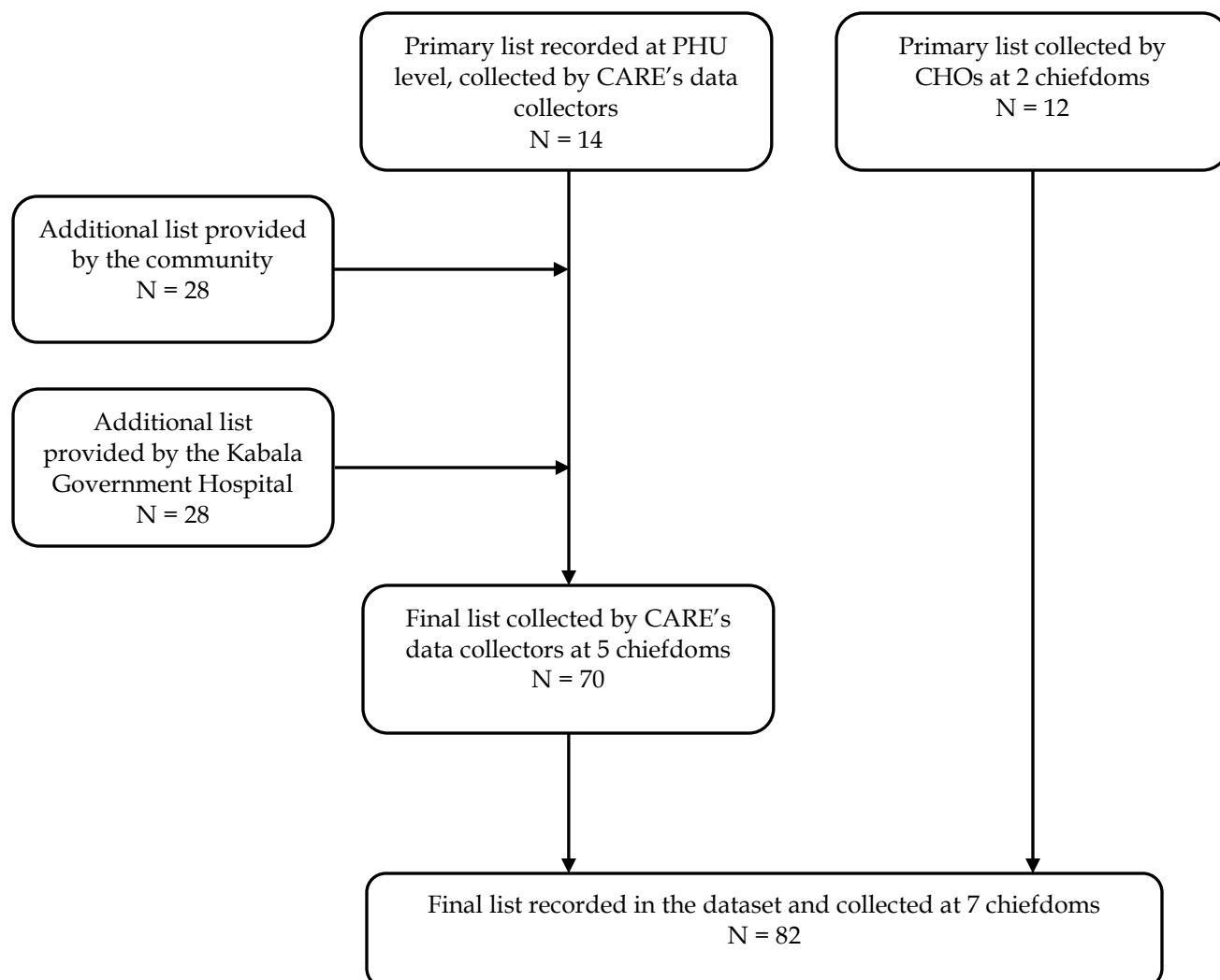
hand to help translate questions to respondents and then translate the response to data collectors. Completed MDR forms were taken to the monthly chiefdom MDR review meetings by CARE data collectors, where the summary form was completed for each death, including recommended actions to be taken at the community level. CARE staff also participated in chiefdom review meetings.

In the two MOHS chiefdoms, the case investigation form was completed by the CHOs. As MOHS data collectors, they first visited the homes of the deceased and identified close persons and relatives (i.e. husband, TBA, sister, nurse, neighbor, grandparents, etc). The community authorities assigned community representatives who assisted the data collectors in reaching the families of the deceased. The data collectors filled out the case investigation form and submitted completed copies to the CARE M & E Officer.

For CARE and MOHS models, investigations were conducted with relatives or people (husbands, TBAs, sisters, nurses, neighbors, grandparents etc.) who were present at the time of death.

Initially, a listing of deaths was obtained from PHUs which then provided an initial sample frame of 14 deaths. These data were followed up in the respective communities. When MDR investigators went into communities, they were told of more deaths that had not been reported to the health facility. Through this, 28 more deaths were listed in the CARE-SL chiefdoms. The Kabala Government Hospital recorded an additional 28 maternal deaths which were also followed up in the communities. Combining all of these, a total of 70 deaths were investigated in the CARE-SL chiefdoms. Meanwhile, a total of 12 deaths were also investigated in the two MOHS chiefdoms. Overall, 82 deaths were investigated for the study and inputted in a data base using the CSPRO Software program.

Figure 4 - Flow chart of data collection for maternal death review, Koindugu District, Sierra Leone, 2010

```
┌─────────────────────────┐          ┌─────────────────────────┐
│ Primary list recorded at │          │ Primary list collected by│
│ PHU level, collected by  │          │ CHOs at 2 chiefdoms      │
│ CARE's data collectors   │          │ N = 12                   │
│ N = 14                   │          │                          │
└─────────────────────────┘          └─────────────────────────┘
```

Primary list recorded at PHU level, collected by CARE's data collectors
N = 14

Primary list collected by CHOs at 2 chiefdoms
N = 12

Additional list provided by the community
N = 28

Additional list provided by the Kabala Government Hospital
N = 28

Final list collected by CARE's data collectors at 5 chiefdoms
N = 70

Final list recorded in the dataset and collected at 7 chiefdoms
N = 82

Qualitative data collection

The qualitative survey was done by a consultant with support from CARE staff. CARE staff prepared the field for the data collection. Question guides were developed for Chiefdom Maternal Death Review Committee (CARE and MOHS separately), District Maternal Death Review Committee, CARE Data Collectors and MOHS Data Collectors. The number of chiefdoms visited was the same as in the quantitative data collection.

The committees are comprised of Paramount Chiefs, selected Chiefs from other communities within the same chiefdom, the Mamie Queen at the chiefdom level, Public Health Unit staff, the Youth Leader, Community Health Club chairperson/Secretary, the Village Development Committee representative, TBA, the Elder community representative (Advisers). The assigned CARE staff in each of the chiefdoms made appointments with the Paramount Chiefs and shared the schedule for the focus group discussions (FGD). The chiefs notified committee members and ensured that they were present for the FGD with support from the CARE staff. Committee members ranged from ten to fourteen.

A total of five FGD were conducted with Chiefdom MDR committees (two in CARE and one in MOHS chiefdoms) and with the District MDR committee. Individual interviews were also held with the District Medical Officer (DMO) and two Data Collectors from DHMT. The DMO is the chairperson of the District MDR committee, but his interview was done separately to have more open discussions with the district MDR committee. The two data collectors are zonal supervisors (Community Health Officers) of Diang and Neini chiefdoms and members of the DHMT. The groups used for the FGD were mixed (males & females), and the total number of participants (both chiefdom and district committee) ranged from ten to fourteen.

The focus group discussions (FGD) and interviews were facilitated by a consultant assisted by CARE staff in note taking and recording. The consultant explained the purpose of the discussions and asked the consent of the participants for their participation in the FGD. He also got permission for the use of a tape recorder and the note taking. As suggested by the participants, a common dialect (Krio) was used, especially in the communities which made communications easy. An interpreter was used in only one FGD in the Diang chiefdom.

E.   Data analysis

This paper focuses only on analyzing quantitative data collected during the implementation of CB-MDR in Koinadugu district. Its main scope is assessing the risk factors and predictors of maternal deaths. Further analysis and discussion are included of all causes to understand their contribution to the deaths either direct or indirect. The validity and reliability of the methods used in collecting the data are also analyzed.

The CARE and MOHS datasets are stored separately in SPSS files.   The main outcome variable was maternal death, and the exposure variables were obstetrical and non-obstetrical causes of death and other contributing factors delaying access to appropriate heath care services.

For a practical reason, the age at death was coded categorically with an interval of 5 years: below 14, 15 – 19, 20 – 24, etc. Descriptive statistics were computed using SPSS software and all ANOVA and multivariate analyses were computed using SAS software.

In order to address Objective One, demographic data and reported causes of death such as socioeconomic status (education, wealth quintile), age at death, and cause of maternal deaths were analyzed together. Whenever it is possible, the comparison was made between the two sources of data (MOHS and CARE).

To address Objective Two, the four phases of delays were scrutinized, and then the association between certain demographic variables and certain behavior risk factors were tested.

And finally, to address Objective Three, the correlations between signs or symptoms and the assigned causes of death were calculated for and between each interviewer.

IV.   – Results

The analysis focused only on quantitative results and mainly on CARE's dataset. The MOHS dataset is used only for comparison. A total number of 82 pregnant women who died between January 2008 and August 2010 was recorded and included in the study. Among those, 70 deaths were collected from CARE's data collection form and 12 from MOHS's (**figure 4**).

