Maternal Death Surveillance and Response

TECHNICAL GUIDANCE

INFORMATION FOR ACTION
TO PREVENT MATERNAL DEATH

WHO Library Cataloguing-in-Publication Data

Maternal death surveillance and response: technical guidance information for action to prevent maternal death.

1.Maternal mortality – prevention and control. 2.Maternal mortality – epidemiology. 3.Cause of death. 4.Public health surveillance. 5.Death certificates. 6.Guideline. I.Organization.

ISBN 978 92 4 150608 3 (NLM classification: WQ 270)

Designed by minimum graphics
Printed by the WHO Document Production Services, Geneva, Switzerland

Contents

Abbreviations

AFP	Acute flaccid paralysis
ANC	Antenatal care
BTN	*Beyond the Numbers*
CBR	Crude birth rate
CDC	Centers for Disease Control and Prevention
CHWs	Community health workers
CoIA	Commission on Information and Accountability for Women's and Children's Health
CR/VS	Civil registration/vital statistics
EmOC	Emergency obstetric care
GIS	Geographical information systems
HMRI	Health Management and Research Institute
ICD	International Classification of Diseases
IDSR	Integrated Disease Surveillance and Response
IMPAC	Integrated Management of Pregnancy and Childbirth
LAC	Latin America and the Caribbean
MCA	Department of Maternal, Newborn Child, and Adolescent Health/WHO
MCH	Maternal and child health
MDG	Millennium Development Goal
MDR	Maternal death review
MDSR	Maternal death surveillance and response
MMR	Maternal mortality ratio
MoH	Ministry of Health
NGO	Nongovernmental organization
PAHO	Pan American Health Organization
PNC	Postnatal care
RESCUER	Rural Extended Services and Care of Ultimate Emergency Relief
SMS	Short Message Service
TBAs	Traditional birth attendants
VA	Verbal autopsy
UNFPA	United Nations Population Fundd
UNICEF	United Nations Children's Fund
WHO	World Health Organization
WRA	Women of reproductive age

Acknowledgements

The framework for the MDSR technical guidance was developed by the MDSR Working Group and included representatives from the following agencies (alphabetically): Canadian Network for Maternal, Newborn & Child Health, International Federation of Gynecology and Obstetrics (FIGO), International Stillbirth Alliance (ISA), Department for International Development (DFID UK) (Evidence for Action (E4A)), United Nations Population Fund (UNFPA), United States Centers for Disease Control and Prevention (CDC), and the World Health Organization (WHO).

Isabella Danel, Diane Morof and Florina Serbanescu (CDC) prepared the initial draft of and subsequent revisions to this technical guidance. Substantial input was provided by Cindy Berg (CDC), Wendy J Graham (University of Aberdeen and E4A) and Louise Hulton (E4A), Hamid Rushwan and David Taylor (FIGO), and Sennen Hounton, Luc de Bernis, Yves Bergevin, Edilberto Loaiza, and Mauricio Saavedra (UNFPA). WHO staff contributing to the document were Matthews Mathai, Elizabeth Mason, Maurice Bucagu, Doris Chou, Narimah Awin , Bremen De Mucio, Ardi Kaptiningsih, Gunta Lazdane and Ramez Mahaini.

Foreword

The birth of a baby should be a joyous end to a pregnancy for the mother and her family. Yet the physiological function of reproduction carries with it a number of possible outcomes including grave risks of death and disability for the mother and her baby, particularly in low and middle income countries.

There have been significant reductions in maternal and newborn mortality over the last two decades. Yet in 2010, still there were approximately 287 000 maternal deaths, 2.6 million stillbirths and neonatal deaths, resulting mostly from complications during and following pregnancy and childbirth.

Effective interventions to prevent and treat maternal and perinatal complications are well known. Most maternal and perinatal deaths are preventable if life-saving preventive and therapeutic interventions are provided at the right time – in fact, what are known as the "three delays" are major barriers to improving chances of survival: 1) delay in recognizing and seek care when complications occur, 2) delay in reaching a health facility, and 3) delays in receiving appropriate care within the health facility. Recognition of such important links between development and women's health in particular led to "Improving maternal health" being set as one of the Millennium Development Goals.

To understand how well we are progressing, however, accurate information on **how many** women died, **where** they died and **why** they died is essential, yet currently inadequate. In the absence of reliable vital registration data, maternal mortality estimates are based on statistical models. While statistical estimates increase global awareness of the problem, they do not provide information needed for targeted and timely response. The Commission on Information and Accountability (the Commission), created to track progress on resources and results towards the goals of the UN Secretary-General's Global Strategy on Women's and Children's Health, recommended in its report attention to three interconnected processes – monitoring, reviewing and acting – aimed at learning and continuous improvement in life-saving interventions.

Maternal death surveillance and response (MDSR), a relatively new concept that builds on the principles of public health surveillance, supports the processes called for by the Commission. MDSR promotes routine identification and timely notification of maternal deaths and is a form of continuous surveillance linking health information system and quality improvement processes from local to national level. It helps in quantification and determination of causes and avoidability of maternal deaths. Each one of these untimely fatalities provides valuable information, which if acted on, can prevent future deaths. In that regard, MDSR emphasizes the link between information and response. MDSR will contribute to strengthening vital registration and better counting of maternal deaths, and provide better information for action and monitoring improvements in maternal health.

This guidance document has been developed by the MDSR Working Group comprising UN agencies, academics and professional organizations and other partners. It provides practical guidance to move from maternal death reviews to surveillance and response and build on the 2004 WHO publication *Beyond the Numbers: Reviewing maternal deaths and complications to make pregnancy safer* and prior work done in this area by WHO and other partners

Maternal deaths should receive equal attention to the consequences of other life threatening health conditions. This guidance document is timely as we near the 2015 deadline set for achieving the MDGs. If maternal mortality is to become more and more a rare event, MDSR will be crucial. It can drive more effective action, motivate more targeted investments and thereby move us closer to a future where preventable maternal deaths are a thing of the past.

Dr Flavia Bustreo
Assistant Director-General
Family, Women's and Children's Health
World Health Organization

Ms Kate Gilmore
Deputy Executive Director
United Nations Population Fund

Executive Summary

An estimated 287 000 women worldwide died from pregnancy and its complications in 2010, 99%, of them in developing countries. The vast majority of such deaths are preventable. In 2012, the United Nations Commission on the Status of Women passed a resolution calling for the elimination of preventable maternal mortality. To accomplish this, it is essential to have a system that measures and tracks all maternal deaths in real time, helps us understand the underlying factors contributing to the deaths, and stimulates and guides actions to prevent future deaths. Maternal Death Surveillance and Response (MDSR) is a model of such a system..

MDSR is a form of continuous surveillance that links the health information system and quality improvement processes from local to national levels, which includes the routine identification, notification, quantification and determination of causes and avoidability of all maternal deaths, as well as the use of this information to respond with actions that will prevent future deaths:

> **The primary goal** of MDSR *is to eliminate preventable maternal mortality* by obtaining and strategically using information to guide public health actions and monitoring their impact.
>
> **The overall objectives of MDSR** are to provide *information that effectively guides immediate as well as longer term actions* to reduce maternal mortality; and to count *every maternal death*, permitting an assessment of the true magnitude of maternal mortality and the impact of actions to reduce it.

Assessing the magnitude of maternal mortality compels policy-makers and decision-makers to give the problem the attention and responses it deserves.

Moving from maternal death reviews to MDSR

The MDSR system is a *continuous action cycle* that builds on established approaches such as maternal death review (MDR). MDR has led to local policy changes and improvements in the quality of maternal health services, even in challenging settings. MDSR builds on the work done to implement MDR and helps us understand the events surrounding maternal deaths. It stresses the need to respond to each maternal death with actions to prevent similar deaths in the future, and to collect data on all maternal deaths using clearly defined data sources and processes for identification and notification.

New technical guidance for MDSR

This technical guidance introduces the critical concepts of MDSR, including goals, objectives, and specific instructions for implementing each surveillance component. It emphasizes the importance of improving the quantitative and qualitative information collected by existing systems as well as the important role of districts in the MDSR process. Imple-

menting MDSR will depend on the degree to which systems of maternal death notification and review have already been undertaken and the quality of information they are producing.

Key components in the technical guidance

- A maternal death should be made a notifiable event and incorporated in the notifiable disease reporting system
- Identification and notification of maternal deaths
- Maternal death review
- Analysis – data aggregation and interpretation
- Response
- Dissemination of results, recommendations, and responses
- Monitoring and Evaluation (M&E) for MDSR system
- MDSR implementation plan

Identification and notification

The first step in identifying maternal deaths is to assess all deaths in women of reproductive age (WRA) and identify those that occurred while a woman was pregnant or within 42 days of the end of a pregnancy (**suspected maternal death**):

- Any death of a WRA in a health facility should trigger a review of her medical record to determine her pregnancy status. Suspected maternal deaths in the community may be reported by community health workers (CHW), traditional birth attendants, or other community leaders; verbal autopsies should then be performed to determine the probable cause of death.
- Deaths occurring in health facilities should be identified and notified to the appropriate authorities *within 24 hours*, and deaths in communities *within 48 hours*. Notification should include "zero reporting," an active process of notifying suspected maternal deaths, whether or not any occurred.
- The district's role in the identification and notification process is initially to notify the national level about all suspected maternal deaths and then follow up by reporting probable or confirmed maternal deaths.
- Triangulating data sources helps avoid duplicate notification of the same suspected maternal death.

Maternal death review

MDRs, an essential component of MDSR, are "qualitative, in-depth investigations of the causes of, and circumstances surrounding, maternal deaths" that occur in both healthcare facilities and communities.

Steps in the MDR process: A written summary of each death, including key findings, is prepared and presented to a multidisciplinary committee that discusses the case, reviews all pertinent data, and completes a brief report on the medical cause of death (including probable causes for deaths that occurred in communities), contributing factors, and avoidability. Findings are coded and entered into the database. The committee then issues recommendations, which may be broad or specific, to address avoidable factors noted by the review to prevent similar deaths in the future.

Key points related to MDR:

- Each country should decide what data to collect; however, collecting consistent data for action and defining comparable data elements across countries should be underlying principles.

- The MDR process should include **all** probable maternal deaths and, at the minimum, be performed at the facility and district levels. The number and frequency of MDRs depend on the number of cases identified and available resources. Ideally, local reviews are conducted immediately for facility deaths and within a month, if more information is needed, so that early actions can be instituted.
- National guidelines for MDR should include information on its processes, availability of data and tools, data transmission, frequency, required channels, feedback mechanisms, and clear standard operating procedures for MDR at each level, including legal information.

The support of local community leaders, facility directors, and national or state government entities for MDR and their involvement at each step in the process is essential.

Analysis and interpretation of aggregated findings from reviews

The aim of aggregated data analysis is to identify causes of death, groups at highest risk, contributing factors, and emerging data patterns and to prioritize health problems to guide the public health response. The translation of MDSR data into information meaningful for decision-makers, the medical community, and the public is important. The analysis is instrumental in monitoring and evaluating responses and detecting the impact of changes in health-care practices and health-seeking behaviours. Key points related to this step:

- A data management plan with a clear framework for data transmission, aggregation, processing, and storage must be defined, along with an analytical plan that includes specified indicators. MDSR should include basic descriptive analyses by person, place, and time.
- Analysis should be performed at the level closest to the community with the appropriate analytical skills – at the minimum, at the district level.
- Health facilities with large-volume deliveries (≥500 annually) should also perform descriptive analyses of facility-based maternal deaths. All facilities should know their facility-specific number of maternal deaths, calculate facility indicators, and report on causes of death in their facility.
- Document the frequency of medical and nonmedical contributing factors in maternal deaths.
- Grouping the findings from death reviews and reviewing them quantitatively provides information about which problems are most common and assists in prioritizing responses.

Response

Findings from reviews should lead to immediate actions to prevent similar deaths, at health facilities and in the community. In addition, responses may also be periodic or annual. Identification of patterns of particular problems contributing to maternal deaths or geographical areas where deaths occur in greater numbers should result in more comprehensive responses. Responses should be tailored to address the problems identified in the community, health-care facility, and health-care system, as well as at the inter-sectoral level. The type of action taken will depend on the level at which the decisions are being made, the findings of the analysis, and the stakeholders involved. Improving quality of care is an important element of response at the health facility. Guiding principles for response include:

- starting with the avoidable factors identified during the review process;
- using evidence-based approaches;

- prioritizing actions (based on prevalence, feasibility, resources, health-system readiness);
- establishing a timeline (immediate, short, medium, and long term);
- deciding how to monitor progress, effectiveness, and impact;
- integrating recommendations within annual health plans and health-system packages;
- monitoring to ensure recommendations are being implemented.

Dissemination of results, recommendations, and responses

A plan for disseminating MDSR results should be determined in advance. Flexibility must be built in because the results will not be known until the review data are analysed. The team involved in undertaking the MDR should be fully involved in the review, developing the recommendations, planning and promoting their implementation, and acting as advocates for change. Data should be aggregated or de-identified so individual families or providers cannot be identified; recommendations should be fed back to the hospital or community where the information was collected using language and dissemination methods tailored to the target audiences; and legal safeguards should be in place to prevent the use of the review findings in litigation. Key messages must get to those who can implement the recommendations and make a real difference towards saving mothers' lives.

Monitoring and Evaluation (M&E) of the MDSR system

M&E takes place to improve the timeliness, quality, and completeness of information and ensure that the major steps in the system are functioning adequately and improving with time. Monitoring of the MDSR system is carried out primarily at the national level.

The framework for M&E includes standard indicators based on MDSR principles: maternal death as a notifiable event; facility-, community-, and district-level reviews; data quality; and percentage of recommended responses undertaken. Because the main purpose of MDSR is to take actions to eliminate preventable maternal deaths, the system is failing if this is not happening. In this case, a more detailed evaluation may be needed to assess how the system can function more effectively.

MDSR implementation plan

The final structure and scope of MDSR will differ according to the local context and challenges. MDSR implementation strategies must consider local capabilities, limitations, logistical issues, budgetary realities, and legal requirements, and they must be adaptable and customizable.

Prerequisites to implementation are intensive and inclusive planning and development of system-wide linkages and processes that foster communication and collaboration at all levels, agreement on the scale of coverage and design of the system, assessment of the current situation including mapping existing resources and identification of gaps, identification of regulations and legal protections in place, and identification of opportunities for cost-saving and achieving wider benefits.

After documenting the current status of the components of the MDSR system, realistic long-term (3- to 5-year) goals should be established, along with annual benchmarks for monitoring progress towards reaching the goals. Taking a phased approach to achieving key benchmarks will make the implementation seem less daunting and demonstrate progress towards reaching the final goal.

Key messages of this guide:

- MDSR is a system aimed at preventing maternal deaths and improving the quality of care through the dissemination and use of information for appropriate decision-making.
- Understanding the underlying factors leading to the deaths is critical for preventing future mortality.
- Data collection must be linked to action. A commitment to respond, that is to act on findings, is a key prerequisite for success.
- As a starting point, all maternal deaths in health facilities should be identified, notified, reported, reviewed, and responded to with measures to prevent future deaths.
- Improving the measurement of maternal mortality by working to identify all maternal deaths in a given area is imperative; without measuring maternal mortality ratios, we will not know if our actions are truly effective in reducing maternal deaths.

1.
Introduction

The death of a mother is a tragedy that has an immense impact on the wellbeing of her family. The survival and development of her children, especially infants, may be adversely affected. Each mother's death diminishes the society at large. Yet, nearly all of these deaths are preventable and should be eliminated, as called for by the Commission on the Status of Women. A vital component of any elimination strategy is a surveillance system that not only tracks the numbers of deaths, but provides information about the underlying factors contributing to them – and how they should be tackled. Maternal Death Surveillance and Response (MDSR) is a model of such a system.

An estimated 287 000 women worldwide died from pregnancy and its complications in 2010, 99%, of them in developing countries (*1,2*). Reported maternal mortality underestimates the true magnitude by up to 30% worldwide and by 70% in some countries (*3,4*). Inadequate measurement contributes to a lack of accountability and in turn to a lack of progress. By investigating a woman's death, MDSR inherently places value on her life – an important form of accountability for families and communities. An MDSR system provides essential information needed to stimulate and guide actions to prevent future maternal deaths and improve how maternal mortality is measured (*5*).

What is Maternal Death Surveillance and Response?

Public health surveillance is the ongoing systematic collection, analysis, and interpretation of health data. It includes the timely dissemination of the resulting information to those who need it for taking action. Surveillance is essential for the planning, implementation, and evaluation of public health practice (*6*).

Maternal Death Surveillance and Response (MDSR) is a form of continuous surveillance linking the health information system and quality improvement processes from local to national levels. It includes the routine identification, notification, quantification, and determination of causes and avoidability of all maternal deaths, as well as the use of this information to respond with actions that will prevent future deaths. Elimination of preventable maternal mortality is the goal of MDSR.

The "R" focuses on the response – the action portion of surveillance. MDSR underlines the critical need to respond to every maternal death. Each death provides information that, if acted on, can prevent future deaths. MDSR emphasizes the link between information and response. In addition, the notification of every maternal death permits the measurement of maternal mortality ratios and the real-time monitoring of trends that provide countries with evidence about the effectiveness of interventions.

MDSR has two underlying rationales:

- Providing information about avoidable factors that contribute to maternal death and using the information to guide actions that must be taken at the community level, within the formal health-care system, and at the intersectoral level (i.e. in other governmental and social sectors) are critical for preventing similar deaths in the future.
- Establishing the framework for an accurate assessment of the magnitude of maternal mortality permits evaluators to assess more accurately the effectiveness of interventions to reduce maternal deaths. It also helps provide accountability for results and compels decision-makers to give the problem the attention and responses it deserves.

The context for MDSR

MDSR responds to Millennium Development Goal 5, which aims to reduce the maternal mortality ratio by three quarters. This MDG is far from being achieved. To accelerate progress, the Secretary-General of the United Nations launched the Global Strategy for Women's and Children's Health in September 2010 (*7*). The Commission on Information and Accountability (CoIA) was then formed to determine the most effective international institutional arrangements for global reporting, oversight, and accountability on women's and children's health. Among CoIA's key recommendations is a focus on getting better information for producing better results. It recommends setting up efficient health information systems that combine data from facilities, administrative sources, and surveys (*7*). The framework for implementing these recommendations, developed by the World Health Organization, includes establishing MDSR systems and improving vital registration in each country.

The UN Commission on the Status of Women has an even more ambitious goal: the elimination of preventable maternal mortality and morbidity (*8*) through universal access to family planning methods, skilled birth attendance, and basic and comprehensive emergency obstetric care. By providing information to guide corrective actions and monitoring real-time numbers of maternal deaths, MDSR is an essential element of any strategy for eliminating preventable deaths (*9*).

How does MDSR build on Maternal Death Reviews and other available systems?

Maternal Death Review (MDR) systems have led to local policy change and improvement in the quality of maternal health services, even in challenging settings. Facility-based MDR systems are "qualitative, in-depth investigations of the causes of, and circumstances surrounding, maternal deaths which occur in health-care facilities" (*10*). Community-based maternal death reviews (verbal autopsies) are "a method of finding out the medical causes of death and ascertaining the personal, family, or community factors that may have contributed to the deaths in women who died outside of a medical facility" (*11*).

MDSR builds on the work done to implement MDR and to promote understanding of the events surrounding maternal deaths. It also works to improve maternal death notification. Though countries may already have in place provisions for notification of maternal deaths, these provisions are not always well defined and enforced. MDSR stresses that *all* countries should incorporate maternal deaths in their system of notifiable disease reporting and that concrete steps should be taken to ensure timely notification. MDSR also stresses the need to collect data on all maternal deaths that occurred in facilities as well as communities, and to use this information to provide a snapshot of weaknesses in the health-care delivery system as a whole – from the community through the various levels of referral to the tertiary care facility. Clearly defined data sources and processes for death identification and notification, regardless of the place of death, are emphatically required. In countries where maternal death notification, reporting, and response are included in

other surveillance systems (e.g. Integrated Disease Surveillance and Response [IDSR] systems, as shown in Box 4.1, Chapter 4), MDSR explicitly builds upon existing processes and guidelines and makes specific recommendations for action.

MDSR emphasizes the importance of data analyses, the use of the findings for response, and accountability for the response, as well as the provision of feedback to partners who are part of the MDSR system. It provides more formalized reporting and strengthens linkages to national and district maternal mortality reduction plans. It encourages a more robust response and gives maternal mortality greater visibility and importance.