Aim number 1: Identifying the risk factors contributing to maternal death

- **Demographic characteristics**

Among the 7 chiefdoms, the most populated were Niene, WWY, Sengbe and Diang. Ten maternal deaths were identified from January to December 2008, 28 deaths from January to December 2009, and 44 from January to August 2010 (**Table 1**). The total includes 12 deaths in 2010 identified in the MOHS chiefdoms (Diang and Niene). The estimated population in 2010 was about 179,425, among which 39,832 would be expected to be women of reproductive age (WRA). Based on this information, the MMRate is estimated to be about 192 pregnancy-related deaths per 100,000 women at reproductive age per year (95% CI: 129 – 255/100,000). The MMRatio is about 958 deaths per 100,000 live births (95% CI: 639 – 1,276/100,000). The adult lifetime risk (LTR) of maternal mortality for women in the population is one in 15, i.e. for every 15 women, one will die of maternal causes in Koinadugu district.

Table 1: Percent distribution of death and population per chiefdom, Koinadugu, Sierra Leone, 2010

Chiefdoms	Identified maternal deaths N				Estimated population 2010*	
	From Jan. to Dec. 2008	From Jan. to Dec. 2009	From Jan. to Aug. 2010	**Total**	Number (N)	Percent (%)
DEMBELIA SINKUNIA	3	4	2	9	15,896	8.9%
FOLOSABA DEMBELIA	1	7	8	16	16,618	9.3%
KASONKO	2	8	7	17	23,245	13.0%
SENGBE	2	7	8	17	25,646	14.3%
WARA WARA YAGALA	2	2	7	11	31,024	17.3%
DIANG	N/A	N/A	N/A	12	22,496	12.5%
NIENE	N/A	N/A	N/A		44,500	24.8%
Total CARE sites	**10**	**28**	**32**	**70**	**112,429**	**63.7%**
Total MOHS sites	**N/A**	**N/A**	**12**	**12**	**66,996**	**37.3%**
Grand total	**10**	**28**	**44**	**82**	**179,425**	**100.0%**

* (source CARE)

Six tribes were identified including Temne (2.9%), Madingo (7.1%), Yalunka (12.9%), Fullah (18.6%), Limba (25.7%) and Kuranko (32.9%). The main religions were Muslim (80%) and Christian (20%).

Eighty two percent of the sample had no formal education. Only 10% and 5% respectively reached the primary and the secondary level.

The mean age of the women at death in CARE's dataset was 24.5 (range: 13 - 42 years old); 52.9% of the deceased women were younger than 25 years old. The mean age of death in the MOHSs dataset was 26.7 (range: 19 - 36 years old). MOHS's dataset missed an important range of the cases, specifically those below 19 years old and those above 36 years old accounting for 37% loss of data. In comparison, CARE's dataset captured younger cases and a wider range of maternal mortality than MOHS's dataset. The mean age at first birth was 18 (minimum = 13 and maximum = 35), and 70% of women gave birth before the age of 25 years old (**Table 2**).

Table 2: Percent distribution of death and first pregnancy per age group, Koinadugu, Sierra Leone, 2010

Age group	Number of maternal death		First pregnancy	
	Frequency	Percent	Frequency	Percent
up to 14	2	2.9%	3	4.3%
15 – 19	14	20.0%	39	55.7%
20 – 24	21	30.0%	7	10.0%
25 – 29	12	17.1%	0	0.0%
30 – 34	7	10.0%	0	0.0%
35 – 39	8	11.4%	1	1.4%
40 – 44	1	1.4%	0	0.0%
Don't know	5	7.1%	20	28.6%
Total	70	100.0%	70	100.0%

Fifty percent of the women died between 0 and 3 years after having their first child. This percentage includes 40% who died between 0 and 12 months after their first pregnancy. According to the dataset, only 30.8% were primigravidas. The gap between the two statements shows that almost 10% of the women were pregnant at least two times within a short period of time (less than 1 year). The age at time of death and the age at time of first pregnancy are positively correlated (coefficient= 0.29, p-value < 0.05). This means that early pregnancy and a short period of inter-genesis are risk factors for early maternal mortality.

In the CARE dataset, 44 (62.9%) cases were in households with the lowest wealth quintile while only 4 (5.7%) were in the highest quintile (**Figure 5**). The MOHS dataset identified 100% of the deceased women as unemployed, and 92% of them had no formal education.

Figure 5: Distribution of household wealth quintiles in Koinadugu District, Sierrra Leone, 2010
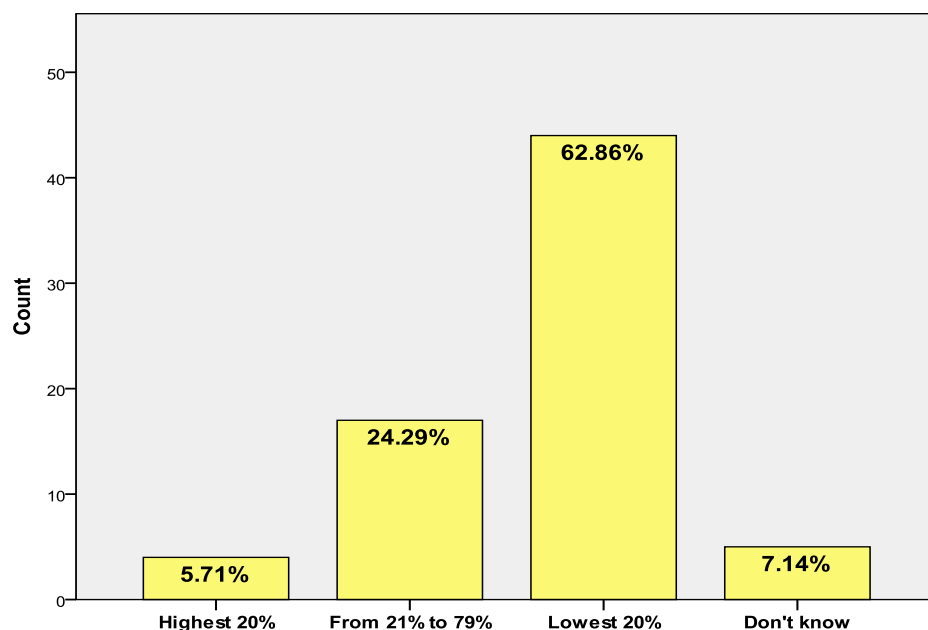
Most maternal deaths occurred between the third trimester and the first week after delivery (**Table 3**). Among 82 maternal deaths, 73 (89%) died in the third trimester or after delivery. Among those 73 women, 14 died during the last trimester, 15 during delivery, and 44 after delivery. Disaggregating by source, CARE's dataset reported 40 out of 70 women (57%) died up to 42 days after delivery versus 4 out of 12 (33.3%) for the MOHS dataset. Also, MOHS data did not capture any deaths in the first trimester nor deaths during delivery; 8 out of 12 (66.7%) of the deceased died either during the second or the third trimester before delivery.

Table 3: Distribution of stage of pregnancy at death per source, Koinadugu, Sierra Leone

Duration of pregnancy	CARE's data	MOHS's data	TOTAL	
	N	N	N	%
First trimester	2	0	2	2.5
Second trimester	5	2	7	8.5
Third trimester:				89
Before delivery	*8*	*6*	*14*	
During delivery	*15*	*0*	*15*	
After delivery	*40*	*4*	*44*	
Total	70	12	82	100

The 82 cases included 40 (48.8%) reported as direct maternal deaths, 35 (42.7%) as indirect maternal deaths and 7 cases (8.5%) had unknown causes.

- **Obstetrical causes (direct causes)**

Among 82 deaths, 40 (48.8%) were from obstetric causes. The primary diagnoses and case-fatality rates of the 40 cases were: post partum hemorrhage (PPH) n= 20 (24.4%), eclampsia n= 10 (12.2%), ante partum hemorrhage (APH) n= 4 (4.9%), sepsis n= 2 (2.4%), obstructed labor n= 2 (2.4%) ectopic pregnancy n= 1 (1.2%), and abortion n= 1 (1.2%) (**Figure 6**).

Figure 6: Obstetric causes of deaths from CARE and MOHS sources, Koindugu District, Sierra
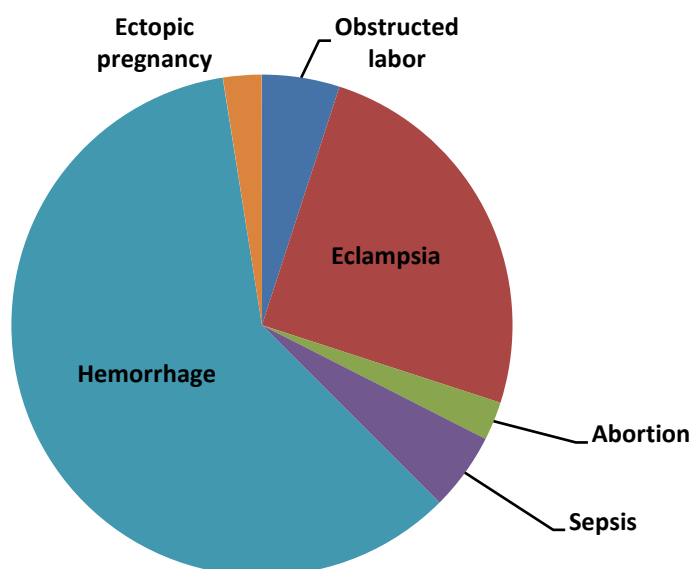
Analyzing by source, CARE's dataset identified 19/70 hemorrhage, 8/70 eclampsia, 2/70 sepsis and 1/70 ectopic. MOHS data set identified 5/12 for hemorrhage, 2/12 eclampsia, and 2/12 obstructed labor (**Figure 7**).

Figure 7: Distribution Obstetric causes of deaths by sources, Koindugu District, Sierra Leone
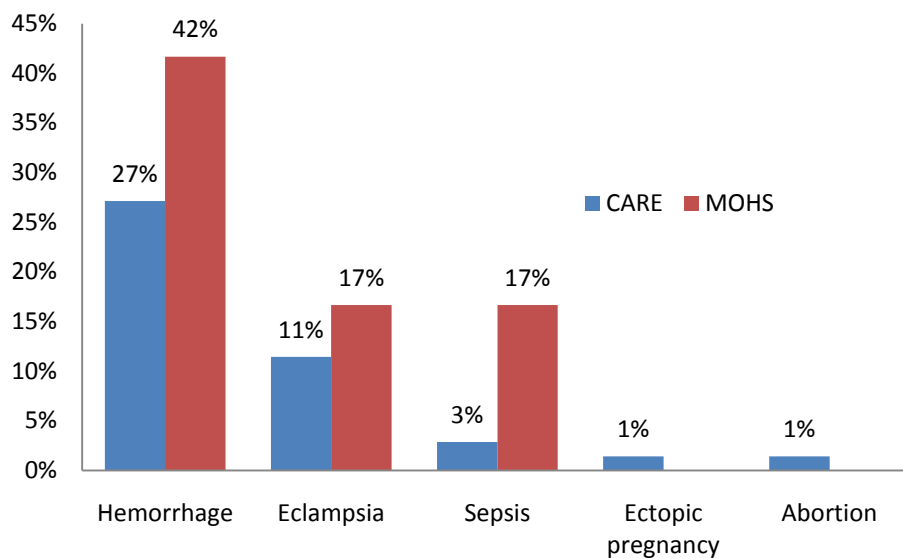
- Indirect causes

Among 82 deaths, 35 (42.7%) were from indirect causes. Among indirect causes identified, 31 (37.8%) died from anemia, 3 (3.7%) from malaria and 1 (1.2%) from HIV/AIDS (**Figure 8**).

Figure 8: Indirect causes of death from CARE and MOHS sources, Koinadugu, Sierra Leone
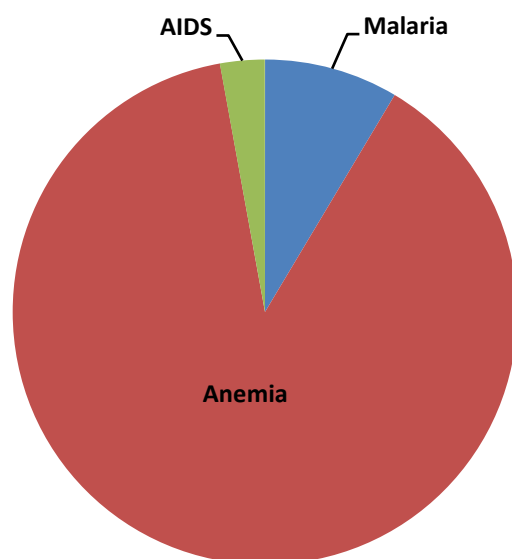
CARE data did not identify HIV/AIDS while MOHS did. MOHS data did not identify malaria.

Aim number 2: Assessing Non-clinical causes for maternal deaths: the 4 delays

Non-clinical causes are related to (i) delays in decision making about seeking medical care, (ii) delays in reaching the health care facility, (iii) delays in receiving prompt and appropriate care at the health facility, and (iv) delays in recognizing the problem. Data were analyzed according to the 4 delays model.

 In 15 cases reported by relatives, 13.3% stressed that financial barriers were the main issue, 26.7% reported transportation barriers, and 60% did not know.

Delay # 1 deciding to seek care:

This delay includes socioeconomic status as risk factors influencing the decision to seek care.

Among the 82 maternal deaths, 82% had no formal education and 68.3% were in the lowest wealth quintile.

Among the 70 maternal deaths from CARE data, 79% were confirmed as having attended at least one Antenatal Care (ANC) visit. The mean number of ANC visits was 1.3 (range: 0 to 7 visits). Tetanus toxoid, Iron folic acid and IPT were the most common types of ANC service received by the patient. Almost twenty-four percent (23.6%) of women who attended ANC visit received the combination of those three services, 38% received IFA and IPT combined, and 45.5% received only IPT.

Only 45.5% (20/44) of those who died after delivery visited a health facility for PNC.

According to family members, 81.7% of the expenses related to health care during the pregnancy were paid for from their own resources (44.3%), family support (28.7%) and small loans such as village savings and loans (8.7%). Half of the interviewees reported

that it was difficult for the women or family members to get money for appropriate services. Mean cost of services at a health facility is 58,729 Leones, equivalent to about $12 (range: 0 - 300,000 Leones).

There is a strong (and positive) relationship between number of ANC visits and economic status. The group who had the lowest SES had fewer or no visits to a health facility (coefficient = 0.3, p-value = 0.02).

Education, religion or ethnicity did not influence the number of ANC or PNC visits (p-value > 0.05).

Delay # 2 reaching care services:

This delay looks at physical barriers to reaching care services, including poor roads and lack of transportation.

The average distance to the nearest health facility was 6.13 miles (range: 0 - 42 miles). The relationship between number of ANC visits and distance from health facility is not statistically significant (coefficient = 0.11, p-value = 0.5).

Almost forty-three percent of 70 deaths from CARE's dataset occurred outside a health facility, either at home or at traditional birth attendants' homes (**Figure 9**). The MOHS dataset was not analyzed because unlike CARE's data, it did not include deaths in health facilities.

Figure 9: Distribution of Place where 70 women were died, Koinadugu, Sierra Leone
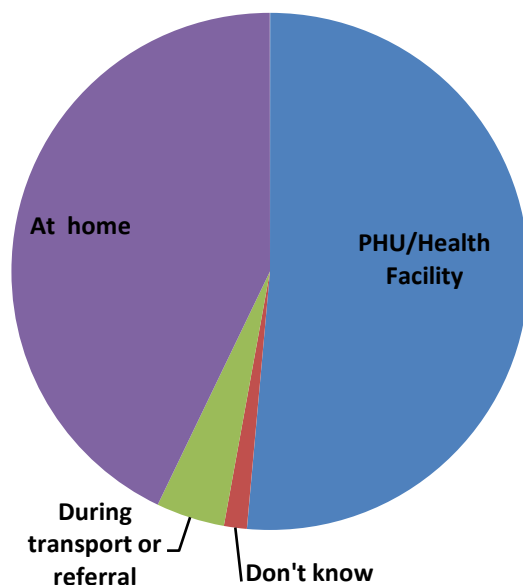
Delay # 3: receiving appropriate care

This delay focuses on whether woman who died were able to access health facilities and whether those facilities were able to provide appropriate care services, including motivation and skills of personnel andlack of supplies.

Out of 70 deaths, 45% of the women were examined during pregnancy and/or assisted by skilled birth attendants (doctors, midwives, SRN, MCHA, and CHO) during delivery, while 36% were examined/assisted by traditional birth attendants (TB) and traditional practitioner (TP).

Among 30 traditional birth attendants interviewed, 43% had conducted 0 to 5 deliveries during the last one year (overall mean = 8 deliveries, overall range: 0 - 40 deliveries).

The average time between visits to a primary health facility and the time when women were referred to well-equipped health facilities was about 4 hours (from 21 minutes to 9 hours). The average waiting time before the women were seen by a doctor was about 17

hours (minimum = 1 and maximum = 64 hours). And then the average wait for a medical or surgical procedure was 7 hours (from 12 minutes to 12 hours).

Figure 10: Distribution of care providers seen by deceased pregnant women, Koinadugu, Sierra Leone
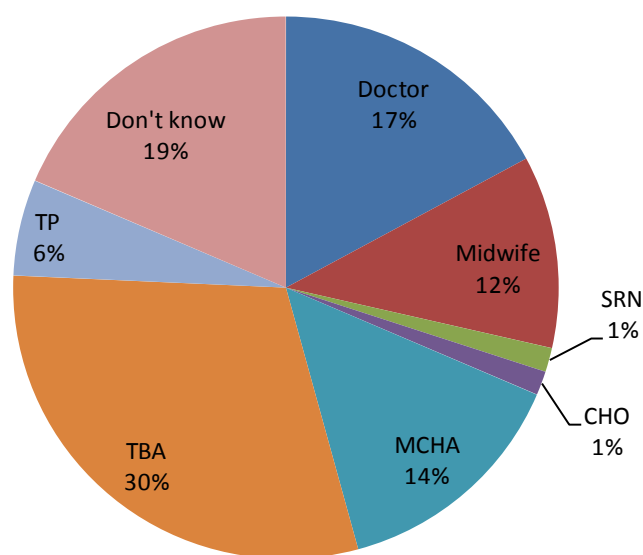
SRN= State Registered Nurse, MCHA = Maternal Child Health Assistant, TP = Traditional Practitioner
CHO = Community Health Officer, TBA = Trained Birth Attendants

Delay # 4: recognizing the problem:

This delay focuses on knowledge and ability of the patients or family members in recognizing danger signs.

Lack of knowledge either of the women's or the family members' recognizing risks is one of the main causes of this delay. Lack of knowledge was measured by awareness of the magnitude of the problems. 73% of the women had a "birth plan". More than sixty-one percent of those who died had been asked to visit a health facility during pregnancy, labor, or delivery. However, Only 9% of women or family members were warned that the pregnancy was high risk. Most of the family members (77.1%) did not consider giving birth at home as an alternative.

Aim number 3: Assessing reliability of the methods

Recall period

As a retrospective cohort study, the length of the recall period may impair a respondent's ability to remember and report relevant information around maternal deaths.

For CARE's dataset, the interviews were held between 25 and 920 days after deaths occurred (**Table 4**). The MOHS dataset did not provide any information about the date of interviews, but all interviews were conducted within a 10 month period (January to October 2010).