Implementation of MDSR

Implementing MDSR will depend on the degree to which maternal death notification and review systems have already been implemented and the quality of information they are producing. This guidance document emphasizes the importance of building on existing systems to improve their collection of quantitative and qualitative information. Having more accurate information will help ensure that all maternal deaths are counted, a review process takes place to understand how to prevent future deaths, and actions are taken to implement the recommendations produced by the review process.

Who is this document for?

This technical guidance introduces critical concepts of MDSR, including goals, objectives, and specific instructions for implementing each surveillance component. Further, it explains how districts can set up MDSR processes to strengthen surveillance and response activities. The intended readership includes health professionals, health-care planners and managers, those who measure maternal mortality and policy makers working in maternal health. The use of findings to improve maternal health outcomes is central to MDSR implementation. Stakeholders who can drive change should be involved in all aspects and processes of setting up MDSR to ensure that the recommended changes take place.

2.
Goals and objectives of MDSR

Goal: To eliminate preventable maternal mortality

The primary goal of MDSR is to eliminate preventable maternal mortality by obtaining and using information on each maternal death to guide public health actions and monitor their impact.

MDSR expands on ongoing efforts to provide information that can be used to develop programmes and interventions for reducing maternal morbidity and mortality and improving access to and quality of care that women receive during pregnancy, delivery, and the puerperium. MDSR aims to provide information that will lead to specific recommendations and actions and improve the evaluation of their effectiveness. The precise nature of this information will differ from country to country. This guidance includes examples from various countries of how data are collected and used to provide information.

Overall objectives

1. To provide information that effectively guides actions to eliminate preventable maternal mortality at health facilities and in the community
2. To count *every maternal death*, permitting an assessment of the true magnitude of maternal mortality and the impact of actions taken to reduce it

Specific objectives

1. To collect accurate data on all maternal deaths, including:
    a. number – identify and report all maternal deaths;
    b. causes of death and contributing factors – review all maternal deaths (e.g. facility records, verbal autopsies, MDR);
2. To analyse and interpret data collected, including:
    a. trends in maternal mortality;
    b. causes of death (medical) and contributing factors (quality of care, nonmedical factors);
    c. avoidability of the deaths, focusing on those factors that can be remedied;
    d. risk factors, groups at increased risk, and maps of maternal deaths;
    e. demographic and socio-political contexts.
3. To use the data to make evidence-based recommendations for action to decrease maternal mortality. Recommendations may include a variety of topics, such as:
    a. community education and involvement;
    b. timeliness of referrals;
    c. access to and delivery of services;

d. quality of care;
e. training needs of health personnel/protocols;
f. use of resources where they are likely to have an impact;
g. regulations and policy.

4. To disseminate findings and recommendations to civil society, health personnel, and decision-makers and policy-makers to increase awareness about the magnitude, social effects, and preventability of maternal mortality.
5. To ensure actions take place by monitoring the implementation of recommendations.
6. To inform programmes on the effectiveness of interventions and their impact on maternal mortality.
7. To allocate resources more effectively and efficiently by identifying specific needs.
8. To enhance accountability for maternal health.
9. To improve maternal mortality statistics and move towards complete civil registration/vital statistics records.
10. To guide and prioritize research related to maternal mortality.

3.
MDSR overview

The MDSR system is a continuous-action cycle designed to provide real-time, actionable data on maternal mortality levels, causes of death, and contributing factors, with a focus on using the findings to plan appropriate and effective preventive actions. While building on established approaches such as Integrated Disease Surveillance and Response and Maternal Death Reviews, it aims to identify, notify, and review all maternal deaths in communities and facilities, thus providing information to develop effective, data-driven interventions that will reduce maternal mortality and permit the measurement of their impact.

The MDSR cycle consists of four steps (Figure 3.1):

FIGURE 3.1
Maternal Death Surveillance and Response (MDSR) system: a continuous-action cycle

1. **Identification and notification on an ongoing basis:** Identification of suspected maternal deaths in facilities (maternity and other wards) and communities, followed by immediate notification (within 24 and 48 hours, respectively) to the appropriate authorities.
2. **Review of maternal deaths by local maternal death review committees:** Examination of medical and nonmedical contributing factors that led to the death, assessment of avoidability and development of recommendations for preventing future deaths, and immediate implementation of pertinent recommendations.
3. **Analysis and interpretation of aggregated findings from reviews:** Reviews are made at the district level and reported to the national level; priority recommendations for national action are made based on the aggregated data.
4. **Respond and monitor response:** Implement recommendations made by the review committee and those based on aggregated data analyses. Actions can address problems at the community, facility, or multi-sectoral level. Monitor and ensure that recommended actions are being adequately implemented.

The cycle continues as cases are identified and reviewed, paying particular attention to monitoring whether recommended actions have been implemented and whether they are effective. Monitoring and evaluation of the MDSR system takes place to improve the quality and completeness of information.

Principles of MDSR

The information provided by MDSR can increase awareness of maternal mortality at the community, health-care system, and intersectoral levels; lead to changes in practices by the public, communities, and health-care providers; and foster the reallocation of resources to activities that more effectively prevent maternal deaths. MDSR needs an enabling environment – one of collaboration rather than blame – to make its findings and apply them towards action. The system should build on and strengthen existing maternal death information systems. For a successful MDSR, the following principles should be considered:

Intensive and inclusive planning: Establish a code of conduct and legal environment for setting up an MDSR system; establish standards for conducting MDRs; engage and orient all stakeholders, including communities and the private sector; and engage professional associations and identify champions.

Sustained collective learning, for action at all levels: Promote shared responsibility and teamwork; introduce MDSR principles and guidance in training curricula; and foster collective learning for action at different levels – from the community to the health care delivery system.

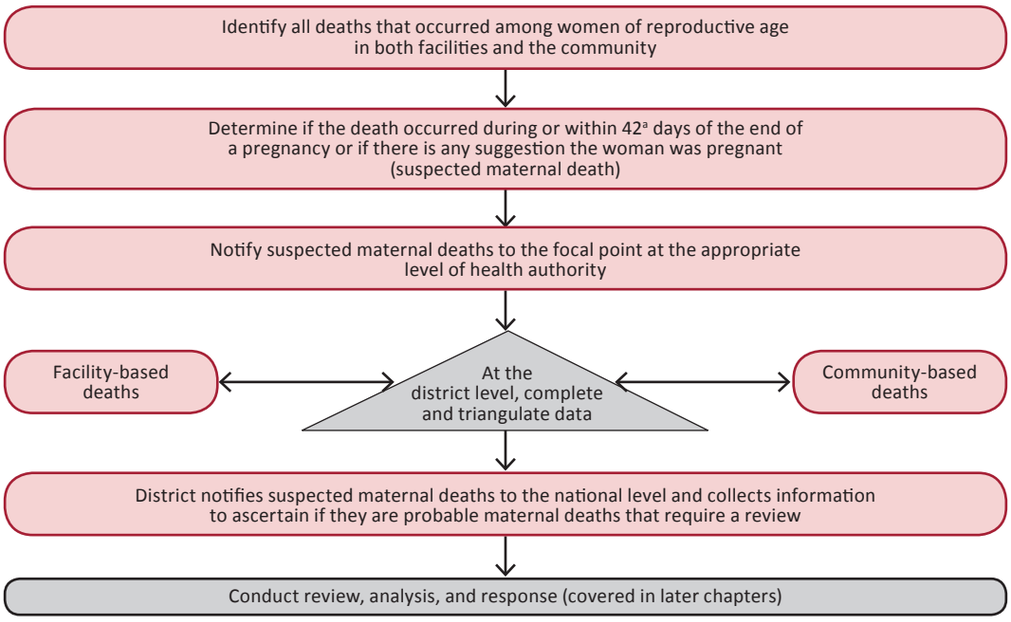
Optimizing opportunities for achieving wider benefits: Develop a culture of accountability and quality of care centered on continuous improvement of health care and services; improve recordkeeping, data flow, data quality, and health management information systems; strengthen existing systems, including vital registration and population/pregnancy surveillance; and focus on improved understanding of the burden and level of maternal deaths in the population.

4.

Identification and notification of maternal deaths

MDSR begins with identification of deaths. Figure 4.1 provides an overview of the steps taken for the identification and notification of maternal deaths.

FIGURE 4.1
Identify and notify all suspected maternal deaths



[a] When capturing suspected maternal deaths in the community, widening this time period to 2–3 months may be appropriate to ensure all maternal deaths are captured. Determinations as to whether they are maternal deaths can be made either at the district level or during the review process.

Case definitions

The 10th International Classification of Diseases (ICD-10) defines **maternal death** as "the death of a woman while pregnant or within 42 days of the termination of pregnancy, irrespective of the duration and site of the pregnancy, from any cause related to or aggravated by the pregnancy or its management but not from accidental or incidental causes" (*12*). Maternal deaths can be categorized into direct obstetric deaths and indirect obstetric deaths (see Glossary).

A **suspected maternal death** is defined here as the death of any woman while pregnant or within 42 days of the termination of pregnancy. In many settings, a pregnancy is not confirmed until the second trimester or until it is physically evident. Any death where there is a suggestion of a pregnancy should be notified as a suspected maternal death. Because the concept of "42 days or 6 weeks" may not be well understood, this time period should be extended to 2–3 months when setting up the system for notification of suspected maternal deaths. Some countries also include late maternal deaths (up to one year after the termination of pregnancy – see Glossary) in notification, reporting, and review (although these do not count in official maternal death statistics).

Someone should be identified, usually at the district of sub-district level, and held responsible for collecting additional information to help classify the death even if the death appears to be due to incidental or accidental causes, for example, a motor vehicle incident or a homicide. Deaths among women of reproductive age, not clearly due to incidental or accidental causes, constitute **probable maternal deaths**, and should be submitted to the maternal death review committee for review (as detailed in Chapter 5). Depending on the circumstances surrounding the death, identification of a death as maternal is sometimes challenging – particularly for indirect maternal deaths. The maternal death review committee will review the circumstances and confirm maternal deaths (i.e. whether the death was "related to or aggravated by the pregnancy and its management").

Maternal death – a notifiable event

Maternal mortality reduction is the MDG that is lagging furthest from achievement; therefore, its importance to society must continually be underscored by national leaders. Maternal deaths often indicate weaknesses in the health-care system (*13*). Timely reporting of maternal deaths is critical if the MDSR system is to be successful – memories of such events and the surrounding circumstances become less clear as time passes. Additionally, families often break up after a mother's death or other key informants may leave the area, leading to loss of key information about why the woman died.

Because of their importance, when implementing MDSR, countries should develop policies to make suspected maternal death a notifiable event. In countries where IDSR technical guidelines include maternal mortality as a notifiable condition, the IDSR platform should be strengthened during the MDSR implementation process (see Box 4.1). Obligatory notification makes maternal mortality a national priority, underlining the fact that every maternal death matters. Many countries have already implemented a policy of adding maternal death to the list of notifiable diseases (*6*).

Generally, classifying an **event or disease as notifiable** means it must be **reported to the authorities within 24 hours and followed up by a more thorough report of medical causes and contributing factors**. This approach is used for many infectious diseases. Deaths occurring in health-care facilities should be notified within 24 hours, and deaths in communities should ideally be notified within 48 hours.

If suspected maternal death is classified as a notifiable event, the channels for communication and reporting must be clearly understood. In most cases notifiable diseases are communicated to the epidemiology and/or surveillance departments at the district level, which then communicate to the national level (*6*). Decisions about how the chain of notification would work from a rural village to the district must be adjusted according to the country context. Generally, the chain will be similar to that for other notifiable conditions, that is, immediate notification followed by a more thorough report.

Notification should be systematic, including absence of cases ("zero reporting"). Zero reporting means there is an active process of notifying suspected maternal deaths, whether or not any occurred. If no maternal deaths occurred, a "zero" is captured in the data

collection system rather than nothing at all. If an entry is left blank, it is not clear that attention was paid to the entry. Zero reporting is used as an indicator that active monitoring for other diseases is taking place. It helps remind people to look for these events.

If notifiable event information is being collected by the epidemiology department, a clearly defined method of communication must be set up that includes those who will carry out the maternal death review or verbal autopsy, as well as those responsible for analysing and reporting on maternal health (usually the MCH department).

BOX 4.1

The Integrated Disease Surveillance and Response System and MDSR

The Integrated Disease Surveillance and Response System (IDSR), used to some degree in 86% of districts in Africa, is a strategy for comprehensive public health surveillance and response (*6*). Several African countries have adapted the IDSR technical guidelines to the national context and included maternal mortality as a notifiable condition in the national priority lists of diseases and conditions (*6*). Supporting IDSR, where available, would be preferable to initiating a duplicate system for MDSR.

IDSR advises that after determining that the death of a woman occurred during pregnancy or within 42 days of its termination, the initial notification of the suspected maternal death should be done immediately, by the fastest means possible. The health facility should contact the district authority and provide information about the case. The initial notification should be followed by a written report using a case-based report form (Appendix 1). The form is completed and submitted electronically where possible; if not, it is delivered by telephone or on paper.

If no cases of a maternal death have been identified during the week, a "zero" is actively reported.

Sources of information

The two major sources of information for timely reporting of maternal deaths are **health-care facilities** (where women give birth and are attended when they have pregnancy complications) and **communities** (when women give birth at home or on the way to a health-care facility or die during pregnancy without receiving medical care). Although MDSR systems may operate differently from country to country, the objectives should be the same – to identify and notify all suspected maternal deaths, review those deaths that are potentially due to pregnancy and its complications or its management, act on the information and implement measures to prevent future deaths, and assess the response. Only when every maternal death is identified, notified, and reviewed can the magnitude and causes of the problem be understood, more effective interventions be implemented, and their impact be evaluated.

Vital records are an important source for formal maternal mortality reporting, and their development should take place in parallel with MDSR. Ideally, information from MDSR will feed into the formal vital registration process. Ghana estimated a 6.5% increase in death reporting with improved hospital and civil registration data (*14*).

Deaths among women of reproductive age

The first step in identifying maternal deaths is to assess all deaths in women of reproductive age, which requires questioning the family and community informants. Some suspected maternal death cases will be obvious (e.g. the woman died during childbirth or shortly afterwards, or she was in her third trimester and the pregnancy was evident). Other cases may be less obvious (e.g. a death from complications of an abortion, whether

spontaneous or induced, an ectopic pregnancy, or a death that occurs many weeks after childbirth). A few screening questions will establish whether the family had any knowledge that the woman was pregnant at the time of death or if she had delivered in the past 6 weeks. To capture all postpartum maternal deaths, the screening questions for a suspected maternal death can include women who delivered 2–3 months previously or other questions that may be culturally appropriate.

Identification and notification of suspected and probable maternal deaths in health facilities

Suspected maternal deaths occurring in a hospital or other health facility are usually easier to identify. Nevertheless, to ensure that none are missed, someone should have a daily responsibility to check death logs and other records from the previous 24 hours and collect a line listing of deaths of all WRA. The death logs review should include not only the obstetric ward but other areas where women may seek care or enter the facility (e.g. adult or women's wards, emergency or surgery departments, mortuary) (*15*). Any death of a WRA should trigger a review of her medical record to look for evidence that she could have been pregnant or within 42 days of the end of a pregnancy. This process should be documented by using either a paper or electronic questionnaire. If there is such evidence, the death will be notified as a suspected maternal death to the proper authorities. Generally, notification is made to the district office, but in some countries the chain of communication may include municipalities or other levels.

A more extensive review of the record should then be carried out to confirm if the death was probably maternal (due to or aggravated by a pregnancy or its management) or if it was due to accidental or incidental causes. A finding of probable maternal death should then trigger a more in-depth review (detailed in Chapter 5).

Identification and notification of suspected maternal deaths in the community

Suspected maternal deaths in the community are usually reported by community health workers (CHW) or, in their absence, by other community representatives. This process is more complicated than reporting from health facilities for several reasons: 1) Deaths are far less frequent, and communities will need periodic reminders about their importance and the reporting process; 2) supervising every single community is difficult, especially if there are no CHWs; and 3) there may be no way to report quickly, for example, if telephone service is nonexistent. The process works best where CHWs have periodic meetings with first-level health professionals where information can be shared and reminders given about MDSR. Traditional birth attendants (TBAs) are an important source of information and are generally willing to participate in an MDSR system. Other community leaders may also become part of the process and maintain lists of deaths among women of reproductive age.

Ideally the CHWs or other community representatives will identify deaths of all WRA, determine if the woman was pregnant or within 42 days after the end of a pregnancy when she died, and notify the death to the appropriate authority. To ensure that all maternal deaths are captured in countries where dates and times are not easily ascertained, the 42 days can be extended to 2–3 months, or whatever time period is culturally appropriate. Notification should include the name of the woman, where she resided, where she died, when she died, and the name of the person making the notification. The health authorities will follow up to ascertain if it is a probable maternal death, which will prompt a review to identify the medical cause of death and any nonmedical factors that may have contributed to it (see Chapter 5).

Methods of notifying deaths

Methods for death notification depend on the level of development of information and communication systems. In many countries systems have been established for communicable diseases (such as IDSR), and suspected maternal death notification can be, and has been, incorporated. Depending on the context, the Internet, telephone (texts or calls), radio, and paper forms can be used. Preference is given to automated and reliable systems.

Innovative uses of technology for maternal death notification

Using technology to simplify the collection, transmission, and administration of health information saves time and money. Integrating new technologies with health data management systems can increase the number of deaths that are reported.

Personal digital assistant devices and tablet computers are becoming more affordable and offer additional benefits to data collection. Programmes such as mHealth and Epi Info 7.0 offer options for data collection and entry on mobile devices, including touch-screen questionnaires, photographs, and GIS coordinates (*16,17*). Thus, collecting and transmitting data becomes easier and data analysis is done more quickly.

BOX 4.2

Examples of communication and information technologies in maternal death notification

In the Sene District of Ghana, heath workers and TBAs were trained to send Short Message Service (SMS) text messages from mobile telephones using a numeric protocol to report findings on postpartum hemorrhage, including its management and related deaths. Data for all births attended over a 90-day period were reported. All attendants followed the reporting protocol correctly, showing it was feasible to train health workers and TBAs to report health outcome data in this manner (*18*).

SMS has also been used in Kenya. In one study mobile telephones were given to chiefs, who were asked to text a notification of every pregnant woman and to register each outcome of that pregnancy. The researchers found that the mobile telephones were being used not only to get more accurate numbers, but to identify causes of death as well (*19*).

With the support from Gramin Intel, a pilot maternal care project in Bangladesh is using laptop-based software for CHWs to identify high-risk pregnancies, track patients and their outcomes, provide education and training modules to the pregnant mothers based on their risk factors, and allocate health resources (*20*).

Identification and notification of suspected and probable maternal deaths – district responsibilities

Data generally flows from the community or facility to the municipality or sub-district and then to the district. When a suspected maternal death occurs, the district either receives a notification form or fills out the form itself based on information provided by telephone or other medium. District personnel should assign case registry numbers and retain files in secured storage. The district's initial role in the identification and reporting process is to notify the national level about all suspected maternal deaths (along with other notifiable events and diseases). The district then follows up by reporting the number of probable or confirmed maternal deaths. Countries can decide for themselves whether to report probable maternal deaths to the national level before they are confirmed, or whether to report these deaths only after they are confirmed through the review process. The periodicity

of reporting to the national level should be linked to the periodicity of reporting other notifiable diseases. Confirmed maternal deaths, that is, those that have been reviewed (see Chapter 5) and confirmed to be maternal, should be reported to the national level on a monthly or quarterly basis, along with any other key information found during the review process.

The district also has the responsibility to provide training and supervision on MDSR to health workers in its municipalities; to monitor zero reporting and identify areas that are 'silent'; and to monitor the quality of the maternal mortality reporting (i.e. whether deaths reported as suspected or probably maternal are correctly classified).

Using triangulation to avoid duplication

It is important to avoid duplicating notification of the same suspected maternal death from multiple sources, for example, from both a facility and community. Triangulation of data between sources using personal identifiers helps ensure each death is reported only once. Designating a focal point, usually someone at the sub-district or district, can ensure there is no duplication. After triangulating information, the focal point will notify the next level (regional or national).

Communication

When establishing an MDSR system, effective communication is essential for ensuring accountability and the complete identification of maternal deaths. A communications plan should be prepared at the start that includes how results will be communicated, how crises communications will be managed (e.g. to avoid unintended consequences such as rebuttal, denial, or denigration for political reasons), and how communications to promote advocacy and resource mobilization for the system will be conducted.

Connections between MDSR and vital registration systems

Mortality data are a critical component of the public health information infrastructure. Ultimately, all deaths, including maternal deaths, should be reported to a civil registration/vital statistics (CR/VS) system. In developed countries, maternal mortality ratios are derived from vital statistics. In jurisdictions where the CR/VS system is insufficient or nonexistent, MDSR can help contribute to its development. In many countries, forms for death reports include duplicates, with one copy sent to the appropriate health authority and a second sent to the CR/VS authority.