Table 4: Distribution of recall period between date of death and date of interview, Koinadugu, Sierra Leone

Recall period (months)	Frequency	Percent
Up to 6 months	24	34.3
7 to 12	20	28.6
13 to 18	14	20.0
19 to 24	5	7.1
25 to 30	5	7.1
31 mo and over	1	1.4
	69	98.6
Missing value(*)	1	1.4
Total	70	100.0

(*) Error: date of death is more recent than date of the interview

The dataset from CARE comprised 303 variables and the MOHS dataset had 99 variables. The quality of the data was tested according to the length of recall period. The following variables were used in the analysis of data validity: place of death, date of death, duration of pregnancy, stage of pregnancy, ANC visit, and symptoms of complication (**Table 5**).

Table 5: Cross-tabulation between some variables and data quality, Koinadugu, Sierra Leone

	Valid data			Missing data		Total	
	With response (n)	Do not know (n)	Total (%)	N	Percent	N	Percent
Place of death	67	1	68 (97.1%)	2	2.9%	70	100.0%
Date of death	69	0	69 (98.6%)	1	1.4%	70	100.0%
Duration of pregnancy	69	0	69 (98.6%)	1	1.4%	70	100.0%
Stage of the pregnancy	69	0	69 (98.6%)	1	1.4%	70	100.0%
Antenatal care	68	1	69 (98.6%)	1	1.4%	70	100.0%
Symptoms of complication	66	3	69 (98.6%)	1	1.4%	70	100.0%

All variables had a "missing value" which came from the error in computing the date at death and date of interview. Consequently, a missing value did not affect the quality of the data. However, the analysis of "Do not know" (DNK) provides information about the quality of the data because it may reflect the ability of the respondents to recall the events surrounding the deaths.

There is no major difference in terms of data quality between all recall period groups. "DNK" responses in "place of death", "antenatal care" and in "symptoms of complication" were identified during interviews which took place within the first 6 months after death.

Inter-rater agreement

In CARE's dataset, 6 interviewers collected the data in the field, and at the same time, they classified the cause of death. The 6 interviewers worked independently and reviewed data separately. MOHS's dataset did not report the number of data collectors.

Interviewer # 1 interviewed 8 family members and assigned 4 causes of death: one eclampsia, one malaria, 4 anemia, and one unknown. These causes were formulated from 6 combinations of possible symptoms.

Causes	Combination of signs and symptoms
Eclampsia	Swelling of legs, Swelling of face, pallor, weight loss and high fever
Malaria	Swelling of face, pallor, weight loss and high fever
Anemia	1- Swelling of legs, blurred vision, pallor 2- No signs or symptoms were identified 3 – Pallor, weight loss, high fever 4 – only pallor
Unknown	Swelling of face, pallor, weight loss and high fever

Based on this information, interviewer #1 assigned two causes of death for the same combination of signs. The first cause was malaria and the second was unknown. In addition, 4 different combinations of symptoms were assigned to anemia. From this interviewer, there is no association between the reported causes of deaths and the symptoms or combination of symptoms reported (CMH chi-square = 0.06, p-value = 0.8).

Interviewer # 2 interviewed 14 family members and assigned 7 causes of death.

Causes	Combination of signs and symptoms
Eclampsia	None of the signs and symptoms above were identified
Malaria	high fever
Anemia	1- Swelling of legs, blurred vision, Fits, shortness of breath, weight loss, high fever; 2- Swelling of face, pallor, shortness of breath, high fever; 3 – Swelling of face, blurred vision, Fits, pallor, shortness of breath, weight loss, high fever; 4 – shortness of breath, weight loss, 5 – None of the signs and symptoms above were identified 6 – High fever; 7 - Swelling of legs
Ectopic	None of the signs and symptoms above were identified
Sepsis	Swelling of legs, Swelling of face
PPH 48 h after delivery	None of the signs and symptoms above were identified
Unknown	weight loss

Again, anemia had multiple symptoms. When the interviewer did not identify any signs, the interviewer gave different causes of death: ectopic pregnancy, PPH, anemia, or eclampsia. It is clear that in every case, from this interviewer also, there is no association between the reported causes of deaths and the symptoms or combination of symptoms reported (CMH chi-square = 0.2, p-value = 0.6).

Interviewer # 3 interviewed 8 family members and assigned 4 causes of death.

Causes	Combination of signs and symptoms
Anemia	1- Pallor, shortness of breath, weight loss, high fever 2 - Swelling of legs, Swelling of face, weight loss, high fever 3 – High fever
Abortion	None of the signs and symptoms above were identified
Hemorrhage during delivery	None of the signs and symptoms above were identified
PPH 48 h after delivery	1 - None of the signs and symptoms above were identified 2 - weight loss, high fever 3 – High fever

There is no relationship between causes of death assigned and symptoms reported (CMH chi-square = 1.9, p-value = 0.2)

Interviewer # 4 interviewed 25 family members and assigned 7 causes of death.

Causes	Combination of signs and symptoms
APH	1 - Swelling of legs 2 - Swelling of legs, Swelling of face, pallor
Hemorrhage during delivery	1 – None of the signs and symptoms above were identified 2 – Swelling of legs, high fever 3 – Swelling of legs 4 – Swelling of legs, pallor, shortness of breath, weight loss, high fever
PPH 48 h after delivery	1 - None of the signs and symptoms above were identified 2 - Swelling of legs, high fever 3 - blurred vision, pallor, high fever
PPH 48 h to 42 days after delivery	None of the signs and symptoms above were identified
Eclampsia	None of the signs and symptoms above were identified
Sepsis	Swelling of legs
Anemia	1- Blurred vision 2- Swelling of legs 3 - Shortness of breath 4 – None of the signs and symptoms above were identified
Unknown	None of the signs and symptoms above were identified

There is no relationship between causes of death assigned and symptoms reported (CMH chi-square = 2.1, p-value = 0.1)

Interviewer # 5 interviewed 6 family members and assigned 3 causes of death.

Causes	Combination of signs and symptoms
PPH 48 h after delivery	High fever
Eclampsia	1 - Swelling of legs, Swelling of face, Blurred vision, fits, high fever 2 - Blurred vision, high fever
Anemia	1- Swelling of legs, Swelling of face, Blurred vision, pallor, high fever 2- Swelling of face, Blurred vision, Shortness of breath
Unknown	high fever

There is no relationship between causes of death assigned and symptoms reported (CMH chi-square = 1.04, p-value = 0.3)

Interviewer # 6 interviewed 9 family members and assigned 2 causes of death.

Causes	Combination of signs and symptoms
Malaria	high fever
Anemia	1- high fever 2- None of the signs and symptoms above were identified
Unknown	None of the signs and symptoms above were identified

There is no relationship between causes of death assigned and symptoms reported (CMH chi-square = 0.3, p-value = 0.6).

V. – Discussion

This study reveals the challenges in measuring the cause of maternal mortality in community-based maternal death reviews (CB-MDR) led by CARE's team in Sierra Leone.

The results of this study relate slight differences in the general characteristics of the target population of this study when compared to maternal mortality with those collected at the National level using the MOHS estimates. The MMR is about 958 for 100,000 live births, which is slightly higher than the SLDHS estimate. In Koinadugu, one woman is at risk of dying of maternal mortality for every fifteen women of reproductive age.

The mean age of maternal death in CARE's dataset is younger than that reported by MOHS. CARE's data has a wider range of ages, including women who were below 19 and above 36 years old. CARE's data provides important information about the oldest and the youngest maternal deaths. The CB-MDR helps to reveal the "untold story" surrounding maternal deaths that occur outside of health facilities, including but not limited to abortion, early marriage, and a variety of delays caused by a variety of factors. All cases outside of health facilities can be easily captured if the community is involved in the system. With full participation, the community can significantly contribute to the success of the program. While in the field, CARE's data collectors were told by the community of the presence of additional women who died that were not recorded in the PHUs. The main difference between the two data collection processes (CARE and MOHS) was the involvement of the community in the CARE process.

Recall that ICD-10 defined a maternal death as the death of woman while pregnant or within 42 days of termination of pregnancy, irrespective of the duration and site of the pregnancy or its management, but not from accidental or incidental causes. The

problem with this definition lies in the classification of cause of death. Usually, two raters are used for classifying the cause of deaths using ICD-10 as a reference. A standard verbal autopsy tool is comprised of a questionnaire, cause-of-death classification system, and diagnostic criteria [Soleman et al., 2006]. During the data collection, the interviewers, working alone, used only the VA questionnaire to assign the cause of death from the families' information. For example, based on swelling of legs, swelling of face, pallor, weight loss, and high fever, interviewer #1 recorded eclampsia as cause of death. The reliability of the method used is questionable. Without a second interviewer and cause-of-death classification system, it is not possible to verify the accuracy of the data collected.

Analyzing each interviewer's results, the relationship between symptoms and reported causes of death were not consistent. This may be because the interviewers have different training and educational backgrounds. Many specialists recommend the usage of medically-trained interviewers to determine signs and symptoms of the deceased in order to be accurate.

In addition, the large number of interviewers (6 interviewers for CARE) may have an impact in classifying the cause of death. As the classification of the cause of death depended on the judgment of one interviewer in the CARE cohort, a large number of interviewers increased misclassification bias, and so decreases agreement within and between interviewers.

In spite of these limitations, the study provides a snapshot of maternal death in Koinadugu district. The quality of the data is good in general. The length of recall period did not affect the responses of the interviewees. This is because most of the questions were formulated as closed questions that required recognition by the respondents. Even those which required recall did not present major issues.

The numbers of cases of abortion complications, obstructed labor and infections were fewer than those reported by the Ministry of Health in 2005 at the national level, while the numbers of cases of hemorrhage, hypertensive disorder and other direct and indirect causes were higher. One of the reasons might be the limitation of the community-based MDR approach using the verbal autopsy tool. The tool requires intimate knowledge of the deceased on the part of the family members and technical knowledge of the interviewers to determine the potential causes of deaths. For these reasons, there is a risk of misclassification of maternal death, in particular for early abortion and indirect causes such as anemia and malaria.

Ante and post-partum hemorrhage continue to be major direct causes of maternal death. The major long term result of severe PPH is anemia. This might explain the high prevalence of anemia in this study. Anemia leads all causes of maternal death and remains the most serious problem of maternal health in Sierra Leone.

Normally, anemia would be diagnosed during ANC, PNC, or routine visits in a health facility. The major objective of ANC is to identify and treat problems during pregnancy including anemia. WHO recommends at least four ANC visits to reduce risk factors related to pregnancy. The number of PNC visits was also low and should receive much more attention as most maternal deaths happened at this stage. Due to low numbers of visits, often due to low socioeconomic status, anemia is usually not treated.

The questionnaire allows for multiple signs and symptoms to define the cause of death, but it does not allow for multiple causes for one death. This approach does not show the interaction of different complications. For instance, if maternal death followed a case of malaria and an abortion, the combination of the two causes may have lead to her death. To count only one cause of death may distort mortality estimates and lead to misclassification. This is particularly true for the combination of PPH - anemia or malaria - anemia. At which stage should the illness be classified as PPH, anemia, or

malaria? The result of long lasting PPH is anemia, and malaria is aggravated by the presence of anemia. Misclassification can result in over or underestimates of one specific cause of death. This misclassification may lead to the overestimation of anemia in the study (37.8% of the total for all deaths).

All phases of delays are identified in the study and have almost the same importance. According to family members, 61.4% had been asked to go to a health facility during pregnancy, labor, or delivery by a TBA or any health professional for any reason. In women who developed complications at home, seeking care from a TBA first was the first delay in reaching a health facility. In the majority of the cases, these TBAs did not advise immediate referral, and the family members did not take any additional action. And then, if the condition of the woman deteriorated, she was taken to a nearby health facility in which appropriate personnel and supplies might not have always been available. In the health facility, there were delays in receiving immediate and appropriate care.

VI. - Recommendations

Considering the issues identified by the results of this study, a number of actions are recommended as follows:

The CB-MDR should be incorporated in the national MDR networks. The idea is to provide an additional method for obtaining data wherever there are gaps in the MOHS system. In this study, CB-MDR is beneficial where access to healthcare is poor. In this study, CB-MDR effectively collected data at the community level because of the presence of a local community network. However, the weakness of the CB–MDR is in identifying the accurate causes of death. This can be overcome by utilizing the medical background of the MOHS team.

For comparisons across locations and between interviewers, there is a need for a standardized cause-of-death classification using ICD-10 codes. A panel of at least 2 raters is necessary. Further agreement on VA tools, in particular algorithms to derive causes of death, is needed.

Before implementing the study, the VA questionnaire should be pre-tested and corrected accordingly to avoid redundant and inaccurate questions.

To be more effective, additional programs should be implemented concurrently with CB-MDR such as empowerment of women, gender inequity and family planning. Particular attention must be accorded to the major causes of deaths that are avoidable such as anemia, PPH, and APH.

The target population of women in Sierra Leone prefers TBAs, so increasing the skills of all birth attendants is key. A regulatory mechanism, such as credentialing of TBAs, should be developed so that TBAs function effectively. In addition, the program should stress an effort to increase awareness of danger signs in the community. It should also put in place and reorganize health-care networks to promote timely referrals in order to

respond as soon as possible in case of emergency and improve access to health services, especially in rural areas.

VII. - Conclusion

The findings suggest that CB-MDR is feasible in resource-poor settings and can be effective in reducing maternal mortality. Relevant evidence supports this conclusion. Reducing maternal mortality requires strengthening of the health care system including community participation. The CB-MDR includes that strategy. This process takes time and must be supported by the authorities (MOHS). Quality care given to women before, during and after pregnancy, inside and outside the health system, reduces maternal mortality.

Knowing major direct and indirect causes of maternal death is necessary to set up a program that averts maternal death. CB-MDR is the best way to learn these causes and is easy to implement at the community level with limited resources and limited knowledge.

The pilot study showed that a strong connection between the community and the health facility network is needed. This pilot approach needs to be implemented at another location to confirm its benefits in developing countries. Furthermore, good coordination is needed to ensure continuity of the MDR process. In particular, improved logistics support is essential for the National MDR committee to institutionalize the CB-MDR process. Both the MOHS and CARE tools need some improvement to ensure that sufficient information is captured.

Appendices

Appendix 1: CARE's community-based maternal death review structure and responsibilities [*source : CARE – Sierra Leone, 2011*]

National MDR committee

Structure : has secretariat at Directorate for Reproductive and Child Health. Broad based representation of members from the MoHS, civil society, parliamentary committee on health, UN agencies, etc.

Responsibilities: (1) Meet twice annually to consolidate and review district data on maternal deaths and recommend actions to address the situation; (2) Committee provides feedback to the district levels; (3) Conduct an annual confidential enquiry into maternal deaths (CEMD) and flag the main contributing factors of maternal deaths in Sierra Leone.

District MDR Committee

Structure: 5-7 members, with representation of health professionals, local government, NGO and community leaders

Responsibilities: (1) Review and discusses findings and recommendations from chiefdom MDR committee; (2) Recommend and implement actions to reduce maternal mortality at district level

Chiefdom MDR Committee

Structure: 5-7 members, including health professionals, local government, NGO and community leaders

Responsibilities: (1) Discuss the outcome of the verbal autopsies in the Chiefdom; (2) Complete MDR Summary Form; (3) Recommend interventions to address maternal deaths at the Chiefdom level

Community Volunteers

Structure: community health club members; pregnant women support groups; Village development committees; and others like grave diggers, chiefs, TBAS.

Responsibilities: (1) Identify maternal deaths; (2) share information with village leader who informs the PHU staff.

Appendix 2: CARE's Verbal autopsy and summary forms

Verbal Autopsy form for maternal death

Case Identification Code ☐☐☐☐☐   Interviewers Initials ☐☐☐

Part A: Interview details

No.	Questions and filters	Coding Categories	Skip to
4.	Interviewers name/initials		
5.	Date of interview	__/__/__ DD/MM/YY	

Part B: Listing of people who participated in the interview:

Relationship to woman	Present during/at: (check all that apply)				Did they attend some, all or most of the interview (choose one)?
	Pregnancy	Birth	Post-partum	Death	

Section 1: Background/General information about the deceased

No.	Questions and filters	Coding Categories	Skip to
1.	Town/ village of residence		
2.	Chiefdom of residence		
3.	District of residence	Kenema 1 Tonkilili 2 Koinadugu 3 Bo 4 Bombali 5 Kono 6 Port Loko 7 Kambia 8 Bonthe 9 Moyamba 10 Pujehun 11 Kailahun 12 Western Area 13 Other, specify_____ 14 Don't know 99	
4.	Nationality	Sierra Leonean 1 Guinean 2 Liberian 3 Other, specify_____ 4 Don't Know 99	
5.	Tribe	Mende 1 Temne 2 Madingo 3 Fullah 4 Limba 5 Susu 6 Kuranko 7 Yalunka 8 Sherbro 9 Krio 10 Kissi 11 Loko 12 Other, specify_____ 13 Don't Know 99	
6.	Religion	Christian 1 Muslim 2 Other, specify_____ 3 Don't Know 99	
7.	Primary language	English 1 Krio 2 Temne 3 Mende 4 Fulani 5 Koranko 6 Loko 7 Other, specify_____ 8 Don't know 99	
8.	Economic status (preferably filled in after talking to the village head)	Highest 20% 1 From 21% to 79% 2 Lowest 20% 3 Don't know 99	
9.	Level of education	No formal education 1 Primary 2 Secondary 3 Tertiary 4 Vocational 5 Other, specificy_____ 6	

		Don't know 99	
10.	Marital status	Married, living with husband 1 Married, husband lives outside the village 2 Single 3 Widowed 4 Divorced 5 Living together/ tap-to-me 6 Separated 7 Deserted 8 Other, specify_____ 9 Don't know 99	
11.	Date of death	___/___/___ DD/MM/YY Don't know 99	
12.	Time of death	___:___ am/pm hour:minute Don't Know 99	
13.	Age at time of death (in complete years)?	� Don't Know 99	
14.	Duration of pregnancy	Up to 3 months 1 4-6 months 2 6-9 months 3 Don't know 99	
15.	At what stage of the pregnancy/delivery/post partum did the woman die?	During pregnancy (prior to onset of labour) 1 During delivery 2 Up to 42 days after delivery 3 Don't know 99	
16.	Reported cause of death	APH 1 Bleeding during delivery 2 PPH 48 hours after delivery 3 PPH 48 hours to 42 days after delivery4 Eclampsia 5 Sepsis 6 Ectopic pregnancy 7 Abortion 8 Malaria 9 Anemia 10 HIV/AIDS 11 Other, specify_____ 10 Don't know 99	

Section 2
Relatives and friends interview on events around the woman's death and illness

Ask them to tell you what happened from the time the woman started to feel ill to her death

Take detailed notes. If needed continue on back or add additional sheets.

Section 3

Obstetrical history of earlier pregnancies including most recent pregnancy that led to death (except where indicated)

17.	How many times has she been pregnant including those that ended early, where the baby did not survive, and the most recent one during which the mother died?	Fill in number _____ Don't know 99	
18.	Age of first pregnancy	Fill in number _____ Don't know 99	
19.	How many live births did she have?	Fill in number _____ Don't know 99	
20.	How many still births did she have?	Fill in number _____ Don't know 99	
21.	How many abortions/miscarriages did she have?	Fill in number _____ Don't know 99	
22.	Number of living children	Fill in number _____ Don't know 99	
23.	Number of children that died	Fill in number _____ Don't know 99	
	NOTE: THE FOLLOWING QUESTIONS IN THIS SECTION ONLY RELATE TO PREVIOUS PREGNANCIES, NOT THE MOST RECENT ONE		
24.	Did she develop any complications or problems during any of her *previous pregnancies* (prior to the onset of labor)?	Yes 1 No 2 Don't know 99	
25.	If yes, indicate which pregnancy and the type of problem(s) below (circle all that apply). If there were more than 7 pregnancies, please list on back.		