Reporting maternal deaths to CR/VS systems is simplified further if electronic systems are available. Hospitals are a good starting point for ensuring that all deaths are reported to CR/VS. In several countries a CR/VS office is located within a hospital where both births and deaths can be registered. For example, Argentina, Bolivia, and Uruguay have registry offices in maternity hospitals. In addition, Venezuela has had a birth registration office in its main hospitals since 2003 (*21*).

BOX 4.3

MDSR and vital registration in The Gambia

The Gambia supported the integration of birth registration at maternal and child health clinics throughout the country. Principal public health officers and officers at district and divisional levels are required to serve as registrars and deputy registrars. These actions led to an increase in birth registration, from 32% of births in 2000 to 55% in 2006 (*22*). Similar systems could be implemented for deaths and in hospitals.

In countries with reasonably complete vital registration systems, national maternal mortality reporting is based on maternal deaths reported through CR/VS. Including **pregnancy checkboxes** on death registration forms helps ensure that all maternal deaths are captured through CR/VS. In the Latin America and Caribbean (LAC) region, Ecuador, Nicaragua, and Honduras include checkboxes on death certificates to increase the identification of women who died while pregnant or postpartum (*21*).

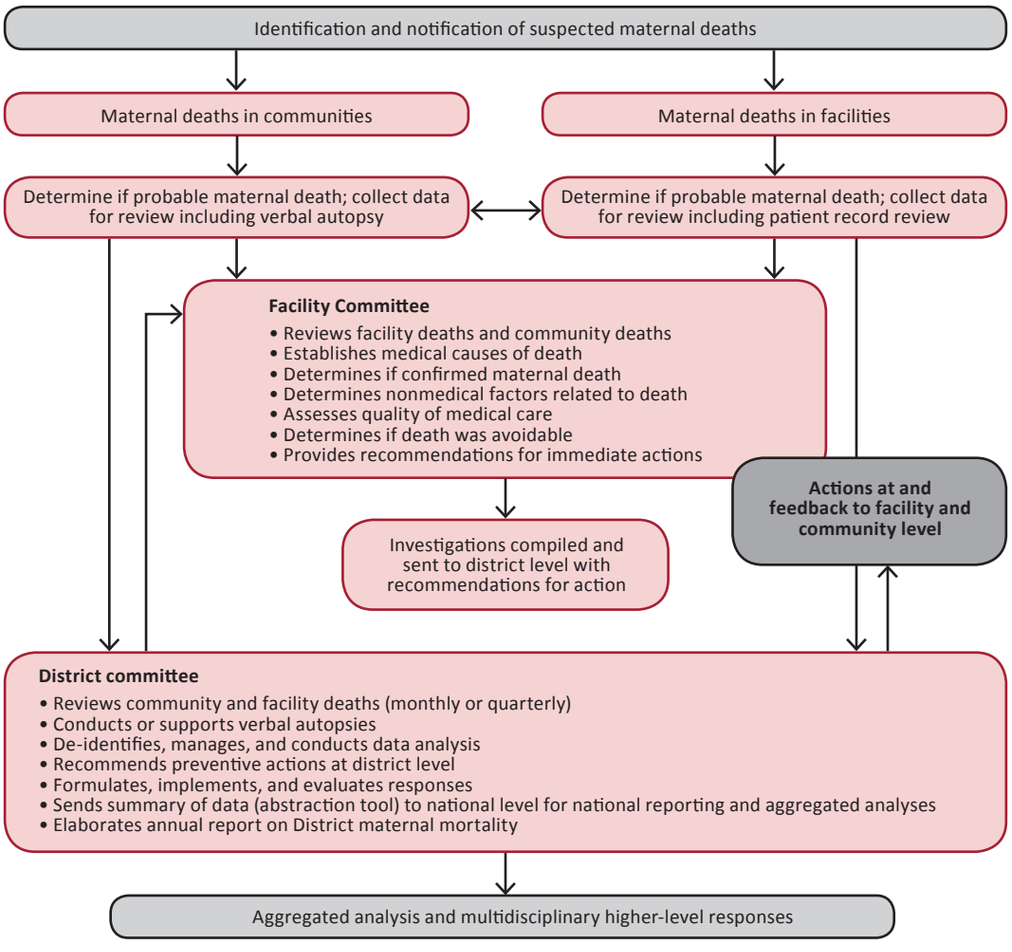
If vital registration is complete and computerized, deaths among WRA can be linked to registered births and fetal death files. Such linkages can increase the number of suspected maternal deaths by detecting women who died within 42 days after giving birth, thereby helping ensure that all maternal deaths are identified.

Pregnancy surveillance systems

Pregnancy surveillance involves notification and monitoring of all pregnant women and reporting the outcomes of their pregnancies. In areas where all pregnancies are monitored and outcomes reported, all maternal deaths should theoretically be captured. This type of system has been piloted in a few areas in Africa (*23,24*) and elsewhere. Pregnancy surveillance has many advantages (besides enhancing maternal death notification). However, it also requires greater resources and more intense community involvement to be successful.

5.
Maternal death review

FIGURE 5.1
Maternal Death Review



Overview

Following the World Health Organization's publication of *Beyond the Numbers* (BTN) in 2004 (*11*), maternal death reviews (MDRs) have been successfully introduced or strengthened in many resource- poor countries. These reviews help facility-, district-, regional-, and national-level health officials develop safe motherhood strategies and influence clinical and public health practice. Fifty percent of *Countdown* countries (*25*) now carry out facility or community MDRs.

BTN defines MDR as "qualitative, in-depth investigation of the causes of, and circumstances surrounding, maternal deaths" and includes methods designed for reviewing deaths that occur in both health-care facilities and communities (*11*). Medical causes and contributing factors are determined as part of MDR with a view towards finding out why maternal deaths are occurring and what can be done to prevent them. MDR prerequisites include confidential, participatory approaches that aim to improve quality of care rather than to blame or punish.

These approaches, described in depth in BTN, are reviewed briefly here. This guidance document emphasizes that MDRs are an essential component of MDSR and highlights features of MDR implementation in the context of MDSR. In particular, these include the expansion of the MDR concept to include information on maternal deaths from the community, even when deaths occurred in health facilities; the necessity to conduct MDR for all probable maternal deaths in both communities and facilities; the linkages of MDR with reporting, aggregated analyses, and multilevel responses; and the importance of monitoring and improving case detection, data quality, and the quality of recommendations and implementation.

Figure 5.1 illustrates the MDR processes within MDSR. Following the immediate notification of suspected maternal deaths by communities and facilities, a determination is made about whether it was a probable maternal death (i.e. not due to incidental or accidental causes – see Chapter 4). Reports of probable maternal deaths are then forwarded for maternal death review.

Data collection in facilities is done before the review. Data from multiple sources, including patient records, are verified and compared. For example, data initially may be extracted from the Ob/Gyn admission and discharge register, then complemented with information from the labour and delivery ward register and theatre or minor surgery record books. Case notes, patient records, postoperative notes, and laboratory results, when available, also can be valuable sources of information. Cross-checked data are used to compile summaries needed for the review.

Deaths occurring in the community and notified to the facility or district must also be reviewed. Although notification can be done by various key informants (e.g. community, religious, or political leaders; action groups; civil society organizations; police) maternal deaths can be confirmed only through a review. Therefore, community health workers, midwives, or other personnel from the health facility serving the community or designated personnel from the district are essential to this process. Review at the community level requires performing verbal autopsy; these are conducted with assistance from the family and other community members. Verbal and social autopsies help reviewers understand the circumstances of the death and determine if it could have been avoided. Only cases of probable maternal deaths will be submitted for review. Reviews of probable community maternal deaths can be conducted either by the facility responsible for providing health services to the community or by the district.

To identify the levels and determinants of maternal mortality and emphasize the message that no maternal death is acceptable, *all* maternal deaths must be reviewed. Reviews

should be done at the facility or district level by multidisciplinary committees made up of health professionals and management staff. This is essential for changing practices, fostering ownership, and ensuring the best possible data quality. All efforts should converge to ensure the leadership (or at least strong engagement) of health professionals and to create an effective tool for improving the quality of care at all levels, not just another burdensome bureaucratic system.

MDR methodologies include facility-based and community-based reviews (i.e. verbal autopsies), depending on the place where the deaths occur (home, first-level care facility, or referral facility) and the availability of data sources. Often, a combination of methods may be considered to collect as much information as possible. For example, a maternal death that occurred in a facility or during transportation may be further investigated at the community level. A review at the referral level may require investigation at a lower level and even at the community level to understand the woman's history and the path she followed. A maternal death at home may be complemented with information from medical records, for example, to find out if the woman had antenatal care or if death occurred soon after discharge from a health facility. The extent and quality of data collected will determine the organizational structure and cost required, the complexity of analyses that can be performed, what information can be given as feedback, and if and how the quality assurance strategies will be informed.

National guidelines for MDR already in place usually include information on the process by which death reviews should occur, availability of data and tools (review forms), instructions on where and how to send the data through the required channels, and how to provide feedback. National guidelines should also include clear standard operating procedures of the review process at each level, including legal and advocacy information and contacts.

The primary purpose of maternal death review is action; recommendations cannot be turned into actions without the support of key stakeholders. Recommended actions may include community- or facility-based interventions, guideline development and introduction, improving access to services, or health system reform. Thus, the importance of having the support of local community leaders, facility directors, and national or state government entities for such reviews cannot be overemphasized. Also, to ensure sustainability, national ownership is critical. The ministry of health and other key stakeholders should be involved from the beginning of the review process, kept informed of progress, and invited to attend meetings or sit on steering committees as appropriate.

A successful MDR process started in Tamil Nadu, India, in 1994 with identification and compulsory reporting of maternal deaths; by 2001 it achieved nearly complete case detection and investigation (see Box 5.1.)

The MDR process

The support and participation of relevant health-care workers is critical to the success of the maternal death review process. These workers frequently act as the primary catalyst for such reviews. Local ownership of the review process improves participation, data collection and quality, and feedback. Participants need to be assured that the sole purpose of the review process is to save lives and not to apportion blame. "No name, no blame" is a key principle of MDR. Health workers must believe that MDR provides a safe environment for discussing sensitive details about their professional practices without fear of provoking management sanctions or litigation.

As described in *Beyond the Numbers*, several overarching factors must be considered before setting up an MDR process: the *coverage* of the review (e.g. all maternal deaths or a sample of deaths; all deaths in a single health-care facility or a group of facilities; all deaths in a

BOX 5.1

MDR in Tamil Nadu (*26*)

The system mandates immediate notification of maternal deaths by the Village Health Nurse working at the level of the Health Sub-Centre, the medical officers of primary health centres, first referral unit (FRU) and non-FRU government hospitals, district public health nurses, and Deputy Directors of Health Services. Investigations of maternal deaths are carried out through community-based maternal review (verbal autopsy) and facility-based maternal death reviews and clinical audits.

Following recommendations of the maternal death review committees, a quality-improvement process aiming to benefit patient care and outcomes through clinical audits was introduced. The quality of the care processes and outcomes of care were examined and evaluated against explicit criteria; changes were made at the individual, team, and service levels, when necessary; further monitoring to confirm improvements was institutionalized.

community, sample of communities, or district-wide; all districts in a region or a sample); *who* should perform the review (e.g. health facility team, district health management team, sub-district committee, other); and *what depth* of the review will provide the most benefit for the least cost. When transitioned to MDSR, the MDR process should include all confirmed maternal deaths; at the minimum, be performed at the facility and district levels; and yield a pre-set, structured amount of information about each death that could be used for aggregated analyses and detailed response formulation.

The simplest and least expensive methodology is a regular, formalized, facility-based review. However, to allow the MDR to measure the real magnitude of maternal mortality, this should be expanded to include all facility-based deaths and all deaths that occurred in the community. The distribution of maternal deaths between those occurring in the community and in health facilities may influence decisions on where the system should be expanded.

The number and frequency of MDRs depends on the number of cases identified and the resources available to collect the necessary data. Whenever possible, the goal is to review *all* maternal deaths. Table 5.1 shows how the total number of maternal deaths requiring review can be estimated as a function of the expected level of the maternal mortality ratio (MMR) and the crude birth rate (CBR) within a year in a given population. For example, if a district population is around 130 000 residents and the crude birth rate is 40 births per 1000 population – data usually available from the national statistic offices – and the national estimated MMR is 400 maternal deaths per 100 000 per year, at least 21 maternal deaths are expected to occur at home and in facilities.

TABLE 5.1

Expected number of maternal deaths per year

Total population	Number of births per year if CBR=40 births per 1000 pop	Expected number of maternal deaths per year for various MMRs (per 100 000 live births) and annual births			
		MMR 200	MMR 400	MMR 600	MMR 800
32 500	1 300	3	5	8	10
65 000	2 600	5	10	16	21
130 000	5 200	10	21	31	42
250 000	10 000	20	40	60	80
500 000	20 000	40	80	120	160
1 000 000	40 000	80	160	240	320

In setting up the MDR, the district should assess its capacity to conduct reviews for all 21 maternal deaths, assuming data sources are available to identify all community and facility deaths. In places where MDSR is fully established and all maternal deaths are being reviewed, and where there is a low maternal mortality ratio (i.e. few maternal deaths), MDR can potentially be expanded to include reviews of cases of severe maternal morbidity (near-misses) – such as severe obstetric haemorrhage, eclampsia, or severe infection – which will add more depth to data collection and better inform quality assurance strategies. Near-miss reviews are not described further here, but can be found in *BTN* (*11*), the WHO near-miss approach for maternal health (*27*), and the IMMPACT publications (*28*).

The structure for MDR

MDR coordinator

Coordination of the maternal death review process can significantly affect the quality of the data collected and the overall smooth operation of the review process, including the transmission and use of data at the district level. To improve communications and the review process, a designated coordinator with an in-depth understanding of the data collection process, instruments, and flow of data should be in place. He or she should be able to relate well to other staff and be supportive, but should also have the authority to review data quality, triangulate data from multiple sites, coordinate focal points, assign work, and set schedules, including dates and times of review committee meetings. Ideally, an MDR coordinator should be working at the district level and receiving data from focal points at the facility and community level. This increases the likelihood that information can be used at the district level. The scope of the MDR (e.g. number of facilities or geographical area covered, number of data collectors, amount of data collected per maternal death, facility deaths or community deaths) will determine the coordination structure, number of focal points needed, and supervisory structure. Having a schedule of supervisory responsibilities and a protocol or checklist of tasks will make the role of coordinators more effective.

MDR committee

The number and structure of MDR committees should be determined by the health structure in place. Depending on the number of known deaths that must be reviewed, facilities may have their own review committees. Usually, each referral hospital and district-level hospital should set up committees and perform periodic reviews. The MDR review committee evaluates or assesses cases to identify problems that occurred and possible solutions. Collectively, the members of the review committee need to have the expertise to identify both the nonmedical and medical problems that contributed to the deaths. In addition, having the right mix of expertise in the MDR committee is critical when it is time to act on the review findings and help develop and implement the recommendations.

If the review process is focused on deaths in the community, where there is greater interest in understanding social or nonmedical factors affecting maternal deaths, the review committee should include individuals with knowledge of the local customs and practices, community representatives, and perhaps social scientists. A physician and a midwife or experienced nurse should also be on the committee to review any medical information, including findings from any verbal autopsy done as part of the community-based surveys (*29*). In cases where a verbal autopsy does not clearly indicate a medical cause of death, computer-based algorithms can help obtain this information.

Data for MDR

Decide what data to collect

Deciding on the scope of the review is the next key step in setting up or expanding the MDR system. Having a clear understanding of all aspects of the review is essential, including the information needed to identify problems leading to maternal death, what data analysis is anticipated, what feedback is needed, and what level of detail is required to develop solutions. For example, the Three Delays model (see Figure 5.2) and the Pathway to Survival (see Figure 5.3) are two widely used frameworks for examining care-seeking decision-making and quality of care during childbirth and obstetric emergencies. Both frameworks can help identify common delays associated with three components – seeking care, reaching care, and receiving care at the facility.

FIGURE 5.2
The Three Delay model

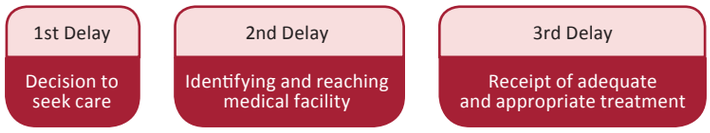
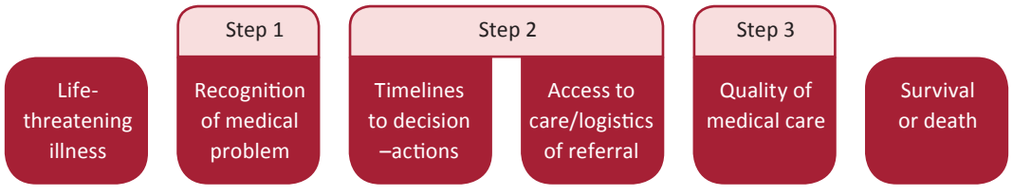


FIGURE 5.3
The Pathway to Survival



Delay in deciding to seek care and delay in reaching appropriate care relate directly to the issue of access to care, encompassing factors in the family and the community, including transportation. The third delay (delay in receiving care) relates to factors in the health-care facility, which is the most critical for programmes to address. Facilitating access to a health-care facility is futile unless it is available, well-staffed, well-equipped, and providing good quality care. The pathway to survival adds improved recognition of danger signs as a prerequisite for increasing timely use of skilled delivery care.

Expanded models for identifying and integrating the contextual domains where maternal health behaviours occur have also been proposed. They focus on understanding the broader sociocultural context of household decision-making so it can be used to frame behavior-change strategies. Thus, the depth of the MDR should be geared toward identifying modifiable factors and behaviours and linkages with proven interventions and strategies to improve maternal survival.

Because maternal deaths occur both in facilities and in communities, the source of maternal death review data and methods may vary. Reviews of facility deaths, primarily based on facility data, may also extend into the community. Likewise, a maternal death that occurred outside the health facility is primarily reviewed at the household and community levels, but may also include data from the facility where the woman sought care during the index pregnancy. Because of different sources and methods, coordination and data

triangulation between facility and community reviews are essential to obtain a complete picture of the circumstances and contributing factors to maternal deaths.

Specifically, data sources contributing to the MDR include pregnancy cards, vital records, antenatal care records, medical records and registers from health facilities, and interviews with family members, local community members, traditional health workers, midwives, nurses, and doctors. Appendices 2 and 3 present the basic content of an MDR conducted at the facility and community levels. Each country should decide what data to collect; however, collection of data for action and consistency in defining data elements that may be comparable across countries (i.e. skilled birth attendance, emergency obstetric care) should be underlying principles.

Key information to collect, particularly for a facility-based review, includes 1) the condition of the mother on admission or the onset of labour (antepartum or intrapartum death), 2) events that occurred during her stay at the facility (including time and date), and 3) the date and time of delivery and death. In addition, community reviews explore the family's awareness of medical complications prior to death, attitudes towards health care, health-seeking behaviours, and barriers to care or referral. For both the facility and the community reviews, information on pregnancy-related care – antenatal care, skilled birth attendance, availability at birth of basic or comprehensive emergency obstetric and neonatal care (EmOC), and postnatal care – should always be collected. Including information on the availability and use of these services can help assess the presence or absence of optimal care as a key modifiable factor that can be addressed in developing future interventions. Existing data collection tools developed by WHO should be examined for ideas on possible variables to include; these will help maintain consistency in data collection across locations (*11,29*). Examples of MDR data collection forms recently updated in Zambia and Uganda are included in Appendix 4.

Development of data collection instruments

Data collection instruments, instructions, operational procedures, and training materials should be developed in accordance with available data sources. Instruments should be adapted to include country-specific response categories and be culturally sensitive and easily understood. Instruments and instructions should use the local language and terminology. They have to be pilot-tested and refined with careful attention to content, language, and format. Tests of the instruments should be clearly documented to include the following: who will participate in the "test," how it will be carried out, when and where it will be conducted, what resources and preparation might be needed, and how the feedback will be formulated and used. The pilot-testing should be quietly observed and the results used to further refine the instruments as well as improve the work of the data collectors.

Most of the MDR content is based on structured questions that are suited for collecting information about variables for which much is already known, and potential responses can be listed. Open-ended or semi-structured questions are recommended when enquiring about reasons for behaviours or complex sequences of events. The instructions should be very clear about the interviewers' purpose and the necessity of accurately capturing complex responses. Text fields should allow adequate space to record information in a detailed narrative format. Later, these data can be coded for the qualitative analysis.