26.	Pregnancy 1 Year:	P 2 Year:	P 3 Year:	P 4 Year:	P 5 Year:	P 6 Year:	P 7 Year:	
	Bleeding 0-3 months 1	1	1	1	1	1	1	
	Bleeding 4-6 months 2	2	2	2	2	2	2	
	Bleeding 6-9 months 3	3	3	3	3	3	3	
	Fits 4	4	4	4	4	4	4	
	Swelling of legs 5	5	5	5	5	5	5	
	Swelling of face 6	6	6	6	6	6	6	
	Dizziness or blurred Vision 7	7	7	7	7	7	7	
	Pale 8	8	8	8	8	8	8	
	Lost weight 9	9	9	9	9	9	9	
	Yellow skin 10	10	10	10	10	10	10	
	High fever 11	11	11	11	11	11	11	
	Smelling vaginal discharge 12	12	12	12	12	12	12	
	Other, specify_____ 13							
	Don't know 99	13 99	13 99	13 99	13 99	13 99	13 99	

27.	Did she develop any complications or problems *during childbirth* during any of her previous pregnancies?	Yes 1 No 2 Don't know 99	
28.	If yes, indicate which pregnancy and the type of problem(s) below (circle all that apply). If there were more than 7 pregnancies, please list on back.		
29.	Pregnancy 1	P 2	P 3	P 4	P 5	P 6	P 7	

	Fits 1	1	1	1	1	1	1	
	Prolonged labor 2	2	2	2	2	2	2	
	Obstructed labor 3	3	3	3	3	3	3	
	Ruptured uterus 4	4	4	4	4	4	4	
	Breech 5	5	5	5	5	5	5	
	Vacuum extraction 6	6	6	6	6	6	6	
	Forceps delivery 7	7	7	7	7	7	7	
	Manual removal of placenta 8	8	8	8	8	8	8	
	Destructive operation 9	9	9	9	9	9	9	
	Caesarean section 10	10	10	10	10	10	10	
	Other, specify_____ 11	11	11	11	11	11	11	
	Don't know 99	99	99	99	99	99	99	

30.	Did she develop any complications or problems *after the delivery of the baby* during any of her previous pregnancies?	Yes 1 No 2 Don't know 99	
31.	If yes, indicate which pregnancy and the type of problem(s) below (circle all that apply). If there were more than 7 pregnancies, please list on back.		
32.	Pregnancy 1	P 2	P 3	P 4	P 5	P 6	P 7	

	Post Partum Haemorrhage (PPH) (0-48 hrs. after delivery) 1	1	1	1	1	1	1	
	PPH (48 hrs to 42 days after delivery) 2	2	2	2	2	2	2	
	Breathless 3	3	3	3	3	3	3	
	Yellow skin 4	4	4	4	4	4	4	
	High fever 5	5	5	5	5	5	5	
	Smelling vaginal discharge 6	6	6	6	6	6	6	
	Other, specify_____ 7	7	7	7	7	7	7	
	Don't know 99	99	99	99	99	99	99	

Section 4: Details of antenatal care during most recent pregnancy- Should be completed for all woman

33.	Did the woman attend antenatal clinic?	Yes 1 No 2 Don't know 9	→Q 40 →Q 40
34.	If yes, specify location	PHU 1 Hospital 2 Private, NGO or Mission 3 Outreach clinic 4 Other, specify _____ Don't know 99	
35.	Number of antenatal care visits (interviewee)	Fill in number _____ Don't know 99	
36.	Is an ANC Card available?	Yes 1 No 2 Don't know 99	→Q 37 →Q 40 →Q 40
37.	If yes, number of ANC visits listed	Fill in number _____ Don't know 99	
38.	Cadre of health personnels offering ANC services at location	Doctor 1 Midwife 2 SRN 3 SECHN 4 CHO 5 CH/A 6 Maternal Child Health Aide 7	

		Trained birth attendant 8 TP 9 Community Health Worker 10 Don't know 99	
39.	What ANC/Clinic services were offered at the location	Tetanus Toxoid 1 Iron/folic acid supplements 2 STI tests 3 PMTCT 4 Intermittent Prophylactic Therapy (malaria) 6 Insecticide Treated Nets (bednets) 7 Deworming 8 Health Education 9 Birth preparedness 10 Other, specify_____11 Don't know 99	

Section 5
Obstetrical issues during *most recent* pregnancy – <u>Should be completed for all woman</u>

40.	During THIS pregnancy, did she (check all that apply):	Yes	No	Don't know	
	Have swelling of the legs?				
	Have swelling of the face?				
	Complain of blurred vision?				
	Have any fits?				
	Was she pale?				
	Was she short of breath when she carried out regular household activities?				
	Lose weight?				
	High fever?				
41.	Were the problem(s) managed?	Yes 1 No 2 Don't know 99			→Q 42 →Q 45 →Q 45
42.	If yes, please specify how they were managed	Explain			
43.	If yes, by who?	Doctor 1 Midwife 2 SRN 3 SECHN 4 CHO 5 CH/A 6 Maternal Child Health Aide 7 Trained birth attendant 8 TP 9 Community Health Worker 10 Don't know 99			→Q 45
44.	If yes, where was the problem treated?	Home 1 PHU 2 Hospital 3 NGO/Private mission 4 Other, specify_____5 Don't know 99			

45.	Had she been ill with any other illness during this pregnancy? (E.g., Asthma, diabetes, heart disease etc)	Yes 1 No 2 Don't know 99	
46.	If yes, specify	Explain	
47.	Was the illness managed?	Yes 1 No 2 Don't know 99	→ →Q 51 →Q 51
48.	If yes, how?	Explain_____ Don't know 99	
49.	If yes, by who?	Doctor 1 Midwife 2 SRN 3 SECHN 4 CHO 5 CH/A 6 Maternal Child Health Aide 7 Trained birth attendant 8 TP 9 Community Health Worker 10 Don't know 99	→Q 51
50.	If yes, where was the problem treated?	Home 1 PHU 2 Hospital 3 NGO/Private mission 4 Other, specify_____5 Don't know 99	
51.	Did the woman have an abortion?	Yes 1 No 2 Don't know 99	
52.	Was the abortion induced?	Yes 1 No 2 Don't know 99	

Section 6: Fill out the table below that corresponds to when the woman died

Complete for women that died during pregnancy, *prior to the onset of labour*

No.	Questions and filters	Coding Categories	Skip to
Filter	*Only ask the questions in this section when the woman died <u>prior to the onset of labour</u>*		
53.	Did she have any obstetric complications/problems during this pregnancy (prior to the onset of labour)?	Yes 1 No 2 Don't know 99	→Q 54 →Q 64 →Q 64
54.	During her final illness, was she bleeding from the vagina?	Yes 1 No 2 Don't know 99	
55.	If yes, did the bleeding wet her clothes, the bed or the floor? (circle one)		

56.	Was anything done to stop the bleeding?	Yes 1 No 2 Don't know 99	
57.	If yes, please specify	Explain	
58.	Was she in pain while bleeding?	Yes 1 No 2 Don't know 99	
59.	Did she have any other episodes of bleeding during her pregnancy?	Yes 1 No 2 Don't know 99	
60.	Were they painful?	Yes 1 No 2 Don't know 99	
61.	Did she have high fever during her final illness?	Yes 1 No 2 Don't know 9	
62.	Was she yellow at the time of her death?	Yes 1 No 2 Don't know 99	
63.	Was she short of breath at the time of death?	Yes 1 No 2 Don't know 99	
64.	Please describe any another problems	Explain Don't know 99	

Complete for women that died during _labour and/or delivery_

No. Filter	Questions and filters _Only ask the questions in this section when the woman died during labour and/or delivery_	Coding Categories	Skip to
65.	What type of delivery was it?	Normal 1 Breech 2 By operation/ CS 3 Delivery by other instrumental 4 Destructive operation 5 Not applicable, child not delivered 6 Other, specify_____ 7 Don't know 99	
66.	Was she in good health when labour began?	Yes 1 No 2 Don't Know 99	
67.	Was she given any medicine during labour?	Yes 1 No 2 Don't Know 99	
68.	If yes, what was the name of the medicine?	Explain	
69.	If yes, what was the medicine for?	Explain	
70.	In what route was it given?	Directly in vein 1 With saline in the vein 2 In the muscle 3 Orally 4 Don't know 99	
71.	How long after the start of labour pain did the woman die?	Hours |__|__| Days |__|__| Don't know 99	
72.	How long after the start of labour was the baby delivered?	Hours |__|__| Days |__|__| Don't know 99	
73.	Did she die before the baby was born?	Yes 1 No 2 Don't Know 99	
74.	Did the woman have convulsions?	Yes 1 No 2 Don't Know 99	
75.	If yes, was she given any medicine for convulsions?	Yes 1 No 2 Don't know 99	
76.	If yes, who provided the medicine?	Pharmacy 1 PHU 2 Hospital 3 TBA 4 TP 5 Other, specify_____ 6 Don't know 99	
77.	Was there bleeding during labour?	Yes 1 No 2 Don't know 99	
78.	Severity of bleeding	Scanty 1 Moderate (wet clothes only) 2 Severe (wet clothes and floor) 3 Don't know 99	
79.	Was the bleeding associated with more pain than normal?	Yes 1 No 2 Don't Know 99	
80.	Was anything done to stop the bleeding?	Yes 1 No 2 Don't Know 99	
81.	If yes, what was done?	Explain Don't know 99	
82.	Was the baby's position normal?	Yes 1 No 2 Don't know 99	
83. Was	Was there any manipulation performed to deliver the baby?	Yes 1 No 2 Don't know 99	
84.	If yes, please specify?	Explain _____ Don't know 99	
85.	Was the baby too big?	Yes 1 No 2 Don't know 99	
86.	Did any part of the baby come out (though the baby was not delivered)?	Yes 1 No 2 Don't know 99	
87.	If yes, what parts were visible?	Explain _____ Don't know 99	
88.	Was the placenta delivered?	Yes 1 No 2	

| 89. | How long after the birth of the child was the placenta delivered (e.g., 1 hour 10 mins)? | Don't know 99
hours \|__\|__\|
minutes \|__\|__\|
Don't know = 99 | |

Complete for women who died _after delivery, but within 42 days of delivery_:

Filter	Only ask the questions in this section when the woman died _during labour and/or delivery_		
90.	How long after delivery did she die? (Fill in boxes as applicable; e.g., 2 days, 10 hours)	days |__|__| hours __|__| Don't know 99	
91.	Did she receive any post natal care?	Yes 1 No 2 → 96 Don't know 99 → 96	
92.	How many times?	Fill in number_____ Don't know 99	
93.	Where did she go for postnatal care?	Hopsital1 PHU 2 Mission/ NGO Private 3 Pharmacy 4 TBA 5 TP 6 Other, specify_____ 7 Don't know 99	
94.	Did she go for a routine visit or for a specific problem?	Specific 1 Routine 2 Don't know 99	
95.	What was the problem?	Bleeding 1 pale 2 Breathless 3 yellow skin 4 High fever 5 Foul smelling vaginal discharge 6 Other, specify_____ 7 Don't know 99	

96.	How far is the nearest health facility that offers maternity services?	Distance in miles						
97.	How long does it take you to reach this facility for each mode of transportation (during the rainy and non-rainy seasons)?							
		Rainy season			Non-rainy seasons			
		Time Hrs:min	DK	NA	Time Hrs:min	DK	NA	
	Ambulance							
	Other motor vehicle							
	By foot							
	Bicycle							
	Motorcycle							
	Hammock							
	Other, specify____							
98.	Is transportation easily available (e.g., is it easier to get transportation during market days)?	Explain:						
99.	How do women typically pay for these services?	Family support 1 Own resources 2 VS&L 3 Other, specify____4 Don't know 99						
	Explain that the following questions are specific to the woman that died							
100.	During her pregnancy, labour and delivery or after delivery - was the woman ever asked to go (possibly by TBA or any health professional) to the HF/Hospital for any reason?	Yes 1 No 2 Don't know 99						
101.	If yes, for what reason/condition was she first referred? Please specify.	Explain						
102.	Did she take your advice? Why or why not – please describe	Explain	→ 94					
103.	If she did not take your advice, did you advise her again to seek care at a higher level? And if yes, how many times?	Specify						
104.	Did you accompany the woman to the referral location?	Yes 1						

		No 2	
		Don't know 99	
105.	If yes, how long were you with the woman before she died?	_____ Hours/mins _____ Days Don't know 99	
106.	How many deliveries have you conducted in the last 1 year?	Fill in number ___ Don't know 99	
107.	What signs make you refer a woman to the Health facility?	Swollen feet 1 Vaginal bleeding 2 Abdominal pains 3 Severe headache 5 Others, specify___ 6 Don't know 99	

Section 8: Health seeking behaviour/ contributing factors

108.	Was a birth plan ever made during the pregnancy for the deceased?	Yes 1 No 2 Don't know 99	→109 →111 →111
109.	With whom was the birth plan shared?	Husband 1 Co-wife 2 Mother 3 Mother-in-law 4 Father 5 Father-in-law 6 Sister 7 Sister-in-law 8 Brother 9 Brother-in-law 10 Son 11 Daughter 12 TBA 13 Mother 15 Other, specify _____16 Don't Know 99	
110.	Did the Birth Plan trigger action for the pregnancy?	Yes 1 No 2 Don't know 99	
111.	On referral, who was responsible for deciding whether the woman could go for treatment (circle all that apply)?	The woman 1 Husband 2 Co-wife 3 Mother 4 Mother-in-law 5 Father 6 Father-in-law 7 Sister 8 Sister-in-law 9 Brother 10 Brother-in-law 11 Son 12 Daughter 13 TBA 14 Grandmother 15 Other, specify _____16 Don't Know 99	

112.	Once the decision was made to send her for care, did she go?	Yes 1 No 2 Don't know 99	→100
113.	If not, why?	Financial barriers 1 Transportation barriers 2 Husband/family did not allow 3 Don't know 99	
114.	Was there a delay in going to the referral location?	Yes 1 No 2 Don't know 99	
115.	If yes, how long?	_____ Hours: min Don't know 99	
116.	Was it difficult to find the funds to send her for treatment?	Yes 1 No 2 Don't know 9	
117.	Where did the funds come from for her to go for treatment? *(i.e. who paid?)*	Family support 1 Own resources 2 VS&L 3 Other, specify____4 Don't know 99	
118.	Was the woman or her family ever told that her pregnancy was high risk?	Yes 1 No 2 Don't know 99	
119.	Was using the birthing home considered as an option? If yes – why If not – why not	Yes 1 No 2 Don't know 99	
120.	If the birthing home was used please describe the experience Satisfaction Cost Peace of mind		

Section 9: Referral to various health facilities:

	Health facility 1- Specify	Health facility 2- Specify	Health facility 3- Specify
a. How did she get to the health facility?	Ambulance 1 By foot 2 Bicycle 3 Motorcycle 4 Hammock 5 Other, specify___6 Don't know 99	Ambulance 1 By foot 2 Bicycle 3 Motorcycle 4 Hammock 5 Other, specify___6 Don't know 99	Ambulance 1 By foot 2 Bicycle 3 Motorcycle 4 Hammock 5 Other, specify___6 Don't know 99
b. Who accompanied her to the health facility (relationship)? Circle all that apply	Husband 1 Co-wife 2 Mother 3 Mother-in-law 4 Father 5 Father-in-law 6 Sister 7 Sister-in-law 8 Brother 9 Brother-in-law 10 Son 11 Daughter 12 TBA 13 Grandmother 14 Other, specify _____15 Don't Know 99	Husband 1 Co-wife 2 Mother 3 Mother-in-law 4 Father 5 Father-in-law 6 Sister 7 Sister-in-law 8 Brother 9 Brother-in-law 10 Son 11 Daughter 12 TBA 13 Grandmother 14 Other, specify _____15 Don't Know 99	Husband 1 Co-wife 2 Mother 3 Mother-in-law 4 Father 5 Father-in-law 6 Sister 7 Sister-in-law 8 Brother 9 Brother-in-law 10 Son 11 Daughter 12 TBA 13 Grandmother 14 Other, specify _____15 Don't Know 99
c. How long did it take to get there?	Hours: minutes |__|__|	Hours: minutes|__|__|	Hours:minutes |__|__|
d. Did for the transport cost a fee?	Yes 1 No 2 Don't know 99	Yes 1 No 2 Don't know 99	Yes 1 No 2 Don't know 99
e. If YES: who paid & how much? (2 people/one way)	The woman 1 Husband 2 Co-wife 3 Mother 4 Mother-in-law 5 Father 6 Father-in-law 7 Sister 8 Sister-in-law 9	The woman 1 Husband 2 Co-wife 3 Mother 4 Mother-in-law 5 Father 6 Father-in-law 7 Sister 8 Sister-in-law 9	The woman 1 Husband 2 Co-wife 3 Mother 4 Mother-in-law 5 Father 6 Father-in-law 7 Sister 8 Sister-in-law 9

	Health facility 1	Health facility 2	Health facility 3
	Brother 10 Brother-in-law 11 Son 12 Daughter 13 TBA 14 Granny 15 Other, specify _____16 Don't Know 99	Brother 10 Brother-in-law 11 Son 12 Daughter 13 TBA 14 Granny 15 Other, specify _____16 Don't Know 99	Brother 10 Brother-in-law 11 Son 12 Daughter 13 TBA 14 Granny 15 Other, specify _____16 Don't Know 99
	Cost	Cost:	Cost
d. When you got to the health facility, how long did she have to wait before she was seen?	Hours: minutes |__|__|	Hours:minutes |__|__|	Hours: minutes |__|__|
e. Whom did she see?	Doctor 1 Midwife 2 SRN 3 SECHN 4 CHO 5 CH/A 6 Maternal Child Health Aide 7 Trained birth attendant 8 TP 9 Community Health Worker 10 No one 11 Other, specify_____12 Don't know 99	Doctor 1 Midwife 2 SRN 3 SECHN 4 CHO 5 CH/A 6 Maternal Child Health Aide 7 Trained birth attendant 8 TP 9 Community Health Worker 10 No one 11 Other, specify_____12 Don't know 99	Doctor 1 Midwife 2 SRN 3 SECHN 4 CHO 5 CH/A 6 Maternal Child Health Aide 7 Trained birth attendant 8 TP 9 Community Health Worker 10 No one 11 Other, specify_____12 Don't know 99
f. If at a hospital, was a doctor consulted on the case?	Yes 1 No 2 Don't know 99	Yes 1 No 2 Don't know99	Yes 1 No 2 Don't know 99
g.If yes, what time was the doctors consultation asked for?	Hours: minutes |__|__| am/pm Don't know 99	Hours: minutes |__|__| am/pm Don't know 99	Hours: minutes |__|__| am/pm Don't know 99
h. What time was the request attended to?	Hours: minutes |__|__|	Hours: minutes |__|__| am/pm	Hours: minutes |__|__| am/pm