Everyone involved in the review process has to be motivated to collect the best quality information required for the investigation. It is important to explain at the outset to all those involved in the data collection process why and for what purposes specific pieces of information must be collected. Depending on the number of deaths to be reviewed, the data abstraction and interviews may be done by the same or different people, as long as they meet the qualifications for performing both tasks. When non facility workers are used

for local data abstraction and interviews, they should be literate, numerate, fluent in the local language, familiar with local terminology, and have sufficient clinical background to be able to read and understand the medical information in the facility records or from the interview.

Training of data collectors should be, for the most part, practical. They should know the purpose of the review process, the importance of obtaining the information without bias, and the need to respect confidentiality. Most of the training should focus on the actual data collection skills. Training should include practice exercises with an emphasis on completing forms legibly and reviewing forms for completeness. The less structured the data collection instrument, the more skilled the data collector will have to be.

Data collection for MDR

The simplest approach is a single-facility–based review that collects data from only that site. However, if a woman who died there had received care at any other facility, the additional records would ideally also be abstracted. Having additional information from the woman's family, although more difficult to obtain, is potentially extremely valuable, and every effort should be made to interview family members. The main sources of data in a community-based review are interviews with the family, community health workers, and any others who might have relevant information. If the mother had received any health care, health records should be reviewed to provide further insight. The data collected should include a summary of the chain of events that led to the maternal death, using corroborated information from facility records and family interviews (see Box 5.2).

BOX 5.2

Example of a story describing events that led to a maternal death in El Salvador (*30*)

A 15-year-old woman was pregnant for the first time. She had one prenatal visit at 5 months of gestation. When she was 8 months pregnant, she developed a bad headache that lasted for 4 days. Her mother took her to the local healer who gave her some herbs for the pain. On the fifth day she had a seizure and was taken to the health centre. Her blood pressure was 200/130, and there was no foetal heartbeat. She was being taken by truck to the district hospital, but died on the way.

MDR data summaries

The purpose of the MDR is to gain an understanding of the problems that led to a maternal death – knowledge that can be used for action. Achieving this will depend on the type and quality of data that have been collected, the care taken in preparing and reviewing the case summaries, and the insight provided by a brief analysis of each death. Data should be presented to the review committee in a qualitative fashion that describes the course of the mother's pregnancy and includes descriptions of where and how care was provided. Essential interventions that took place at all levels and any problems that may have contributed to the mother's death should be accurately described, that is, from the home to the community and at each point of health care.

A written summary of each death, including key findings, is usually prepared for the review committee. This summary uses data from all sources and, although it is concise, it includes all relevant information, both medical and nonmedical, as well as standard demographic data. The case summary may begin with some common, defined variables, such as mother's age, ethnicity, education, and parity and the gestational age at death, if applicable. This information is usually followed by a narrative describing the events that

led up to the maternal death. Summary writers should have a strong medical background, particularly concerning pregnancy and neonatal health issues, as well as an appreciation of the roles medical and nonmedical factors may play in maternal deaths (see Appendix 5). An experienced physician, senior obstetrical nurse, or nurse midwife is the most appropriate person to perform this task.

Case summaries should present objective and de-identified information (i.e. without any identifying data regarding the patient, health care providers, or facilities). De-identification should be performed after data collection is complete. Although the identity of the facility is obvious for single-facility–based reviews and the identity of the patient and health-care workers who provided care may be known, this precept should be adhered to as much as possible.

The review process

As recommended by WHO, each case of maternal death has to be reviewed by the review committees at the facility, district, and upper levels (*11*). After receiving the mortality summary report, the committee at the district level conducts the preliminary review: 1) to check the completeness and accuracy of the report and request additional information if needed; and 2) to determine causes of death, identify preventable conditions and associated factors, and suggest interventions.

In setting up the MDR process, the district should assess its capacity to conduct reviews for all maternal deaths that have been identified and determine what additional resources may be needed (see Table 5.1). The district review team should have regularly scheduled meetings to review case summaries; their frequency should be based on the estimated number of maternal deaths in the district, availability of reviewers, and duration and complexity of the reviews. Ideally, local reviews should be conducted immediately for deaths in facilities, and within a month if more information is needed, so that early actions can be instituted to prevent future deaths. Ideally reviews should take place as soon after the death as possible. However since this is not always possible, meetings are recommended to be held every 1 to 3 months, depending on the number of cases.

Case summaries to be discussed may be handed out at the beginning of the meeting or distributed in advance. The reviewers discuss the case, including the events that may have led to the mother's death, and clarify any details not included in the summaries by consulting the data forms brought to the meeting for this purpose. A rapporteur records the main points of the discussion without reference to specific persons or places to maintain confidentiality. A worksheet (see Appendix 6) can be used to help ensure that the full range of possible problems is considered in the discussion. A brief report based on the committee worksheet should be completed for each reviewed death. The review committee's findings should then be coded and entered into the database with the rest of the data from that maternal death case.

In performing the review, the following general principles can help make the process more effective and efficient: 1) holistic thinking – the problems leading to maternal death are frequently not all medical; 2) focused review – only on those events that may have directly contributed to the maternal death; 3) normative review – care received by the mother is compared with explicit standards based on accepted local practice and best medical evidence; 4) synthetic review – grouping problems into general categories (e.g. lack of transportation to health-care facility) while keeping enough information so that a specific preventive strategy can be developed.

The primary objectives of the MDR include identifying the medical cause of death, evaluating clinical care, and identifying nonmedical and avoidable factors (see Box 5.3). Looking further than just medical factors recognizes that maternal deaths and actions required to

prevent them are complex. For example, having access to clean water and sanitation practices in the household can prevent infection among mothers and their children; providing the mother or household members education could help prevent health complications; having quality care in communities can reduce the need for hospitalization; and having sound primary-care referral systems can support appropriate and quality treatment in well-functioning and adequately equipped health facilities. Essential interventions addressing the problems affecting women and children therefore must take place at all levels: the family, the community, and the health-care system.

BOX 5.3

Causes and associated factors that MDR can help identify:

- Medical causes of death
- Medical factors contributing to the death
  - Quality of care issues
  - Remediable clinical actions, such as a need for guidelines, protocols, etc.
  - Health system failures, such as shortages of blood or other resources or lack of facilities or skilled staff
- Nonmedical factors contributing to the death
  - Cultural attitudes and beliefs
  - Specific community-based factors such as transport, communication, geographical, or financial barriers
- Whether the death was avoidable or not (in some cases "maybe" may be appropriate)

To examine trends and enable evaluations of the effectiveness of interventions across time and regions, obtaining cause-specific mortality data at various levels is critical. Thus, MDRs should determine the medical or pathophysiological cause of death as specifically as possible and categorize it as a direct obstetric, indirect obstetric, or incidental (non-maternal) death. Whenever possible, causes of death should be encoded in accordance with ICD-Maternal Mortality classification (*31*). Precision in establishing the medical cause of death will depend on whether or not the woman was hospitalized.

The medical cause of death can usually be established from data recorded in medical records, including the patient record, admission and discharge data from various wards, case notes, details on treatment administered, procedures performed, autopsy results and, when available, copies of the medical death certificates retained in the facility. Interviews of hospital personnel involved in the woman's care may provide additional information that corroborates facts in the hospital record. This is particularly important in situations where there are questions on quality of care.

When a woman dies outside a medical facility, the probable cause of death is determined by gathering information from a close caregiver about the signs and symptoms of the deceased's terminal illness (i.e. verbal autopsy, or VA) (*29*); any medical information that can be located (e.g. antenatal care book, records of hospitalization prior to her death) may complement information collected through verbal autopsies.

Probable cause of death is most commonly based on independent reviews of the VA data by local physicians who try to reach consensus. This process follows a model closely analogous to clinical practice in which history, signs, and symptoms are used to construct a differential diagnosis. Concerns over physicians' agreement and variability of their methods of interpreting evidence make comparisons of cause-specific mortality between regions and over time difficult. These limitations have led to the development of various algorith-

mic and computer-based probabilistic models for cause-of-death determination based on VAs. One approach developed specifically for deaths among WRA is InterVA-M, which derives up to three probable causes of death from VA data (*32*). Although model-based approaches are faster, cheaper, and more internally consistent and reliable (i.e. the same set of indicators, signs, and symptoms always leads to the same probable cause of death), they are less sensitive for rare diagnoses and unusual cases than physician reviews.

Medical factors leading to death – the quality of medical care

The first referral level of care should have the capacity to provide emergency obstetric care as defined by WHO (*33*). Having adequate capacity means that a facility has both the necessary resources and personnel with appropriate training. The investigation should include information about the medical management of the woman's condition so the committee can determine if the recommendations and treatment were appropriate and the quality of care was adequate.

The quality of prenatal care – such as screening for risk factors or underlying conditions and education about the danger signs of pregnancy complications – also should be assessed. Likewise postnatal care if the death was after delivery. For both hospital and community deaths, the quality-of-care evaluation should include care given by traditional birth attendants, nurses, midwifes, and physicians.

The investigation should determine whether a lack of resources or inadequate caregiver training contributed to the death. Many countries have written protocols or norms regarding the management of obstetric complications. A complete investigation includes an assessment of whether norms or care protocols were available, followed, and appropriate. Recommendations for changing or improving norms can be one result of maternal death surveillance and response.

When problems with medical care are identified, a clinical audit can be used to provide additional information on those particular areas (*11,34–38*). The audits seek to improve standards of care and patient outcomes by comparing current practice against agreed upon standards using explicit criteria. The audit's focus is on a particular component of clinical care or problem of interest. Quality of care criteria selected should represent a high level of standard of care. If criteria of best practice are set primarily in accordance with known current practices, the potential for improvements may be lost (*37,38*). At the same time, the criteria must be attainable and take into account the resources available. Several criteria that reflect best evidence-based practice should be selected. A chart review is then done to evaluate whether care given was in alignment with best practices.

Reviewing the care that women received should also be done in conjunction with a review of the level of expected service provision for the facility. For facilities that provide basic emergency obstetric care and experience a maternal death, the quality of care around administration of parenteral antibiotics, oxytocic drugs, and anticonvulsants for pre-eclampsia and eclampsia; performance of manual removal of placenta; removal of retained products; assisted vaginal delivery; and neonatal resuscitation should be evaluated closely where applicable to the maternal death context. For facilities that provide comprehensive emergency obstetric care, the same functions should be evaluated along with those for transfusion and obstetric surgeries. Reviewing maternal death cases in the context of the standard of service provision may highlight additional services that need improvement.

Nonmedical factors contributing to the death

Interactions of several factors may contribute to a maternal death, particularly among the most vulnerable women. Nonmedical factors are often more important in determining whether a woman lives or dies than the medical cause of death itself. As previously men-

tioned, nonmedical factors leading to death may be examined along the Three Delays or Pathway to Survival models (see Table 5.2).

Most maternal deaths occur in the peripartum period and many are not associated with pre-existing risk factors. Thus, women's knowledge of pregnancy-related danger signs and the health-care system's ability to diagnose a problem and refer women to appropriate facilities in a timely fashion when emergencies arise are paramount. In what condition did a woman arrive at the hospital? Was the referral timely or too late? If too late, what contributed to the delay? How long after her arrival did the woman die? Many deaths occur shortly after arrival at hospitals that provide appropriate emergency obstetrical care. These deaths are often associated with a late referral, including delays in recognizing the problem, delays in making the decision to seek the appropriate level of care, and delays in reaching it.

TABLE 5.2
Examples of delays in care (Adapted from [*39*])

First Delay	Second Delay	Third Delay
• Failure to recognize danger signs • Lack of money to pay for medical expenses/ transport • Fear of ill-treatment at health facility • Reluctance of the mother or the family to seek care because of cultural constraints • Lack of power – by woman or attending family member – to make decisions • Lack of encouragement from relatives and community members to seek care • Unavailability of someone else to take care of the children, the home, or livestock • Lack of accompaniment to health facility	• Distance from a woman's home to a care facility or provider • Lack of roads or poor condition of roads • Lack of emergency transportation, whether by land or water • Lack of awareness of existing services • Lack of community support	• Lack of health-care personnel • Gender insensitivity of health-care providers • Shortages of supplies such as emergency medicines or blood • Lack of equipment for EmOC • Lack of competence of health-care providers to deliver EmOC • Weak referral system (includes transportation and communication)

Another approach to examining the role of nonmedical factors and macro-structural determinants of health (e.g. health system factors, social and policy context) is illustrated in Box 5.4 (*40*).

Determination of avoidability

For developing countries, the assessment of causes of death, whether the death was avoidable and, if so, how it could have been prevented should be based on the country's obstetric care norms and available resources, not on the standards used in more developed countries. Avoidability is a proactive concept, and any lessons learned can be applied to prevent future deaths from similar factors.

A maternal death can be classified as avoidable if it might have been avoided by a change in patient behaviour, provider/institutional practices, or health-care system policies. The determination of avoidability does not follow rigid criteria, and it is often open to interpretation. The MDR committee should discuss in detail all cases thought to be avoidable or potentially avoidable to identify the various factors that contributed to these deaths and issue appropriate recommendations. The following factors should be considered when assessing if a death was avoidable:

1. Family/community level

   Patient/family factors – did the woman and her family recognize that a problem existed, seek medical care – including antenatal care (ANC) and postnatal care (PNC) – and comply with any medical advice given? TBA factors – did the TBA manage the labour and delivery correctly, recognize that a problem existed, and refer the women appropriately and without delay? Community linkages – did the woman or her family have regular interactions with CHWs and TBAs?

BOX 5.4

Nonmedical factors identified by review committee (*40*)

In China, the National Maternal Mortality Surveillance System examines individual, health and social factors stratified into four categories (knowledge/skills, attitude, resources, and management).

Factors regarded as "knowledge" of the individual/family include lack of prenatal care due to the woman's unawareness of its necessity, home delivery due to ignorance of its risk, and not seeking care for medical conditions diagnosed before pregnancy due to lack of awareness that pregnancy could aggravate the conditions. Individual/family attitude factors include refusal of necessary treatment or non-adherence to medical advice for personal reasons. Resources of the individual/family factors include the failure to seek timely care because of poverty, lack of transport, or actual health costs. Factors linked to the knowledge/skills of health professionals in health institutions include failure to identify and solve problems related to the pregnancy, delivery, and puerperium of the woman in time; attitude factors may include lacking a sense of responsibility, being reluctant to refer, and having inadequate continuous education. Factors related to resources of the health institutions include shortage of first-aid drugs, equipment, blood supply, or technicians; institutional management factors relate to failure to keep the equipment for first aid functional, lack of sound diagnosis and treatment protocols, and inability to care promptly for critically ill and emergency patients. Factors are grouped into the social departments when the departments of transportation, family planning, and working community or governmental committees on women and children are involved.

2. Formal health-care delivery system level

   Focused ANC – determine whether the woman received ANC; if so, how many visits, what content (according to country guidelines) was included, if information on signs and symptoms of complications was given, and what risk factors and medical problems were correctly identified and addressed.

   Postnatal care – determine whether the woman received PNC according to the country guidelines.

   Hospital factors – determine whether infrastructure development is adequate, essential obstetric functions were available at the first referral level, appropriate protocols/norms were in place, resources and supplies were adequate, and care was available regardless of the ability to pay.

   Health-care provider factors – determine whether staff members were available and adequately trained, if the treatment was timely and done correctly, and if providers were sensitive to the social and cultural values of the patient and her family.

3. Intersectoral level

   Transportation factors – assess if transfer was hindered by availability of transport, adequacy of transport, road conditions, ability to travel at night, or lack of funding.

   Communication and IT factors – assess effectiveness of communication at community and facility levels (availability of telephones, toll-free telephone numbers, mobile telephones for CHWs, palmtop computers for data collection, computers and computer training at facilities, etc.).

4. Gender-related issues – assess social and economic barriers related to the status of women, women's literacy level, and gender-based beliefs and practices that may be a root cause of poor service utilization.

Reviewed deaths can be classified into three categories: "Not Avoidable," "Potentially avoidable," and "Undetermined." For those that are potentially avoidable, a plan of action must be included for avoiding deaths in the future. This plan should detail actions to be taken in the antepartum, intrapartum, and postpartum settings. It should include actions for the community, for care sites – antenatal care, facility care, emergency care – and for providers. Actions may focus on the systems in place and be broader than specific occurrences or providers.

Recommendations

Based on information obtained from the investigation, the committee makes recommendations to prevent future deaths. This link to action is one of the weak points in many MDRs. Every case review must include recommendations for preventing future deaths. Facility reviews will usually focus their recommendations on both the facility and, at some level, the community. District reviews may result in broader recommendations. While some recommendations for these two levels may overlap, usually they will be tailored to the specific location and appropriate for different stakeholders, depending on where decisions can be made and actions can be realistically taken. As cases accumulate and patterns emerge, especially at the regional and national levels, interventions can be prioritized according to which will have the greatest impact.

Recommendations should be specific and link with avoidable factors. More useful recommendations will focus on the type of response, its implementation, and how to improve the review process. For example, a facility-based response will be needed if the maternal death occurred after hemorrhage and the woman did not receive a transfusion because there was no blood available. The facility may not be able to store blood, and the recommendation could include ensuring safe blood is always available by establishing the capacity to store blood with screening on site.

Committees' recommendations on how to improve response implementation can be very useful. In Bangladesh, a community loan fund was established so people could borrow money to pay for transport and other costs related to health care (*41*). In addition, activities were initiated to upgrade facilities and mobilize communities. The project reported that in sites without the programme, only 12% of community members used health-care facilities. In sites where the facilities were upgraded, 26% used them. Where sites had physical upgrading, community mobilization, and a loan fund established, 40% used the facilities. So, if the original response to a finding of low service use is to recommend refurbishing a facility, the committee also may recommend involving the community and establishing a loan fund to improve the response. These added components could significantly impact the implementation of the response.

Committees should also provide feedback on how to improve the review process itself. They may suggest adding members or changing the frequency or location of the MDR. Their recommendations should be encouraged.

One person should be designated as responsible for each recommendation, and an implementation timeframe and measurable outcome should be defined. A response committee can be formed to work on implementation of recommendations, as shown in the example (see Box 5.5), to improve both the response and the review cycle. Some members of the MDR committee may also be part of the response committee. However, they should recognize that the roles differ and that the response committee's role is to ensure that recommendations are carried forward into actions.

BOX 5.5

MDR recommendations and follow-up, Roi Boudouin district hospital, Dakar Senegal (*42*)

In Roi Baudouin district hospital, Dakar, Senegal, a 2-year study was conducted (1998–2000) to determine the impact of the newly implemented MDR process on maternal mortality. During the intervention, researchers demonstrated a significant decrease in maternal mortality, particularly in deaths related to hemorrhage and hypertensive disorders. The study also assessed how the recommendations of the audit committee were implemented. Thirteen interventions were recommended and implemented, including 24-hour availability of services and essential drugs and blood products and the availability of basic emergency obstetric care at both the hospital and primary-care facilities. Researchers also documented marked changes in resource allocation and management in the hospital. Monitoring the implementation of interventions over the course of the project allowed the hospital leadership to document progress and make necessary improvements.

Debriefing and staff support

MDR is an emotional experience for all involved parties. All health-care providers who have been involved in a maternal death case carry the burden of that death with them. Involved staff, whether as part of patient care or the review process only, may need time to process the review emotionally. Providing additional time and support, including counselling, is an appropriate intervention to allow staff to recover. Focusing on the positive aspects of the review can be helpful to those involved because it will help them see the benefits of preventing the next potential death.