	am/pm Don't know 99	Don't know 99	Don't know 99
i. What time was the decision taken to do a medical/surgical procedure?	Hours: minutes |__|__| am/pm Don't know 99	Hours: minutes |__|__| am/pm Don't know 99	Hours: minutes |__|__| am/pm Don't know 99
j. Who made the decision?	Doctor 1 Midwife 2 SRN 3 SECHN 4 CHO 5 CH/A 6 Maternal Child Health Aide 7 Trained birth attendant 8 TP 9 Community Health Worker 10 No one 11 Other, specify_____ 12 Don't know 99	Doctor 1 Midwife 2 SRN 3 SECHN 4 CHO 5 CH/A 6 Maternal Child Health Aide 7 Trained birth attendant 8 TP 9 Community Health Worker 10 No one 11 Other, specify_____ 12 Don't know 99	Doctor 1 Midwife 2 SRN 3 SECHN 4 CHO 5 CH/A 6 Maternal Child Health Aide 7 Trained birth attendant 8 TP 9 Community Health Worker 10 No one 11 Other, specify_____ 12 Don't know 99
h. What time was the medical/surgical procedure done?	Hours: minutes |__|__| am/pm Don't know 99	Hours: minutes |__|__| am/pm Don't know 99	Hours: minutes |__|__| am/pm Don't know 99
g. What did the health facility staff tell the woman and the persons who accompanied her about her condition upon arrival and her diagnosis?			
h. How much did you have to pay at the health facility?	Cost	Cost	Cost
i. Did they ask you to go and buy anything? If YES: What did you have to buy? How much was spent?	Yes 1 No 2 Don't know 3	Yes 1 No 2 Don't know 3	Yes 1 No 2 Don't know 3

Where did the money come from?			
j. Did they refer her?			
k. If YES: Where to?	Yes 1 No 2 Don't know 3	Yes 1 No 2 Don't know 3	Yes 1 No 2 Don't know 3
l. Did she go?	If YES: next column If NO: why not?	If YES: next column If NO: why not?	

Maternal Death Review Summary Form for Death at the Community
Sierra Leone

GENERAL INSTRUCTIONS

1. This form should be filled by the Chiefdom MDR committee after discussion on the case. The form is not meant to blame a person in the community, (traditional) health workers or the family of the diseased.

2. The form should reflect the discussions of the chiefdom MDR committee and actions they will take.

SECTION A –   DETAILS OF DECEASED

Case Identification Code_____

No.	Questions and filters	
1.	Town/ village	
2.	Chiefdom	
3.	District	
4.	Nationality	
5.	Tribe	
6.	Religion	
7.	Economic status to be judged by data collector after all interviews)	
8.	What age did she die?	
9.	Date of death	
10.	Time of death	
11.	Number of living children	
12.	Number of children that past away	
13.	In which month of pregnancy did she die	
14.	What was her marital status?	
15.	Had she ever been to school?	

SECTION B: DETAILS OF PLACE WHERE DEATH OCCURRED

16.	Where did the death occur? specify:	

17. Cause of death_____

_____

18. Summary of case _____

_____

_____

_____

_____

19. What are the factors that contributed to her death?

_____

_____

_____

_____

_____

_____

20. How could this death have been avoided?

_____

_____

_____

_____

_____

21. What can the community do to avoid such a situation to occur again?

_____

_____

_____

_____

_____

22. What can the community/health facility administration and staffs do to avoid such recurrence?

_____

_____

_____

_____

_____

23. Please note when the community /health facility staff and administration had   a meeting to discuss the summary of the maternal death review report

_____

_____

_____

_____

_____

Date_____

Membership of Review Team_____

Appendix 3: MOHS's Investigation form

REPRODUCTIVE HEALTH PROGRAMME

MINISTRY OF HEALTH AND SANITATION

MATERNAL DEATH REVIEW CASE INVESTIGATION FORM

GENERAL INSTRUCTIONS

1. This form must be completed for all maternal deaths (including indirect deaths, abortions, molar and ectopic gestation) occurring up to 42 days following delivery/termination of pregnancy.

2. This form should be filled by a member of the district Maternal Death audit team at the place where the woman died

3. *Tick the appropriate box and fill the space as necessary*

SECTION A-   DETAILS OF THE DECEASED

1. Name of deceased_____

2. Nationality_____

3. Address of the deceased_____

4. Age of deceased_____

5. Marital status: Married ☐ Single ☐ Widow ☐

6. With whom was she staying_____?

7. Educational level: None☐ Primary☐ Secondary ☐ Tertiary ☐

    Vocational ☐

8. Employment Status: Employed ☐ Unemployed ☐

9. Gravida _____   Parity_____

10. Number of living children: Female ☐ Male ☐

11. Date and time of death_____

12. Period of death: Antenatal ☐ Intra partum ☐ Post partum ☐

    13. If the woman died during pregnancy, what was the gestation period?

    1st Trimester ☐ 2nd Trimester ☐ 3rd Trimester ☐

    14. Place of death:

    At home ☐ Health facility ☐ On the way ☐

    14. Who conducted the delivery? Doctor ☐ Midwife ☐ CHO ☐ SECHN ☐

MCHA ☐ TBA ☐ Others (Specify)_____

15. What was the cause of death: APH ☐ PPH ☐ Eclampsia ☐

Obstructed Labour ☐   Ruptured Uterus ☐, Complications of Abortions ☐

Infections ☐ Ectopic Pregnancy ☐   Malaria ☐   Anaemia ☐   AIDS

Others (Specify)……………………….

SECTION B   DETAILS OF HEALTH FACILITY WHERE DEATH OCCURRED (NOT APPLICABLE FOR DEATH AT THE COMMUNITY)

16. Type of health Facility: Hospital ☐ PHU ☐ NGO/Private/Mission Clinic ☐

17. Name of facility: _____

18. District_____ Chiefdom _____

19. Town/Village_____ Date & time of admission _____

20. Admitted from where: Health facility ☐   Community ☐

21. Reasons for admission………………………………………………………………….

22. Condition of patient on admission: Stable ☐ Critically ill ☐ Dead on arrival

SECTION C   ANTENATAL CARE DETAILS

23. Who is providing the information about the deceased?

Husband ☐ Parents ☐ Others (Specify) _____

24. How long had the informant stayed with the deceased before death?

Specify_____

25. Did she receive ANC? Yes ☐ No ☐

26. If yes, where: Hospital ☐ PHU ☐ NGO/Private/Mission Clinic) ☐

Others (specify)………………………..

27. Number of ANC visits_____ (check from centre visited or ANC Card)

28. What ANC services were offered?   Immunization ☐

29. Vitamin supplement ☐ iron tablets ☐ ITN ☐ Deworming ☐ SP ☐

30. Were there any danger signs during this pregnancy? Yes ☐ No ☐

31. If Yes (Tick from the list) Swollen feet/(oedema) ☐ headache ☐

Abdominal pain ☐ Fits ☐ Bleeding ☐

32. Was the deceased diagnosed with any of following conditions during this pregnancy?

33. If yes which type: Bleeding ☐ PIH/Eclampsia ☐ Complications of

Abortions ☐ Infections ☐ Ectopic Pregnancy ☐ Malaria ☐ anaemia ☐

AIDS ☐ Others (Specify)..........................

34. Was the problem treated? Yes ☐ No ☐

35. If Yes, state treatment given: _____

SECTION D   **DELIVERY AND PUEPERIUM**

36. Did the deceased deliver? ☐ Yes ☐ No

37. If yes, date and time of delivery……………………………………………………

38. Was a partograph used? Yes ☐ No ☐

39. Locality where labour started: Health facility ☐ Community ☐

40. Duration of labour: ☐ hrs ☐ days

41. Mode of delivery: SVD ☐ Breech ☐ Vacuum ☐ Forceps ☐

CS ☐ Destructive operation ☐ Others……………………………….

42. Delivered by whom : Doctor ☐ Obstetrician ☐ Midwife ☐ CHO ☐

CHA ☐ SECHN ☐ MCHAIDES ☐ TBA ☐

OTHERS…………………………………

SECTION E   CAUSE OF DEATH

43. What was the cause of death: APH ☐ PPH ☐ Eclampsia ☐

Obstructed Labour ☐ Ruptured Uterus ☐ Complications of Abortions ☐

Infections ☐ Ectopic Pregnancy ☐ Malaria ☐ Anaemia ☐ AIDS related ☐

Others …………………………………………….

44. Has the maternal death been reviewed by the Chiefdom based MDR committee?_____
     If yes indicate date _____/_____/_____

     SECTION F   OUTCOME OF THE CHILD

45. Sex of child Male ☐ Female ☐

46. Child alive Yes ☐ No ☐

47. If dead state time of death…………………………………

48. If dead state cause of death if known…………………………………

Completed by:

Information collected by _____   **Signature**_____

Designation_____

Date_____

49. Summary of case:

50. In your opinion were any of these factors present? (to be completed by team conducting monthly MDR meetings)

System	Factors	Y	N	DK
Personal/Family-(1st delay)	Failure to recognize danger signs			
	Ignorance of available services			
	Cultural/ religious reasons/ objection			
	Poverty			
	Other specify			
Reach Medical Facility-(2nd delay)	Lack of communication/ transport from home to health care facility			
	Lack of communication/transport between health care facilities			
	Long distances/ poor roads			
	High cost of treatment			
	Others specify			
Quality of Care (3rd delay)	Lack of human resources			
	Poor attitudes, low morale, poor interpersonal relationship			
	Lack of expertise, training, skills			
	Lack of blood for transfusion			
	Lack of life saving drugs			
	Others specify			

51. What can be done to avoid such recurrence? (to be completed by team conducting monthly MDR meetings)

Level of care	Proposed Activities	Proposed time frame	Resp person
Hospital			
Health centre			
TBA			

Family/ community			

Completed by:

Information collected by _____   **Signature**_____

Designation_____

Date_____

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