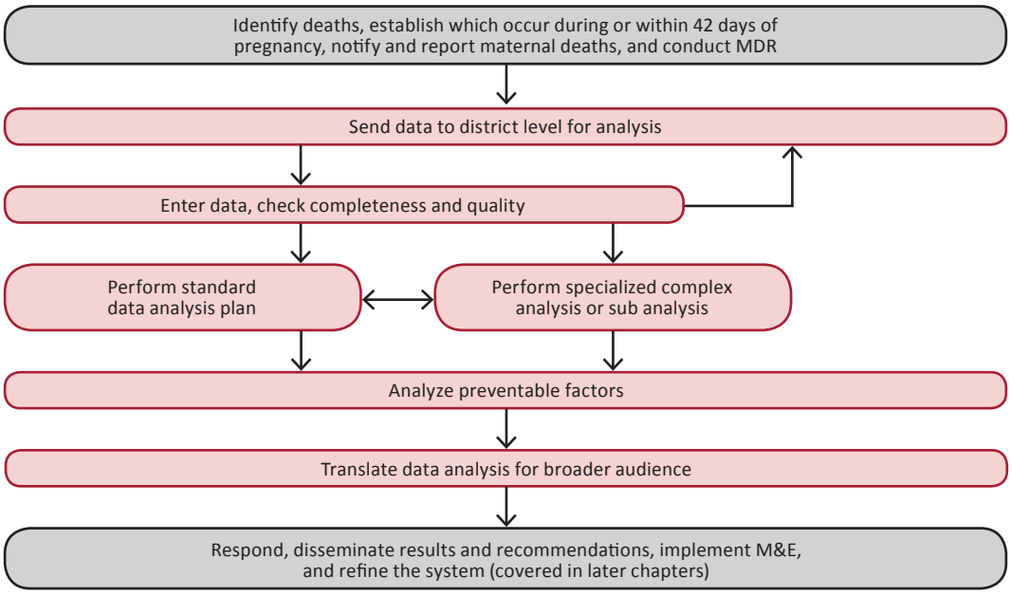
Reporting

Data files, instruments, and review summaries stripped of personal identifiers are kept in locked storage spaces at the district level and given unique identifiers or case numbers. Findings and recommendations resulting from each review process should be abstracted and sent periodically to the national level. Transmission may be done via optical scanning or other data conversion and transmission technologies. Abstraction forms, definitions, and instructions should be streamlined and aligned across all levels. Abstracted individual de-identified data are aggregated at the national level and analyses of levels, trends, and contributing factors are performed (Chapter 6).

6.
Analysis – data aggregation and interpretation

Data analysis and interpretation of results are critical components of any surveillance system that guides and orients appropriate public health measures for prevention and health promotion. Figure 6.1 reviews the analysis process.

FIGURE 6.1
Analyse and interpret MDSR



Data analysis

Team members involved in the analysis of aggregated data should have appropriate epidemiological skills. If these are lacking, trainings or other technical support to increase a local staff's skill levels should be arranged in advance. The initial data analysis should be performed by those with appropriate analytical skills at the level closest to the community. This should occur, at a minimum, at the district level. Health facilities with a large volume of deliveries (500 or more annually) should also be able to perform descriptive analyses of facility-based maternal deaths. Analyses at the facility level will have different functions and corresponding responses than those at the district and national levels. All facilities should know their facility-specific number of maternal deaths, and each should be able to calculate indicators for the facility and report on the causes of deaths that occur there. Each

maternal death should be considered a sentinel health event that automatically triggers the question, "Why did it happen?" and, when appropriate actions are available, immediate responses should be set in motion. The aim of aggregated data analysis should be to identify causes of death and subgroups at highest risk, identify factors contributing to maternal deaths, assess the emerging data patterns, and prioritize the most important health problems to improve the public health response. Standardized cause of death aggregations to improve data comparability are suggested in ICD-MM (*31*).

Data entry, quality and completeness

In preparation for analyses, a clear framework for data transmission, aggregation, processing, and storage must be defined. For example, the district may receive a maternal death notification form within a few days of the occurrence (ideally within 48 hours), then assign case registry numbers, retain files in secured storage, and assemble the review team. A visit to the facility (or to the family in cases of community death) will be scheduled within several weeks and will include the processes of a maternal death review as previously described. Each review will produce de-identified abstraction forms (case summaries) that will be sent back to the district. Abstraction forms in hard copy will be entered at regular intervals in a maternal death database and compared with all maternal deaths reported through the maternal death notifications (from facilities, communities, or the IDSR system). Each abstraction form shall contain all detailed information obtained from the facility registers and records and health-care providers who had contact with the deceased. Abstraction forms based on verbal autopsies will be adapted to the content of the family questionnaires. At the district level, a database manager will check for completeness, individual item code validity, and inconsistencies between data items and will enter abstraction forms in the maternal death database. The manager will also verify coding and other database errors that may need to be corrected. The review team will be notified of any problems, if necessary, including inconsistencies or inadequate reporting of certain items. The maternal mortality review team will also be informed of any differences noted in the number of entries and asked to verify the counts or to determine the nature of the inconsistencies. The database will be used for analyses of all the reviewed maternal deaths. Access to the database will be password-protected, allowing only authorized personnel to perform analyses. Back-up files will be retained in secured, locked areas. Data from the maternal death database and de-identified case summaries will be kept and used in the analysis. The original notification and review forms may be destroyed.

The following factors are prerequisites for performing MDSR analyses:

1. Knowledge of surveillance (sources, mechanisms, data collection instruments, completeness of reporting, abstraction, data entry and validation).
2. Good understanding of the indicators to be calculated and denominator issues.
3. Keeping up with changes over time in case definitions, detection, or data collection methods.
4. Knowledge of the limitations of the data; factors such as incomplete coverage, poor data quality, or changes over time in data processing procedures may also influence the analysis.

Case detection changes (e.g. introduction of mandatory notification, active case detection, and improvements in awareness of reporting) also influence surveillance findings. Modification of data collection instruments should also be taken into account when interpreting trend data. Countries may have added a pregnancy checkbox on the death certificate to increase ascertainment of pregnancy deaths. More deaths from indirect causes can thus be identified, changing the distribution of indirect deaths over time.

Analytical plan and indicators

Formulating an analytical plan in advance is important for guiding the analytical process and identifying problems in the health system that may contribute to maternal deaths, especially those that are amenable to change. The plan should include: the identification of appropriate and feasible indicators prior to data collection; guidelines to calculate rates, ratios, and proportions and how to display data in tables, graphs, and charts; and methodological notes on how to compare rates with expected values, reference rates, and baseline rates and how to use statistical probability methods to determine whether apparent differences in rates are significant. Interpretation of the findings should focus on aspects that will lead to prevention. The ability to provide data for action depends on both the type and quality of data that have been collected and the completeness of the analysis. Obtaining external data, including total number of births, total number of WRA, population size, and geographical location of existing health services (including EmOC), is essential for calculating selected surveillance indicators.

Indicators to be calculated and analysed by MDSR may include: 1) measures of magnitude, such as the number of maternal deaths, incidence (maternal mortality rate, maternal mortality ratio), maternal deaths as a proportion of deaths to WRA (i.e. proportional mortality rate among WRA), and lifetime risk of maternal death; 2) cause-specific mortality measures such as cause-specific mortality ratios, cause-specific proportionate maternal mortality, and case fatality rates; and 3) measures of preventability (proportion of maternal deaths due to avoidable factors). Table 6.1 includes some potential indicators.

TABLE 6.1
MDSR indicators (modified from [*43*])

IMPACT INDICATORS	AVAILABILITY/ACCESS INDICATORS
Maternal mortality ratio	% of deaths that occurred within 24 hours of arrival at facility
Maternal mortality rate	% of deaths among women who were delivered by skilled birth attendant/facility delivery
Proportion of deaths to WRA that are maternal	% of deaths among women who had recommended prenatal care
Proportion of maternal deaths by medical cause of death (haemorrhage, eclampsia/pre-eclampsia, sepsis, abortion, obstructed labour, other direct cause, Indirect causes)	% of deaths where limited drugs and/or supplies was a factor
	% of deaths where limited staffing was a factor
	% of deaths where guidelines were not followed
Case fatality rate	% of deaths for a given complication
Proportion of maternal deaths with avoidable factors	% of deaths where lack of transport was a factor
	% of deaths where health-care costs were unaffordable
	% of deaths where lack of recognition at the community level was a factor

Descriptive Analysis

As in other mortality surveillance systems, MDSR should include basic descriptive analyses by **person, place, and time**. In addition, other factors should be considered with data collection instruments that capture the related information (see Box 6.1).

Analysis of medical causes, nonmedical contributing factors, and preventability of deaths

Maternal deaths can be classified into **direct obstetric deaths** or **indirect obstetric deaths** (see Glossary). Understanding which deaths are from complications of the pregnancy, labour, or puerperium and which are from previously existing disease or newly developed medical conditions aggravated by the physiological effects of pregnancy can provide

BOX 6.1

Descriptive analysis of maternal deaths

Women: Age group, race/ethnicity, gravidity/parity, gestational age at time of death, pregnancy outcome (undelivered, stillbirth, live birth), socioeconomic status of family, education

Place: Where family lived (urban or rural, district/sub-district, town or village); where woman died

Time: Date of death (day, month, year), time of day when death occurred, weekday or weekend, season when death occurred

ANC: Week or month of pregnancy when the woman first attended antenatal care, how many visits, type of care provider and type of place, distance of facility from place of residence

Delivery: Date and time of birth, day of the week, season, place of delivery, type of place, type of delivery attendant, type of delivery (vaginal, forceps, caesarean)

Data source: Notification only, facility-based review, verbal autopsy

Medical cause of death

Contributing factors and preventability

information for responses. Worldwide, 80% of all maternal deaths are from hemorrhage and sepsis (mostly postpartum), pre-eclampsia and eclampsia, obstructed labour, and unsafe abortion (Figure 6.2). Underlying diseases such as malaria, anemia, and HIV/AIDS during pregnancy cause the remainder of maternal deaths.

Documenting the frequency of health service and nonmedical factors that have contributed to the maternal deaths is a priority in MDSR analysis (see Table 6.2). Examination of these factors provides insight into the preventability of each death. Interviewing family members and health-care personnel and reviewing medical records can provide a clear picture of the circumstances both outside and inside the hospital that contributed to the death. Grouping the findings from death reviews, especially related to circumstances surrounding the death, and looking at them quantitatively provides information about which problems are most common. Grouping may include socioeconomic and cultural factors, health status of the woman, health care behaviours, access to and availability of adequate health services, quality of care, and availability of supplies.

FIGURE 6.2

Causes of maternal death (*44*)

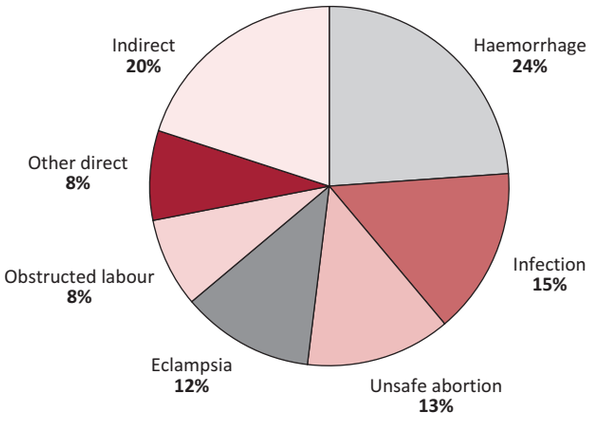


TABLE 6.2
Contributing factors to maternal deaths

Community-based factors	Health service factors
Lack of awareness of danger signs of illness	No health service available or nearby
Delay in seeking care due to lack of family agreement	No staff available when care was sought
Geographical isolation	Medicine not available at the hospital; dependence on family to provide it
Lack of transportation or money to pay for it	Lack of clinical care guidelines
Other family or household responsibilities	Woman not treated immediately after arriving at the facility
Cultural barriers, such as prohibitions on mother leaving the house	Lack of necessary supplies or equipment at the facility
Lack of money to pay for care	Lack of staff knowledge/skills to diagnose and treat the mother
Belief in use of traditional remedies	Long waiting time before qualified staff could see the mother
Belief in fate controlling outcome	No transport available to reach referral hospital
Dislike of or bad experiences with health-care system	Poor staff attitude

Analyses may reveal patterns of problems that should be used to help group them into broader categories. For example, a large number of deaths may occur among mothers who had but did not appreciate warning signs of illness, such as infections, headaches, or swollen legs. The intervention to prevent such deaths (i.e. education of the mother, family, and community about the symptoms of illness at prenatal care visits and through community education) is the same no matter what the medical cause. Logically there would be a problem called "lack of knowledge concerning danger signs." Contributing factors may be grouped as: 1) women and family factors (e.g. delay in recognizing problems, delay in seeking medical care, unwanted pregnancy, no or inadequate use of ANC, lack of a birth plan); 2) service provider factors (e.g. substandard ANC or delivery care by type of provider); and 3) health facility factors (e.g. inadequate number or distribution of facilities with EmOC; lack of blood, drugs, supplies and equipment, or anesthesia; lack of transport for referrals).

Other contributing factors could be grouped around the "Three Delays" analysis framework (see Box 5.3, Chapter 5). The model proposes that pregnancy-related mortality is overwhelmingly due to delays in: 1) deciding to seek appropriate medical help for an obstetric emergency; 2) reaching an appropriate obstetric facility; and 3) receiving timely, adequate care when a facility is reached. This framework was used to analyse maternal deaths that occurred in several countries, including Haiti (*45–47*). In Haiti, a review of the delays for 12 maternal deaths found that a delayed decision to seek medical care was noted in 8 cases, inadequate care at a medical facility was a factor in 7 cases, and multiple delays were relevant in the deaths of 3 women. Often, multiple delays contribute to maternal deaths, and responses should prioritize interventions to maximize impact. For example, a Three Delays analysis in Haiti concluded that expanding the coverage of existing referral networks, improving community recognition of obstetric emergencies, and improving the ability of existing medical institutions to deliver quality obstetric care were all necessary. However, improving the quality and scope of care available at existing medical facilities will have the greatest impact on reducing needless maternal deaths (*48*).

Table 6.3 presents data on another analysis of avoidable factors. Reviewing similar data may lead policy-makers to target actions for each avoidable factor. In this example, substandard care and lack of blood supplies were identified as the most important contributors to most maternal deaths, followed by delays in seeking care due to individual, family, or community factors.

TABLE 6.3
Example of selected avoidable factors in relation to maternal death (*49*)

Factor	Total[a]	
	Number	%
No or poor quality antenatal care (ANC)	239	33
Delay in seeking medical care	304	42
Unwanted pregnancy	36	5
Substandard care from		
General practitioner	87	12
Obstetrics team	334	47
TBA	84	12
Lack of blood bank	341	47
Cause of death could have been detected in ANC	45	6
No avoidable factors	54	8

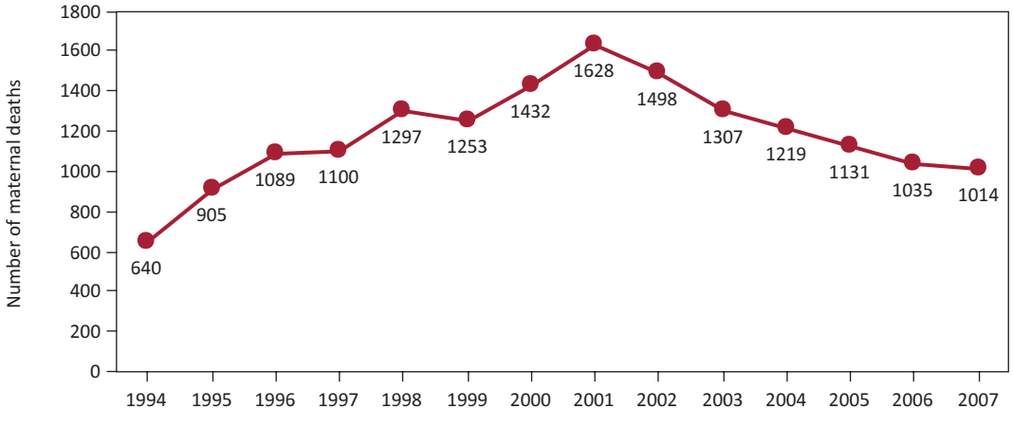
[a] Total includes deaths due to direct, indirect, and unknown causes: percentages do not add up to 100% because each death may have had more than one avoidable cause.

Contributing factors also may be grouped to follow the Pathway to Survival diagram: recognition of medical problem, timelines of decision-making, access to care/logistics of referral, and quality of medical care. The emphasis should be on identifying medical and nonmedical problems, preventable factors, and specific issues at the community level (i.e. the individual, her family, and the community), formal health- care system level (i.e. health posts, health centres, hospital and associated facilities, staff, health management and planning); and intersectoral level (e.g. education, transportation, communication, agriculture).

Trend analysis

Ongoing surveillance, such as MDSR, can provide more detailed information about changes over time. In Tamil Nadu, India, identification and mandatory reporting of maternal deaths began in 1994. Figure 6.3 shows the number of maternal deaths reported there annually from 1994 to 2007 (*26*). Reporting efficacy improved over time. (The apparent increase noted between 1994 and 2001 reflects improvements in reporting rather than an increase in maternal deaths.)

FIGURE 6.3
Annual number of maternal deaths reported, Tamil Nadu, 1994–2007



Source: PHC Records

District- and national-level analysis

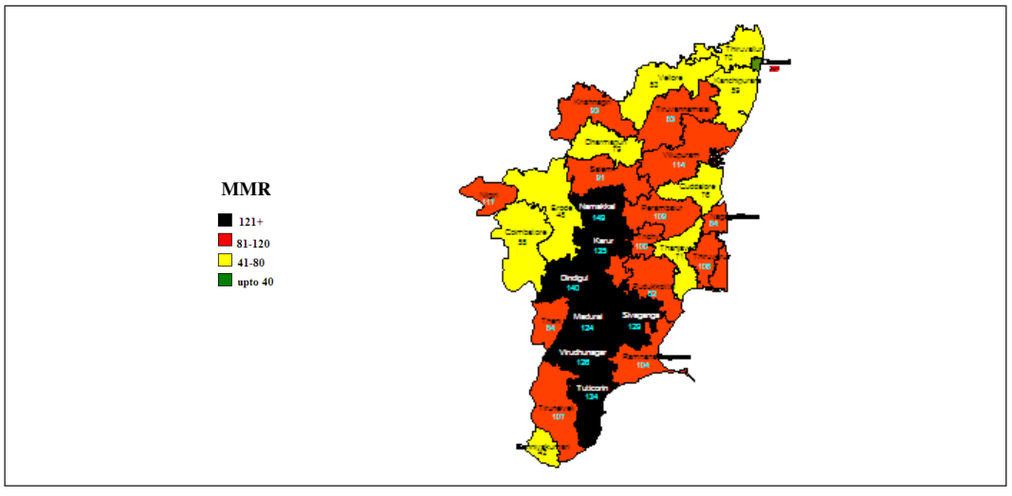
Specific analyses can be conducted at a district level to identify patterns and trends. These may be used to influence district action and response. Figure 6.4 presents GIS data from Tamil Nadu that identifies areas of higher MMR. These data can be reviewed and programmes targeted to these areas.

Similarly, a countrywide mapping of maternal deaths as shown in this figure can help provide a national overview of the situation and be used to determine which districts are in greatest need and to monitor trends over time.

Maps can help answer various questions related to mortality-specific data ("where?", "what patterns in distribution exist?", "what has changed?") as well as how they relate to population settlements, existing social and health services, and the natural environment.

FIGURE 6.4

Map of maternal mortality ratio at the district level in Tamil Nadu, 1999–2010 (*26*)



More complex analyses

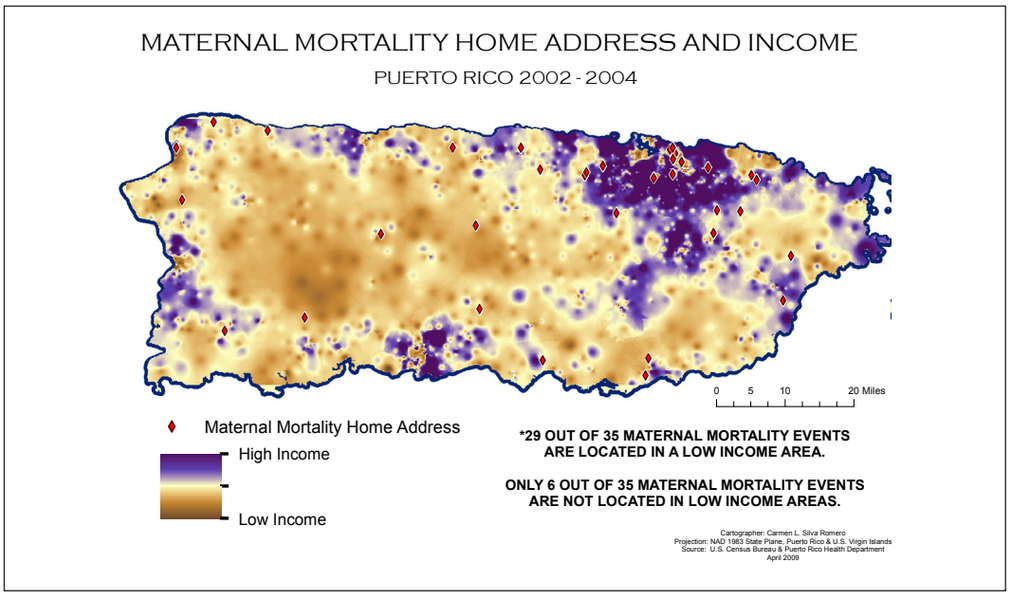
Specific questions that arise may require more complex or customized analytical approaches beyond those routinely performed. Time series analyses and analyses using GIS are very valuable approaches that should be considered when appropriate resources exist. Introduced in the early 1990s, GIS technology has rapidly become an essential addition to epidemiological analysis of surveillance data, both descriptive and analytical. It allows policy-makers to visualize problems easily in relation to geographical location, and thus to mobilize resources more effectively, plan interventions, target areas with the highest need, and monitor impact (Figure 6.5).

In Puerto Rico, GIS analyses were used to illustrate the association between maternal mortality and economic status of the areas where the deceased women lived (i.e. high income vs. low income) and make recommendations for improving access to health-care services (see Figure 6.5) (*50*).

At the facility, district, and national levels, analyses should be performed regularly to identify changes in maternal death reporting. These analyses can be performed using standard approaches (e.g. tabulating reports manually and filling in a summary data sheet) or running a standard computer programme to generate a summary report. Findings should be reviewed regularly and fed back to medical providers and others in the community

FIGURE 6.5

GIS mapping of maternal mortality by income level of the place of residence in Puerto Rico, 2002–2004 (*50*)



who are asked to report cases. Only small numbers of deaths may be found in some areas, but obtaining information for action from even one or two cases is important; this can be achieved through various strategies. Aggregating local data at the district level can provide adequate numbers for analysis. Data can also be collected over a greater period of time. In general, data should be tabulated at monthly, quarterly, or annual intervals. Small numbers should be compared with calculations of the estimated number of expected maternal deaths (see Table 5.1, Chapter 5). If actual numbers differ from expected, a closer examination should be done to determine why. Lower than expected numbers may indicate that there may be additional deaths not captured by the system.

Automated analysis

Computer programmes can be designed to run analysis and produce standardized tables, graphs and maps, which may enhance the use and reporting of data. Although the system will require an initial time investment for designing the automated analysis, doing so will often save time in the longer run. A critical eye must review the data entered, as well as the output, to ensure that the data make sense. Programme maintenance and plans for updating source data and programme codes should be integrated into the data management plan.

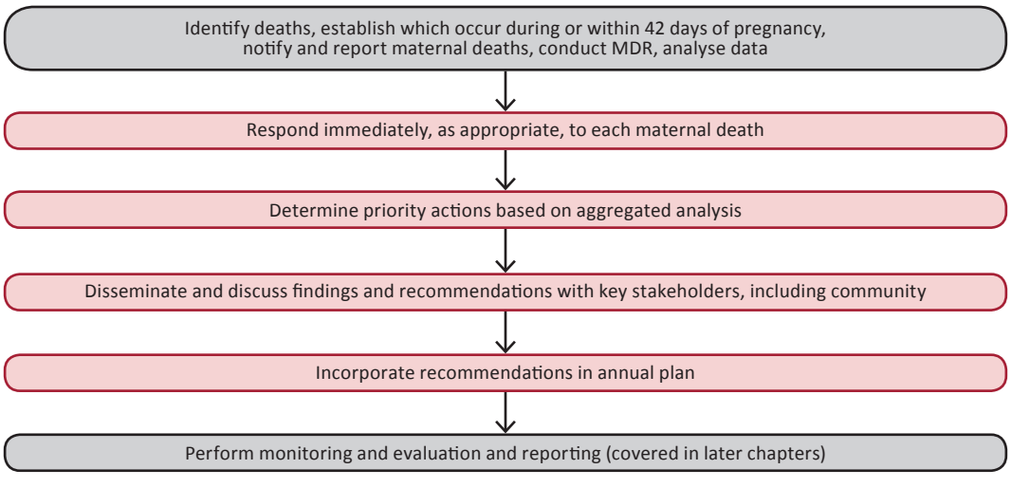
Translation

An important part of MDSR is the translation of surveillance data into information that is meaningful for decision-makers, the medical community, and the public. The interpretation of MDSR data forms the basis for public health or policy action and requires clear presentation of often complex issues. In addition to identifying magnitude, geographical distribution, changes in cause of death, groups at high risk, and contributing factors, the analysis is instrumental in monitoring and evaluating response and detecting the impact of changes in health-care practices and health-seeking behaviours.

7.
Response

This chapter describes types of responses that may be needed to address the problems found by MDSR and discusses criteria that can be used to prioritize recommendations for action, the primary MDSR objective. It re-emphasizes that although aggregated data provides robust information about problems shared by many facilities and districts, every maternal death provides information that can result in actions to prevent future deaths. Figure 7.1 reviews the response steps for MDSR.

FIGURE 7.1
MDSR Response



Timing of response

Immediate response

Findings from reviews of nearly every maternal death can lead to immediate actions to prevent similar deaths, especially those at health facilities, by identifying gaps that should be addressed quickly in both health facilities and communities. Maternal deaths in health facilities often indicate necessary improvements in quality of care, such as ensuring adequate coverage of emergency services by skilled providers, addressing the lack of essential obstetric medications or supplies, improving knowledge or skills of providers in the management of obstetric emergencies, or improving services such as antenatal care or family planning. Deaths in communities can also identify some actions that can be implemented quickly. There is no need to wait for aggregated data to begin implementing actions.

Periodic response

Monthly, quarterly, or semiannual reviews (depending on numbers) of aggregated findings should take place at larger health facilities and at the district level where a committee is established for this purpose. These periodic reviews may begin to show a pattern of particular problems contributing to maternal deaths or particular geographical areas where they are occurring in greater numbers. Such findings should result in a more comprehensive approach to addressing the problem across multiple facilities or multiple communities. Where areas at greater risk are identified, discussion with the involved communities should be a priority to identify solutions.

Response at the health facility level – Improving quality of care

A maternal death in a health facility should be extremely rare. Each death, if properly reviewed, should identify systemic problems that contributed and can be corrected. These include 1) staffing levels – whether the staff (including midwives, physicians, nurses, lab technicians, anesthetists, administrators etc.) is sufficient to meet the demands for quality maternity health care, including EmOC; 2) knowledge and skills – including those of all staff members who are involved in providing care or supportive services; and 3) deficiencies related to infrastructure and supplies of blood, medications, equipment, and other items that may have led to inadequate management of the woman's complications. Each facility-based death should prompt at least one immediate action to correct the contributory systemic problem(s) identified. The hospital-based MDSR system will contribute to the continuous quality assurance process.

Annual response – recommendations incorporated within annual maternal health plans

Health facility

Every health facility should summarize its maternal mortality findings annually. In larger facilities where multiple deaths may have occurred, the findings should contribute to continuous quality improvement plans. Larger facilities should also assess the effectiveness of the implementation of MDSR recommendations and whether they are contributing to a reduction in maternal mortality.

District level

Findings from the analysis of aggregated data and the aggregated recommendations from maternal death reviews are incorporated in a district report that should be disseminated and discussed with key stakeholders, including those in the community (as will be discussed in Chapter 8). For example, in Tamil Nadu (see Figure 6.4, Chapter 6), the areas of Namakkal, Karur, Dindigul, Madurai, Sivaganga, Virundunagar, and Tuticorin were found to have the highest MMR. Although further review was conducted to determine the causes and associated responses, identifying the areas of greatest need allowed communities to work together to generate new ideas for addressing some of the problems identified. Actions were prioritized based on both their potential impact on reducing maternal mortality and their feasibility, including costs, resource requirements, and ease of implementation. To increase equity and more efficient use of limited resources, actions were focused on specified risk groups. These recommendations for action were then included in an annual district maternal health plan.

Possible district-level actions include strengthening the health-system and retaining staff, mobilizing resources, increasing community and institutional awareness of maternal mortality, fostering community–facility partnerships and building alliances with the private sector, and conducting advocacy activities.

National level

Likewise, findings from the analysis of aggregated data and recommendations from maternal death reviews in all of the districts are incorporated in a national report that is then used to develop a national maternal health plan. At the national level, a longer-term strategic plan (3–5 years) often is developed to focus on key priorities identified in many districts or on key geographical areas where more women are dying or the risk of dying is greater. Actions may include allocating required resources to the most affected areas and populations. Actions at the national level may also include changing or updating national policies, laws, or guidelines.

Response actions

The response should be culturally appropriate and specifically tailored to address the problems identified in the community, health facility, health-care system (knowledge, practices, resources, communication), or intersectoral (or systems) level. The confidentiality of the deceased and their care providers is an important consideration. The type of action taken will depend on the level at which decisions are being made, the findings of the analysis, and the involvement of stakeholders. Interventions will be affected by the developmental level and resources of the country and the availability of technologies. These factors will determine which mixture of strategies will suit the particular circumstances. Suggested guiding principles for response are noted in Box 7.1.

BOX 7.1
Guiding principles for response

- Start with the avoidable factors identified during the review process
- Use evidence-based approaches
- Prioritize (based on prevalence, feasibility, costs, resources, health-system readiness, health impact)
- Establish a timeline (immediate or short-, medium-, or long-term)
- Decide how to monitor progress, effectiveness, impact
- Integrate recommendations within annual health plans and health-system packages
- Monitor to ensure that recommendations are being implemented

Possible actions include interventions in the community, within health services, and in the public sector. Findings from the community may indicate the need for developing health promotion and education programmes as well as possible changes in community service provision; changing home practices or the attitudes of health-care providers; or improving infrastructure such as roads, bridges, and communication technology.

Addressing some findings, such as the last mentioned, may require longer time for planning, obtaining the necessary government support, and implementing recommendations. Information from health-care facilities may point to the need for changes in clinical practice or modification of service provision. The required actions may be in the area of direct patient care, such as revising clinical guidelines for care or promoting management by protocol. They may be at the health system level, such as providing the necessary drugs and blood supplies or adding personnel at a health-care facility.

Information from the findings of aggregated data analysis can cover all these issues on a wider scale and be used at institutional, local, district, and national levels by politicians, health service planners, professionals, public health personnel, educators, and women's advocacy groups. Such analysis should lead to stronger maternal health programmes.

Importance of evidence-based interventions

The actions recommended for addressing identified problems should be evidence-based, thus providing a firm basis when advocating for the priority recommendations.

For example, if clinical guidelines or standards have to be developed, they should be based on the best available evidence. The WHO Integrated Management of Pregnancy and Childbirth (IMPAC) (*51*) guidelines can be easily adapted for this purpose, particularly in resource-poor countries.

Table 7.1 presents interventions from WHO evidence based guidelines that can be used to prevent maternal deaths. These include facility (referral and first level) and community clinical interventions (*52,53*). Addressing preventable conditions should take priority. Using locally relevant strategies will increase the likelihood that the intervention will be successful.

TABLE 7.1

Common causes of maternal death: evidence-based medical interventions at the referral/first level facility and in the community (*52,53*)

Cause	Referral/first level facility Interventions	Community Interventions
Prevention and management of postpartum haemorrhage	a) Prophylactic uterotonics to prevent postpartum haemorrhage b) Active management of third stage of labour to prevent postpartum haemorrhage c) Uterine Massage d) Uterotonics e) Manual removal of placenta f) Non-pneumatic anti-shock garment as a temporizing measure until substantive care is available[a]	a) Prophylactic uterotonics to prevent postpartum haemorrhage b) Uterine Massage c) Uterotonics
Prevention and management of hypertension in pregnancy	a) Calcium supplementation in pregnancy b) Low dose aspirin for the prevention of pre-eclampsia in high risk women c) Use of antihypertensive drugs for treating severe hypertension in pregnancy d) Prevention and treatment of eclampsia	Calcium supplementation in pregnancy
Prevention of and management of unintended pregnancy	a) Advice and provision of family planning: barrier methods, oral contraceptives, emergency contraceptives, hormonal methods, implants, intrauterine devices, and surgical contraception. b) Availability and provision of safe abortion c) Provision of post abortion care	Advice and provision of family planning: barrier methods, oral contraceptives, emergency contraceptives, hormonal methods.
Prevention and treatment of Sepsis	a) Antibiotics for management of preterm prelabourrupture of membranes b) Induction of labour for management of prelabour rupture of membranes at term[a] c) Prophylactic antibiotic for caesarean section d) Detection and management of postpartum sepsis[a]	
Obstructed labour (and associated complications, e.g., sepsis, haemorrhage)	Caesarean section[b] Antibiotic therapy[b] Blood transfusion[b]	
Indirect causes	a) Provide essential package antenatal care b) Prevention and management of sexually transmitted infections including HIV for prevention of Mother-to-Child Transmission (PMTCT) of HIV c) Prevention and management of malaria in pregnancy including prophylactic antimalarial and provision and promotion of Insecticide Treated Nets d) Treatment of simple malaria cases e) Treatment of complicated malaria cases[b] e) Social support during childbirth f) Screening for and management of signs/symptoms of domestic violence and sexual assault g) Prevent, measure, and treat maternal anaemia[b] h) Treatment of severe HIV infection.[b]	a) Prevention and management of sexually transmitted infections including HIV for prevention of Mother-to-Child Transmission (PMTCT) of HIV b) Prevention and management of malaria in pregnancy including prophylactic antimalarial and provision and promotion of Insecticide treated Nets

[a] WHO recommendations for the prevention and treatment of postpartum haemorrhage 2012. http://apps.who.int/iris/bitstream/10665/75411/1/9789241548502_eng.pdf

[b] Referral level facility only

Evidence-based community actions to address avoidable factors

Community interventions can also have a substantial impact on improving maternal health. Effective interventions include the following actions (*52*,*53*):

- Health education to women, men, families, and communities on the following topics:
  - Sexual and reproductive health;
  - Self care at home, nutrition, HIV, breastfeeding, healthy lifestyle, harmful effects of smoking and alcohol use;
  - Benefits of safe sex, family planning and birth spacing;
  - Unwanted pregnancy, coerced sex, consequence of unprotected sex;
  - Legal grounds and consequences for unsafe abortion;
  - Birth planning, advice on labour, danger signs and emergency preparedness;
- Support for compliance with preventative treatments
- Social support during childbirth
- Companion of choice to support the women to attend a facility
- Support for transport
- Identification and prompt referral of women with signs of complications of unsafe abortion, domestic and sexual violence, postpartum blues/depression
- Support for women living with HIV/AIDS
- Support for care for the rest of the family
- Support for rest and less work load

Where evidence is lacking

Not all problems identified during the review and analysis have evidence-based solutions, particularly those related to family, community, transportation, and access to care. Finding innovative solutions is more likely when the community participates and provides input. Ideally, actions taken that were not based on known evidence will be evaluated to ensure they are having the expected effect.

Response prioritization

In all likelihood, many problems will be identified. Not all can be tackled simultaneously, so prioritizing them is important. A range of characteristics should be considered when prioritizing problems and their solutions. One important factor is prevalence – how common is a problem? Resolving common problems may have a greater impact than resolving unusual problems. Another factor is the feasibility of implementing the intervention. Is it technologically and financially possible? Are there sufficient human resources? What are the costs? Finally, what is the potential impact of the intervention? If it were successfully implemented, how many women could be reached and how many lives saved?

New technology can be used to provide innovative interventions to enhance care and thereby prevent maternal mortality. The two examples in Box 7.2 illustrate such uses (*54*,*55*).

Role of response coordinator

Identifying someone to facilitate responses at each level (e.g. facility, district, national) and ensure that action will be taken is helpful. Response coordinators are usually on the staff of the MCH Department involved in maternal health. Their work in implementing a response plan includes identifying roles and responsibilities (e.g. educating the community on signs of obstructed labour may best be done by a community health worker) and

BOX 7.2

Examples of new technologies used to reduce maternal mortality

The telemedicine for reducing maternal mortality project by Health Management and Research Institute (HMRI) in Araku Valley, the Visakhapatnam District of India project brings women from remote distances to a centralized location to enroll them in a highly computerized system with a unique fingerprint identifier. Their medical history, including physical and laboratory test results, is all computerized and an algorithm is used to identify problems. Video consultation is carried out with a specialist if needed. Not only is this an innovative use of technology, but this method has been shared through YouTube so other countries and interested parties can learn from this novel approach.

In Inganga, Uganda, The Rural Extended Services and Care for Ultimate Emergency Relief (RESCUER) project teams up UNFPA, Uganda's MoH, and Iganga district authorities. RESCUER uses VHF radios installed in base stations and health units for communications, which contributed significantly to the project's success. "When transport broke down, the presence of a midwife and the communications system played a big role in saving lives: the birth attendants consulted staff in health units, who in turn consulted colleagues and their seniors. The walkie-talkie technology was 'a great source of empowerment' for the birth attendants. It improved their image, built confidence in their clients and helped them attend to more women." Health workers responded more quickly and felt less isolated, and absenteeism fell. "Senior officers are likely to radio to the responsible officer if a call receives no response within 30 minutes." Since initiation, more births are being handled by trained personnel, referrals to health units have increased, and maternal mortality has fallen. The RESCUER project is being replicated in three other districts, with plans to extend it in phases to 30 or more districts.

helping improve communications necessary for actions to be taken at multiple levels (e.g. improving the availability of obstetric medications will require involving hospital management in coordination with those who are responsible for supply chains at the national level). Responses may change over time, so it is important to allow for flexibility during the planning process.

The response coordinator should also monitor the implementation of the actions that have been agreed upon and report progress back to the maternal mortality committee. Conducting regular, periodic all-stakeholder meetings is worthwhile at both the national and district levels. These meetings can be used to share information, particularly that related to response – what works, what does not – and to share new and innovative solutions that have been identified by providers and communities. Community health workers, such as traditional birth attendants, are important stakeholders. Their involvement is critical for successful translation of recommendations to the community.

Advocacy

Advocacy is a process by an individual or a group that aims to influence behaviour, policy, and resource allocation decisions within political, economic, and social systems and institutions.

Changes in behaviour and clinical practice are often difficult to achieve without widespread promotion and visible support from leading, well-respected advocates, professionals, and professional organizations. The choice of people to involve in developing the recommendations is therefore crucial for ensuring that recommendations for change will be implemented.

Successful advocacy requires rigorous, in-depth research; careful planning; and clearly-defined, practical goals. It must have a clear purpose, well-framed arguments, and sound communication with audiences. Effective advocates carefully survey the landscape (political, social, and economic) before getting involved. The evidence and stories behind the maternal deaths are the ingredients for powerful and effective advocacy.

Influencing change through advocacy takes many different forms: simply exposing the extent of a problem; demonstrating patterns and trends and identifying their causes; describing education and training needs and bottlenecks (such as having poor access to drugs); identifying gaps in or absent protocols or policies; and showcasing improvements in health services and quality of care as a result of the MDSR process. Providing stories that support efforts to increase awareness of women's needs is one way for the MDSR to support the case for more or different resources. Through media, stories can be used to create awareness. Advocacy efforts also can be multifaceted, such as those used by the Campaign for Accelerated Reduction of Maternal Mortality in Africa (CARMMA) (*56*) (see Box 7.2). There are many other advocacy methods. Choosing the best option depends on what changes are needed and the most effective route for making them.

BOX 7.2

Campaign for Accelerated Reduction of Maternal Mortality in Africa

The Campaign for Accelerated Reduction of Maternal Mortality in Africa (CARMMA) was initiated by the African Union. Several United Nations agencies, bilateral donors, and the International Planned Parenthood Federation (IPPF) support CARMMA at the national, regional, and global levels.

CARMMA's objectives include identifying and working with national champions to mobilize support and participation at the national level and enhancing political leadership and commitment at the national, regional, and continental levels. Driving the country efforts to take specific actions to reduce maternal mortality, senior political leaders (presidents, vice presidents, first ladies, ministers) have joined efforts with the United Nations (WHO, UNICEF, FAO, UNAIDS, UNIFEM, UNFPA), the World Bank, bilateral donors (USAID, DFID), academia and civil society (IPPF, White Ribbon Alliance), community and religious leaders and institutions, professional associations such as nurses and midwives associations and medical associations, artists, the media, and the private sector.

In some countries, the launch of CARMMA has been used to mobilize additional domestic resources for maternal and newborn health. In many countries, the national champions of CARMMA or the national authorities have committed to follow-up activities to intensify the reduction of maternal mortality:

- launching CARMMA in all districts or states – Malawi, Chad, Zambia, Rwanda, Sierra Leone, and Nigeria;
- adopting district hospitals to strengthen the health system in partnership with the private sector – Malawi;
- instituting maternal mortality monitoring indicators – Swaziland;
- planning launch of CARMMA to coincide with the Campaign to End Violence against Women and also to raise funds for maternal mortality reduction through pledges – Chad;
- providing free medical services for pregnant mothers and infants – Sierra Leone.

8.

Dissemination of results, recommendations, and responses

Ensuring government accountability for improving maternal health requires the periodic and transparent dissemination and discussion of key results – particularly trends in maternal mortality – among stakeholders, including the civil society at large. Most countries have some type of annual health sector review. Progress reports on improving maternal health are generally embedded in this process. MDSR can provide important data to monitor progress in reducing a country's maternal mortality ratio.

Annual national and district reports that summarize MDSR results, recommendations, and the response actions taken are a critical component of MDSR. An annual report is also a response in and of itself, as noted in Chapter 7, because it feeds into the planning process and can contribute to changing how systems work and incorporate new interventions on a broad scale. An MDSR report is a critical element of programmatic plans for maternal health improvements at the national, district, and sub-district levels.

The two main types of reports from the MDSR system are annual reports on maternal deaths and reports on the monitoring and evaluation (M&E) of the system itself (see Chapter 9). The first provide information on the analysis of the maternal deaths, include recommendations, document the adequacy of the response – that is whether the recommendations were implemented, and describe accomplishments and challenges.

The M&E reports assess and evaluate the MDSR system itself and its capacity to respond. Evaluation should take place after the system has been running a few months and when system changes occur, but not necessarily every year.

Annual reports

Publishing a report is one of the primary ways to disseminate the findings and recommendations of MDSR. The report should be written in simple language, be easy to follow, and include the standard sections listed in Box 8.1. Its scope, depth, and breadth may vary, depending on the chosen approach and the number of cases reviewed. Reports may be prepared at the facility, district, or national level.

- A *single-facility death review* report may be an internal document, copied and distributed to all staff, relevant decision-makers in the area, and colleagues outside the facility. The objective is to share the findings and recommendations. Because many of the people involved in preparing the report will know the identities of the deceased women's families and staff involved in their care, focusing on positive recommendations and not placing blame will be important.
- An annual *facility-based MDSR* report may have broader audiences: all the facilities involved in the review, other facilities in the area (public and private), policy-makers, insurance companies, and teaching institutions, as well as national authorities and the public.

- A *district MDSR report* may be distributed to political leaders in the area of the review, individuals involved in local programmes, and district or state health officials.
- A *national MDSR* report

Often annual reports, especially national reports, tend to be large and detailed, which may limit their dissemination. Preferably, a comprehensive report for health-care planners and policy-makers can be supplemented with a shorter "executive summary" for distribution to health-care workers, community representatives, and others.

These summaries could take the form of a simple newsletter or short booklet, preferably with an introduction written by the ministry of health or leaders of health-care professional organizations. New technology can be used to disseminate the key messages, such as text messaging short lists of key findings and suggested interventions.

Although these reports are called "annual," the frequency of their publication will depend on the number of cases reviewed, which in turn depends on the population and mortality rate. As deaths become rarer and the reviews focus on selected problems, the periodicity of reports can be adjusted. An important additional purpose of these publications is to share information on innovative programmes and technology use with those in other parts of the world.

BOX 8.1

Suggested standard sections for an annual MDSR report

1. Background of area covered by review
2. Characteristics of women of reproductive age in area
3. Characteristics of births in area (number, live or stillborn (fresh vs. macerated), birth weight, gestational age)
4. Maternal deaths by area of residence, mother's age, place of death (home or facility), ethnicity (MMR for each if possible)
5. Proportion of maternal deaths by medical cause of death
6. Case fatality rate (for facility deaths)
7. Contributing factors (quality of care, nonmedical) and their frequencies
8. Avoidability of maternal deaths
9. Recommendations for preventing future deaths
10. Review of recommendations from previous year and lessons learned (including implementation challenges)

Develop and disseminate findings and recommendations

The dissemination of results must follow three principles and can make use of several channels:

1. findings and recommendations should always be fed back to the hospital or community where the information was collected;
2. feedback should be in an aggregated or de-identified form so the individual families or health-care providers cannot be identified;
3. legal safeguards should be in place to prevent the use of the review findings in litigation.

During data analysis, factors contributing to maternal deaths often become apparent early on. Specific recommendations should be developed and linked with plans of action and timelines. A report that contains actual recommendations is more powerful than one that suggests these be developed in the future. The quicker a final report is generated after the end of the reporting period, the more immediate its impact will be on local practice.

A plan for disseminating the results of MDSR should be determined in advance, although flexibility should be built in, particularly because the results will not be known until the data from the review are analysed. A key principle of any report, published or otherwise, is that the team involved in undertaking the MDR be fully involved in reviewing the report, developing the recommendations, planning and promoting their implementation, and acting as advocates for change. Recommendations and dissemination methods should be tailored to the target audience.

The published reports of findings should focus on ways to improve the system rather than single out particular errors. Before publication, the contents should be carefully reviewed to avoid breaches in confidentiality and misuse of information.

The information is disseminated using a variety of channels to enable a wide range of people to access it and to ensure that the information gets to the right audience – namely, those who can act on the recommendations. If specific causes of deaths are identified as particularly frequent, conferences or seminars can be held to educate health-care staff on remedies. Short summaries of key findings and recommendations are cheaper and easier to disseminate widely. In general, the shorter the document, the more widely read it is likely to be. Similarly, reports published solely in professional journals tend to be overlooked by other interested people. Potential recipients should be identified in advance and the recommendations written in such a way as to be easily understood by a wide audience.

Whom to inform of the results

The type of groups or individuals to consider when disseminating the review findings depends on the scope and scale of the approach used. The general principle is to get the key messages to those who can implement the findings and make a real difference towards saving mothers' lives. They may include:

- Ministries of Health;
- local, regional, or national health-care planners, policy-makers, and politicians;
- professional organizations and their members, including obstetricians, midwives, paediatricians, general physicians, anaesthetists, and pathologists who are involved at each level;
- medical directors and chief executive officers;
- leaders in other health-care systems, such as social security and the private sector;
- health promotion and education experts;
- health insurance companies (if applicable);
- public health or community health departments;
- academic institutions;
- local health-care managers or supervisors;
- local governments;
- national or local advocacy groups;
- the communications media;
- representatives of specific faith or cultural institutions or other opinion leaders who can promote and facilitate beneficial changes in local customs;
- all participants in the survey.

Dissemination methods

Reports are one of the more common and useful means of information dissemination (see Chapter 9 for more details). If problems are identified in the community, it is important that the people whose lives are affected are involved as participants in the process and are kept informed of the findings. This is true whatever the level of the MMR.

BOX 8.2

Examples of methods for dissemination of results

Community or facility level

- Team meetings
- Thematic seminars at facilities
- Community meetings
- Radio programmes
- Printed reports
- Training programmes
- Posters
- Text messages
- Video clips
- Applications for smart phones

Sub-national or national level

- Printed reports for policymakers
- Statistical publications
- Scientific articles
- Professional conferences
- Training programmes
- Media
- Press releases
- Websites
- Newsletters and bulletins
- Fact sheets
- Posters
- Video clips

9.

Monitoring and Evaluation of the MDSR system

Framework for monitoring and evaluation

Monitoring and evaluation (M&E) of the MDSR system itself is necessary to ensure that the major steps in the system are functioning adequately and improving with time. Assessing the timeliness of the information and the coverage of the system is also important. Monitoring of the MDSR system is carried out primarily at the national level. However, some of the indicators are also pertinent to the district level and permit assessments of whether the system is improving.

A monitoring framework with indicators should be agreed to and indicators assessed annually. A sample framework, with indicators, is shown in Table 9.1.

Evaluate and improve the system so it has an impact

In addition to the monitoring indicators that provide a quick snapshot of whether the system is improving, a more detailed periodic evaluation is useful particularly if 1) the indicators demonstrate that one or more of the steps in the MDSR process is not reaching expected targets, or 2) if maternal mortality is not decreasing. Because the main purpose of MDSR is to lead to action to reduce maternal deaths, the system is failing if this is not happening. A more detailed evaluation can also be used to assess whether the system can function more efficiently. Ideally, there should also be a periodic evaluation of the quality of information provided.

Surveillance system attributes that are particularly important to evaluate for MDSR include acceptability, timeliness, data quality, and stability (*57,58*).

Efficiency

A periodic evaluation should examine how efficient the system is. This includes an assessment of its key processes: identification and notification, review, analysis, reporting and response, and whether there are barriers to their operation that should be addressed. IT solutions can help reduce inefficiencies but require trained staff. Ideally the system will be computerized, at a minimum, at the district level.

Effectiveness

Evaluation of effectiveness determines if the correct recommendations for action have been implemented, if they are achieving the desired results and, if not, where any problems may lie. Exactly how this evaluation should be carried out will depend on the particular circumstances in each community, facility, or health-care system. It starts with a determination of *if* and *how* the specific MDSR findings and recommendations have been implemented and whether they are having the expected impact on maternal mortality.

TABLE 9.1

Example of MDSR monitoring indicators and targets

Indicator	Example Target
Overall system indicators	
Maternal death is a notifiable event	Yes
National maternal death review committee exists	Yes
– that meets regularly	At least quarterly
National maternal mortality report published annually	Yes
% of districts with maternal death review committees	100%
% of districts with someone responsible for MDSR	100%
Identification and notification	
Health facility:	
All maternal deaths are notified	Yes
– % within 24 hours	>90%
Community:	
% of communities with 'zero reporting' monthly	100%
% of community maternal deaths notified within 48 hours	>80%
District:	
% of expected maternal deaths that are notified	>90%
Review	
Health facility:	
% of hospitals with a review committee	100%
% of health facility maternal deaths reviewed	100%
% of reviews that include recommendations	100%
Community:	
% of verbal autopsies conducted for suspected maternal deaths	>90%
% of notified maternal deaths that are reviewed by district	>90%
District:	
District maternal mortality review committee exists	Yes
– and meets regularly to review facility and community deaths	At least quarterly
– % of reviews that included community participation and feedback	100%
Data Quality Indicators	
Cross-check of data from facility and community on same maternal death	5% of deaths cross-checked
Sample of WRA deaths checked to ensure they are correctly identified as not maternal	1% of WRA rechecked
Response	
Facility:	
% of committee recommendations that are implemented	>80%
– quality of care recommendations	>80%
– other recommendations	>80%
District:	
% of committee recommendations that are implemented	>80%
Reports	
National committee produces annual report	Yes
District committee produces annual report	Yes
– and discusses with key stakeholders including communities	Yes
Impact	
Quality of care (requires specific indicators)	
District maternal mortality ratio	Reduced by 10% annually
Hospital maternal mortality ratio/lethality rates	Reduced by 10% annually

10.

Development of an MDSR implementation plan

The final structure and scope of MDSR will differ according to the local context and challenges. Implementation strategies therefore should be adaptable and easily customized to ensure the feasibility of the MDSR system. A list of some tools that may be helpful for implementing MDSR is included in the appendices as is a template for community mortality line listing (Appendices 6 and 7).

Planning efforts must consider local capabilities, limitations, logistical issues, budgetary realities, and legal requirements. The MDSR guide and tools provide a basic structure on which countries can build, taking into consideration the local realities and needs. Prerequisites to implementation are: intensive and inclusive planning and development of system-wide linkages and processes that foster communication and collaboration at all levels; agreement on the scale of coverage (facility-based maternal deaths or all deaths, national or sub-national) and design of the system; assessment of the current situation, including mapping existing resources and identifying gaps; and identification of opportunities for cost-saving and achieving wider benefits.

Implementation of MDSR will vary among countries depending on the types of maternal mortality notification and review guidelines, processes, and systems already in place. The current status of each of the MDSR components (identification and notification, review, analysis and recommendations, response, dissemination and reports, monitoring and evaluation) should be assessed and a plan elaborated to develop those components that are absent, strengthen those that are already established, and expand the system over time to achieve complete national coverage. This chapter highlights some important areas to consider when developing an MDSR implementation plan. A classic approach in planning a standard public health surveillance system is illustrated in Box 10.1.

BOX 10.1
Steps in planning a surveillance system (*59*)

1. Establish objectives
2. Develop case definitions
3. Determine data sources and the data-collection mechanism
4. Determine data-collection instruments
5. Field-test methods
6. Develop and test analytical approach
7. Identify dissemination mechanisms
8. Assure use of analysis and interpretation

Ensure an enabling environment

Evidence from countries that have maternal death notification and review systems shows the importance of an enabling environment. Implementation of MDSR requires coordination and collaboration among multiple stakeholders operating within the surveillance system. Support for MDSR from MoH leadership is essential. MDSR must be recognized as an important component of any MoH strategy to reduce or eliminate preventable maternal mortality. The development of an implementation plan will usually start at the national level with the convening of a group of experts to develop and monitor the implementation process, usually from within the MCH or Reproductive Health Department. Under the stewardship of the MoH, roles and responsibilities of various departments and ministries should be identified. Understanding the linkages and interfaces between ministries and their interaction with the private sector is critical to the development of multi-sectoral coordination and response.

Active involvement of and support from health-care providers (obstetricians, other clinicians, midwives and nurses) is critical, particularly for understanding and identifying solutions for the problems that contribute to maternal deaths in health facilities. However, the participation of other first-line specialists (hospital administrators, epidemiologists, information system specialists, health planners, M&E personnel) is also very important. Collaboration between various sectors within the health system and the engagement of households and communities as partners and beneficiaries of health care enhances the likelihood of success.

Other enabling factors for the maternal death review component of MDSR have been identified in Malawi (Box 10.1). While the Malawi analysis was done for MDR, the findings are also appropriate for MDSR.

BOX 10.1

MDSR enabling factors in Malawi (*60*)

The results of a recent analysis of the Malawi MDR identified the following strengths and enabling factors:

- Political will and presence of a clear safe motherhood agenda
- Good communication and collaboration between various levels of review
- Proper documentation (e.g. “using checklists and supportive supervision”)
- Emphasis on anonymity and confidentiality during maternal death reviews;
- Building capacity of maternity staff to conduct maternal death reviews
- Good leadership and “support from the management”
- Motivation of staff; using standards of care to guide the review committee
- Proper stock inventory and adequate resources
- Involvement of the community
- Support from the “hierarchy.”

Regulations and confidentiality

An MDSR system is more likely to be successful if certain regulations and legal protections are in place. First, notification of a maternal death should be mandatory. Second, a ministerial decree is usually needed to establish the MDSR system, including the national MDR committee and dissemination of results to government entities, civil society, professional organizations, NGOs, donors, etc. Third, legal provisions related to confidentiality and medical liability should be in place. In some areas fear of lawsuits has led to

the abandonment of maternal death reviews. Exploring ways to increase legal protection and provide anonymity may encourage health-care workers to provide information and participate in the review process. Professional organizations can play an important role in ensuring medical practice is aligned with accepted standards and providing legal protection for their members. Implementers should also identify any legal regulations that may affect dissemination of findings. Reviewing patient health records, speaking with family members or friends, and interviewing health-care workers may also require the adoption of regulations.

Assessment of current situation

An assessment of the current situation provides the starting point for an implementation plan. Many countries have already implemented some components of MDSR (such as MDR). This is an opportunity to take stock of the current status of each of the MDSR steps – identify and notify, review, analyze, and respond to maternal deaths – and to assess successes and challenges for each one. This will include an assessment of the coverage of MDSR (nationwide or only in certain districts, at facilities or community based), the quality of the information being produced, and its utilization for actions that reduce maternal deaths. Information collection will also depend on the anticipated next steps. The MDSR monitoring indicators listed in Chapter 9 should be assessed and will serve as a baseline for monitoring progress.

After documenting the current status of the MDSR system components, realistic long-term (3–5 year) goals should be established, along with annual benchmarks for monitoring progress towards reaching the goals.

Existing health information infrastructure

Information on maternal deaths is collected from health facilities and communities. It is important to understand the systems used in these two primary sources for providing information related to maternal death. Likewise, the flow of information to the district and national levels, and how data are aggregated, should be mapped. The coverage of the information system network for both facilities and communities should be assessed. Key questions include:

- What components of MDSR are already in place and where?
- Is maternal death a notifiable event?
- What percentage of deaths is estimated to be notified from health facilities and from the community?
- If more than one system that reports maternal deaths is currently in place, how do these systems interact?
- What is the status of the vital registration system and how does it interact with MDSR? Does the death certificate include a checkbox for pregnancy?
- Is IDSR (*6*) in place and, if so, does it report the number of maternal deaths?

Assembling and examining all relevant, available data or other sources of information (such as informal surveys) on maternal events and health-care services in the proposed surveillance areas is also useful. Types of information that could be helpful include the approximate number of deliveries and maternal deaths, their distribution by place of occurrence (home; health centre; public, private, or other type of hospital [including level]), and estimates of distribution of deaths by cause. These resources will assist in the analysis phase.

Resources, logistics and technology

Notifiable events should be reported quickly, ideally within 48 hours. Determining if this is feasible will require an assessment of the communications technology available in communities and at health facilities. Cellular telephones are increasingly permitting communication with previously isolated communities. At health facilities, cellular telephones, radios, land-line telephones, or e-mail can be used. Likewise, data collection benefits from using computers, tablets, or other hand-held digital devices. This can shape the communication mechanisms used for reporting deaths as well as the responses designed for intervention. Identifying the current state of resources (human, financial, and technological) that are available for use and anticipated changes in resources is important.

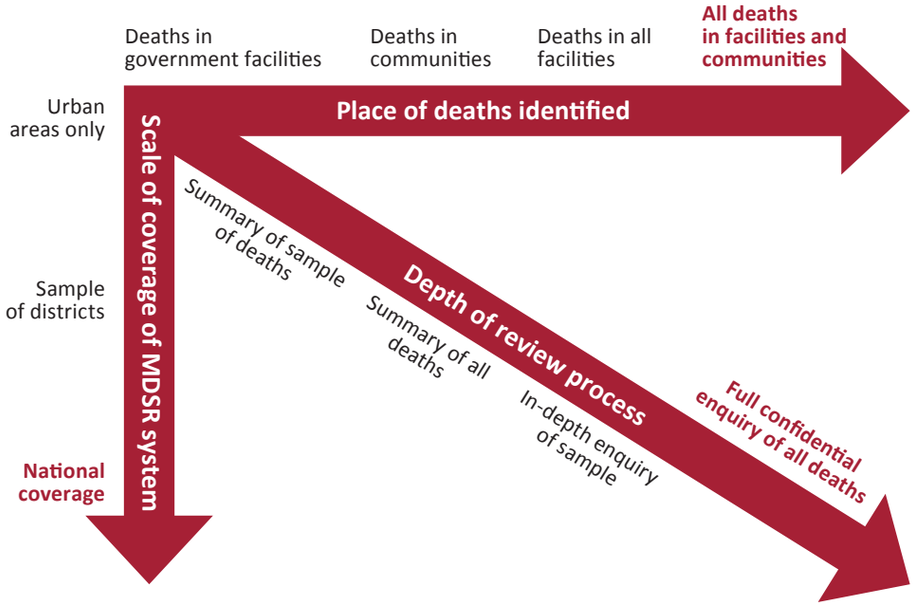
For MDSR to be successful, specific people must be assigned to supervise the work and ensure the processes are working smoothly, data are of adequate quality, recommendations are being implemented, and reports are disseminated to the appropriate authorities, civil society, professional organizations, etc. Hiring an adequate number of people to carry out the required tasks is essential.

Phased approach to MDSR implementation

Implementing an MDSR system can seem daunting. Using a phased approach that breaks the process into more manageable pieces can be helpful. Achieving key benchmarks will show that progress towards the final goal is being made. In the many countries where some components of the MDSR system have already been initiated, the next steps for strengthening and expanding the system can be developed. Figure 10.1 provides an example of a phased approach. However, the exact steps in a phased general introduction of the system will depend on the situation in each country; for instance, some countries may prefer to start in urban areas, whereas others may prefer to start with a group of districts.

Figure 10.1 also shows a typical progression when scaling up a national system. The horizontal arrow shows the expansion of the places where deaths are identified: from only government or other selected facilities to all facilities, and finally to complete coverage,

FIGURE 10.1
Main dimensions for a phased introduction of MDSR system



including the community. Facility-based deaths are usually easier to capture than community-based deaths, and MDSR should be implemented in all health facilities at a minimum. However, the long-term goal should be to identify all deaths, and the upper arrow in the figure captures progression toward that goal. The vertical arrow shows expansion of the geographical coverage of MDSR. In this example the system starts in urban areas only, then expands to include a sample of entire districts and finally the entire nation. The depth of the review process is shown in the centre of the figure, from a superficial review of a sample of deaths to a deeper review of all deaths.

The M&E framework described in Chapter 9, Table 9.1, provides a standardized approach for monitoring progress in the development of MDSR. Activities to expand the programme can be planned for each individual year, keeping in mind the many options for expansion. Appendix 9 is an example of an implementation planning tool that can be modified and used to plan and track MDSR expansion activities. Before moving to the next planned stage, review of current data will help determine if the system is ready for expansion. If data are not of adequate quality, expanding the system will only provide more data of poor quality. Instead, the focus could be on improving both the quality and completeness of the information that is already being collected.

Resource considerations

The scope of MDSR will depend on the availability of resources. Information about the number of births and deaths, where the women received care, and where the deliveries and deaths occurred will help determine the costs involved; influence whether all, or only a subset of the cases, can be reviewed; and determine where the review should concentrate. Countries have instituted a variety of approaches. For instance, India and Nigeria have decentralized the MDSR process, and reviewing their experience may be helpful.

11.
References

1. WHO, UNICEF, UNFPA, and The World Bank. Trends in maternal mortality: 1990–2008: Estimates developed by WHO, UNICEF, UNFPA and The World Bank. Geneva, World Health Organization, 2010.
2. WHO/UNICEF/UNFPA and The World Bank. Trends in maternal mortality: 1990–2010: Estimates developed by WHO, UNICEF, UNFPA and The World Bank. Geneva, World Health Organization, 2012.
3. Royston E, Armstrong S, eds. *Preventing maternal deaths*. Geneva, World Health Organization, 1989.
4. Court, C. WHO claims maternal mortality has been underestimated. *British Medical Journal*, 1996, 312(7028):398.
5. Danel I, Graham WJ, Boerma T. Maternal death surveillance and response. *Bulletin of the World Health Organization*, 2011, 89: 779.
6. World Health Organization and Centers for Disease Control and Prevention. Technical guidelines for integrated disease surveillance and response in the African Region. Geneva, World Health Organization, 2010. Available from: **http://www.afro.who.int/en/clusters-a-programmes/dpc/integrated-disease-surveillance/features/2775-technical-guidelines-for-integrated-disease-surveillance-and-response-in-the-african-region.html**
7. Commission on Information and Accountability for Women's and Children's Health: keeping promises, measuring results. Geneva, World Health Organization, 2011. Available from: **http://www.who.int/topics/millennium_development_goals/accountability_commission/Commission_Report_advance_copy.pdf**
8. UN Economic and Social Council. Commission on the Status of Women. Report on the fifty-sixth session. Resolution 56/3. Eliminating maternal mortality and morbidity through the empowerment of women. New York, United Nations, 2012; Suppl 7:12–22.
9. Gilmore K, Gebreyesus TA. What will it take to eliminate preventable maternal deaths? *Lancet*, 2012, 380(9370):87–88.
10. Pearson L, deBernis L, Shoo R. Maternal death review in Africa. *International Journal of Gynacology and Obstetrics*, 2009, 106(1):89–94.
11. *Beyond the Numbers: Reviewing maternal deaths and complications to make pregnancy safer.* Geneva, World Health Organization, 2004.

12. *International Classification of Diseases (ICD) 10*. Geneva, World Health Organization, 1994. Available from:
http://www.who.int/classifications/icd/en/.

13. Countdown to 2015 Maternal Newborn & Child Survival, et al. Monitoring maternal, newborn and child health: understanding key progress indicators. Geneva, World Health Organization, 2011. Available from:
http://www.who.int/healthmetrics/news/monitoring_maternal_newborn_child_health.pdf

14. The potential of using hospital records and their link to civil registration: Ghana's experience Country Experiences in Civil Registration Systems Development, Geneva, March 18–19, 2009 [online database]. Geneva, World Health Organiation, 3 April 2012. Available from:
http://svn.who-mahler.net/site/standards/tiki-index.php?page=Civil+Registration%2FVital+Statistics+Development.

15. Sombie I, et al. Missing maternal deaths: lessons from Souro Sanou University Hospital, Bobo-Dioulasso, Burkina Faso. *Tropical Doctor*, 2007, 37(2):96–98.

16. Epi Info 7.0 [online datbase]. Atlanta, Centers for Disease Control and Prevention, 3 April 2012. Available from:
http://wwwn.cdc.gov/epiinfo/7/index.htm.

17. Mobile Health (mHealth) [online database]. Geneva, World Health Organization, 3 April 2012. Available from:
http://www.who.int/goe/mobile_health/en/index.html.

18. Andreatta P, et al. Using cell phones to collect postpartum hemorrhage outcome data in rural Ghana. *International Journal of Gynacology & Obstetrics*, 2011, 113(2):148–151.

19. Sgambati M. Mobile Technology May Alter Estimates of Maternal and Infant Mortality. Medscape Medical News November 10, 2010 [cited 2012 April 3]; Available from:
http://www.medscape.com/viewarticle/732319.

20. Innovating for every woman, every child. Oslo, The Global Campaign for the Health Millennium Development Goals, 2011. Available from:
http://www.who.int/pmnch/activities/jointactionplan/innovation_report_lowres_20110830.pdf

21. Danel I, Bortman M. HNP Discussion Paper. An Assessment of LAC's Vital Statistics System: The Foundation of Maternal and Infant Mortality Monitoring. Washington DC, The World Bank, 2008.

22. UNICEF good practices in integrating birth registration into health systems (2000–2009: case studies: Bangladesh, Brazil, The Gambia and Delhi, India. New York, United Nations International Childrens Fund, 2009. Available from:
http://www.unicef.org/protection/Birth_Registration_Working_Paper(2).pdf.

23. Kilonzo A, et al. Improving surveillance for maternal and perinatal health in 2 districts of rural Tanzania. *American Journal of Public Health*, 2001 91(10):1636–1640.

24. Barnett S, et al. A prospective key informant surveillance system to measure maternal mortality – findings from indigenous populations in Jharkhand and Orissa, India. BMC Pregnancy and Childbirth, 2008, 8.

25. World Health Organziation Maternal deaths review in 67 countdown countries. Geneva, World Health Organization, 2011. (unpublished document on file with World Health Organization)

26. Kolandaswamy K. Maternal Mortality in Tamil Nadu during 2001–10: varied progress in reducing maternal mortality at the health district level and preventable causes remain unchanged. Dissertation submitted for degree of Master of Applied Epidemiology, Sree Chitra Tirunal Institute for Medical Sciences and Technology, Thiruvananthapuram, India, June 2010.
27. Evaluating the quality of care for severe pregnancy complications: The WHO near-miss approach for maternal health. Geneva, World Health Orgnization, 2011. Available from: **http://whqlibdoc.who.int/publications/2011/9789241502221_eng.pdf.**
28. Adisasmita A, Deviany P, et al. Obstetric near miss and deaths in public and private hospitals in Indonesia, 2008. *BMC Pregnancy and Childbirth* 8 (10).
29. Verbal autopsy standards: ascertaining and attributing causes of death. Geneva, World Health Organization, 2007. Available from: **http://www.who.int/healthinfo/statistics/verbalautopsystandards/en/index.html.**
30. Ministry of Health – El Salvador. Informal communication with El Salvadoran MOH – Sept 2011. In: Centers for Disease Control and Prevention, ed. Measuring and understanding maternal mortality: strategies to achieve data completeness and quality. Atlanta, CDC, 2011.
31. World Health Organization The WHO Application of ICD-10 to deaths during pregnancy, childbirth, and puerperium: ICD-MM, 2012. Available from **http://www.who.int/reproductivehealth/publications/monitoring/9789241548458/en/**
32. Fottrell E, et al. Revealing the burden of maternal mortality: a probabilistic model for determining pregnancy-related causes of death from verbal autopsies. *Population Health Metrics*, 2007, 5.
33. Monitoring Emergency Obstetric Care. Geneva, World Health Organization, 2009.
34. Kongnyuy EJ, Uthman, OA. Use of criterion-based clinical audit to improve the quality of obstetric care: A systematic review. *Acta Obstetetricia et Gynecologica Scandinavica*, 2009, 88(8):873–881.
35. National Institute for Clinical Excellence. Principles for best practice in clinical audit. Abington, UK, Radcliff Medical Press, 2002.
36. Berg CJ. From identification and review to action – maternal mortality review in the United States. *Seminars in Perinatology*, 2012, 36(1):7–13.
37. Penney GC, Glasier A, Templeton A. Agreeing criteria for audit of the management of induced abortion: an approach by national consensus survey. *Quality in Health Care*, 1993, 2(3):167–169.
38. Shaw CD. Criterion based audit. *British Medical Journal*, 1990, 300(6725):649–651.
39. Thaddeus S, Maine D. Too far to walk: Maternal mortality in context. *Social Science & Medicine*, 1994, 38(8):1091–1110.
40. Liang J, Dai L, et al. Preventable maternal mortality: geographic/rural-urban differences and associated factors from the population-based maternal mortality surveillance system in China. *BMC Public Health*, 2011, 11:243.
41. Hossain J, Ross SR. The effect of addressing demand for as well as supply of emergency obstetric care in Dinajpur, Bangladesh. *International Journal of Gynecology & Obstetrics*, 2006, 92:320–328).

42. Dumont A, et al. Facility-based maternal death reviews: effects on maternal mortality in a district hospital in Senegal. *Bulletin of the World Health Organization*, 2006, 84(3):218–224.

43. Berg C, Danel I, Mora G, eds. Guidelines for maternal mortality epidemiologic surveillance. Washington DC, Pan American Health Organization and Centers for Disease Control and Prevention, 1998 [cited 2012 May 1]. Available from: **http://www.cdc.gov/reproductivehealth/ProductsPubs/PDFs/115049English.pdf.**

44. *The World Health Report 2005: Make every mother and child count*. Geneva, World Health Organization, 2005:219.

45. Barnes-Josiah D, Myntti C, Augustin A. The "three delays" as a framework for examining maternal mortality in Haiti. *Social Science and Medicine*, 1998, 46(8):981–993.

46. Ellis C, Schummers L, Rostoker J-F. Reducing maternal mortality in Uganda: applying the "Three Delays" framework. *International Journal of Childbirth*, 2011, 1(4):218–226.

47. Gabrysch S, Campbell O. Still too far to walk: Literature review of the determinants of delivery service use. *BMC Pregnancy and Childbirth*, 2009, 9:34.

48. Barnes-Josiah D, Myntti C, Augustin A. The "three delays" as a framework for examining maternal mortality in Haiti. *Social Science & Medicine*, 1998, 46(8):981–993.

49. Case study: maternal mortality in Egypt: selected avoidable factors in relation to maternal deaths. Maternal Health Epidemiology Reproductive Health Epidemiology Series, Module 2. Atlanta, Centers for Disease Control and Prevention, 2003. Available from: **http://www.cdc.gov/reproductivehealth/ProductsPubs/PDFs/EPI_Module_2_04__Tag508.pdf.**

50. Silva C. Analyzing accessible health services and income related to maternal mortality rates in Puerto Rico from 2002 to 2004. Online National Geographic Education Blog, 18 November 2010. Available from: **http://blog.mywonderfulworld.org/2010/11/carmen-silva-analyzing-accessible-health-services-and-income-related-to-maternal-mortality-rates-in.html.**

51. Integrated management of pregnancy and childbirth (IMPAC). Geneva, World Health Organization, 2009. Available from: **http://www.euro.who.int/en/what-we-do/health-topics/Life-stages/maternal-and-newborn-health/policy-and-tools/integrated-management-of-pregnancy-and-childbirth-impact.**

52. World Health Organization Packages of Interventions for Family Planning, Safe Abortion care, Maternal, Newborn and Child Health, 2010. Available from **http://whqlibdoc.who.int/hq/2010/WHO_FCH_10.06_eng.pdf.**

53. The Partnership for Maternal Newborn and Child Health, World Health Organization, et al. Essential Interventions, Commodities and Guidelines for Reproductive, Maternal, Newborn and Child Health. A global review of the key interventions related to reproductive, maternal, newborn and child Health, 2011. Available from **http://www.who.int/pmnch/topics/part_publications/201112_essential_interventions/en/index.html.**

54. HMRI India. Rural Telemedicine as a Solution to Maternal Mortality. 2011. Available from: **http://www.youtube.com/watch?v=Uiirg0szrnA.**

55. Musoke Maria GN. Simple ICTs reduce maternal mortality in rural Uganda. A telemedicine case study, 2002. Available from **http://www.medicusmundi.ch/mms/services/bulletin/bulletin200202/kap04/16musoke.html.**

56. UNFPA Africa. What is CARMMA? UNFPA Africa online [cited 2012 September 12]. Available from: **http://africa.unfpa.org/public/cache/offonce/lang/en/pid/8804;jsessionid=F2AA18BA2D88D74C4BB603F0E3281F77.jahia01.**

57. Buehler JW, et al. Framework for evaluating public health surveillance systems for early detection of outbreaks: recommendations from the CDC Working Group. *MMWR Recommendations and Reports*, 2004, 53(RR-5):1–11.

58. German RR, et al. Updated guidelines for evaluating public health surveillance systems: recommendations from the Guidelines Working Group. *MMWR Recommendations and Reports*, 2001, 50(RR-13):1–35.

59. Teutsch SM, Thacker SB, Planning a public Health Surveillance System. *Epidemiologic Bulletin*. 1995 Mar; 16(1):1–6.

60. Kongnyuy EJ, Mlava G, van den Broek N. Facility-based maternal death review in three districts in the central region of Malawi: an analysis of causes and characteristics of maternal deaths. *Womens Health Issues*, 2009, 19(1):14–20.

12.
Glossary

The authors of this document recognize the variety of governmental structures in which countries operate MDSR programmes. For the sake of clarity, we use three levels of governmental structures:

Local – some countries call this the district, municipal, or county level.

Regional – some countries call this the departmental, state, or provincial level.

National – in general, the ministry of health fulfills this role.

Maternal death is defined as the death of a woman while pregnant or within 42 days of the termination of pregnancy irrespective of the duration and site of the pregnancy, from any cause related to or aggravated by the pregnancy or its management but not from accidental or incidental causes (ICD-9, ICD-10).

> **Direct obstetric deaths** are maternal deaths resulting from obstetric complications of the pregnancy state (pregnancy, labour, or puerperium); from interventions, omissions, or incorrect treatment; or from a chain of events resulting from any of the above.
>
> **Indirect obstetric deaths** are maternal deaths resulting from previously existing disease or disease that developed during pregnancy. These deaths are not due to direct obstetric causes, but are aggravated by the physiological effects of pregnancy.

Pregnancy-related death is defined as all deaths of women during or within 42 days of pregnancy regardless of cause (ICD-10)[1] (*12*). This term is useful for two main reasons:

- Cause of death can be difficult to determine.
- In developing countries, a high percentage of deaths that occur during pregnancy and the postpartum period are due to the pregnancy and its complications.

Late maternal death is defined as a maternal death due to pregnancy (direct or indirect obstetric causes) which occurred more than 42 days but less than one year after the end of pregnancy (ICD-10) (*12*). Some recent surveys show the importance of assessing maternal mortality during the year after birth when severe complication occurred. However, late maternal deaths are *not* included in the maternal mortality ratio.

Appendices

APPENDIX 1
Sample of maternal death reporting form

Maternal Death Reporting Form		
The form must be completed for all deaths, including abortions and ectopic gestation related deaths, in pregnant women or within 42 days after termination of pregnancy irrespective of duration or site of pregnancy		
	Questions / Variables	**Answers**
1	Country	
2	District	
3	Reporting Site	
4	How many of such maternal deaths occured cumulatively this year at this site?	
5	Date this maternal death occured (day/month/year)	
6	Maternal death locality (Village or Town)	
7	Record's unique identifier (year-Country code-District-site-maternal death rank)	
8	Maternal death place (Community, health facility, district hospital, referral hospital or private hospital, on the way to health facility or hospital)	
9	Age (in years) of the deceased	
10	Gravida: how many times was the deceases pregnant?	
11	Parity: how many times did the late deliver a baby of 22 weeks/500g or more?	
12	Time of death (specify "During pregnancy, At delivery, during delivery, during the immediate post partum period, or long after delivery")	
13	If abortion: was it spontaneous or induced?	
	Maternal death history and risk factors	
14	Was the deceased receiving any antenatal care? (Yes/No)	
	Did she have Malaria? (Yes or No)	
15	Did she have Hypertension ? (Yes or No)	
16	Did she have Anaemia? (Yes or No)	
17	Did she have Abnormal Lie? (Yes or No)	
18	Did she undergo any Previous Caesarean Section? (Yes or No)	
19	What was her HIV Status? (choose "HIV+; HIV-; or Unknown HIV status")	
	Delivery, puerperium and neonatal information	
20	How long (hours) was the duration of labor	
21	What type of delivery was it? (choose one from "1=Vaginal non assisted delivery, 2= vaginal-assisted delivery (Vacuum/forceps), or 3=Caesarean section"	
22	What was the the baby status at birth? (Alive or Stillborn)	

Maternal Death Reporting Form		
The form must be completed for all deaths, including abortions and ectopic gestation related deaths, in pregnant women or within 42 days after termination of pregnancy irrespective of duration or site of pregnancy		
	Questions / Variables	**Answers**
23	In case the baby was born alive, is he/she still alive or died within 28 days after his/her birth ? (choose 1=Still alive, 2=neonatal death, 3=died beyond 28 days of age)	
24	Was the deceased referred to any health facility or hospital? (Yes/No/Don't know)	
25	If yes, how long did it take to get there? (hours)	
26	Did the deceased receive any medical care or obstetrical/surgical interventions for what led to her death? (Yes/No/Don't know)	
27	If yes, specify where and the treatment received*	
28	Primary cause of the Maternal Death	
29	Secondary cause of the Maternal Death	
30	Analysis and Interpretation of the information collected so far (investigator's opinion on this death)	
31	Remarks	
32	Maternal death notification date (day/month/year)	
33	Investigator (Title, name and function)	
	* Treatment received	
	I.V. Fluids; Plasma; Blood Transfusion; Antibiotics; Ocytocin; Anti-seizure drugs; Oxygen; Anti-malarial; Other medical treatment; Surgery; Manual removal of placenta; Manual intra uterin aspiration; Curettage, laporotomy, hysterctomy, intsrumental delivery (Forceps;Vacuum), Caesarian section, anetshesia (general, spinal, epidural , local)	
	Definitions	
	Gravida: The number of times the woman was pregnant- Parity: Number of times the woman delivered a baby of 22 weeks/500g or more, whether alive or dead	

APPENDIX 2
Community data to be collected

Socio-demographic data	Age, marital status, ethnicity, education, literacy, occupations, socio-economic level, home address, health insurance (if applicable), special/ mobile population.
Prenatal history	Reproductive history (gravidity/parity/live births/stillbirths/spontaneous abortions/induced abortions/previous caesareans/previous pregnancy complications); medical history; whether current pregnancy was planned; antenatal care (place, gestational age at onset, number of visits, complications (including date(s), signs and symptoms, diagnoses, procedures, treatments); hospitalizations (date[s], place, diagnoses, test results, procedures, treatments).
Delivery information	Pregnancy outcome and condition (undelivered, delivered-live birth, stillbirth (macerated/fresh), abortion, unviable/ectopic); method of delivery/ procedure (D&C, vaginal delivery, assisted vaginal delivery, Caesarean section (elective or emergent) medical treatment); onset of labour (place/ day/time); gestational age at delivery; labour management (involved health staff, use of partograph, presentation, active management; complications (including date(s), signs and symptoms, diagnoses (examples include: abruption, hypertension, infection), procedures, treatments); postnatal events (including date(s), signs and symptoms, diagnoses (examples include infection, haemorrhage, pre-eclampsia, depression) procedures, (blood transfusions, treatments); referral information.
Information on death	Death (place/day/time); Physiological cause; categorical cause (direct, indirect, late, incidental); complications/illnesses (date/time of onset/signs and symptoms) whether treatment was sought (medical or traditional)/ place, diagnoses, laboratory test results, procedures, treatments (medical or traditional); date and place of death.
Potentially avoidable factors	Was the family aware of warning signs that the mother had a problem?
	What was the family's attitude towards the health-care system?
	Did they encounter any problems when seeking or obtaining care for the mother? Were there delays in referral?
	Were there problems at the health-care facility (delay in getting attention, delay in diagnosis/treatment, lack of laboratory testing/medication/supplies, lack of trained staff, lack of respectful treatment)?
	Were there any barriers to obtaining care, such as geographical, financial, or social or other responsibilities?
Other contributing factors	Additional open-ended questions to capture any other contributing factors that were not already included.
Information on MDR	Date of Review (s); who performed review; who was interviewed; relationship of interviewee to deceased.

APPENDIX 3
Facility data to be collected

Socio-demographic data	Age, marital status, ethnicity, education, literacy, occupations, socio-economic level, home address, health insurance (if applicable), special/mobile population.
Prenatal history	Reproductive history (gravidity/parity/live births/stillbirths/spontaneous abortions/ induced abortions/previous Caesareans/previous pregnancy complications); medical history; whether current pregnancy was planned (contraceptive use and type); antenatal care (place, gestational age at onset, number of visits, provider).
Pre-existing medical conditions	Hypertension; diabetes, anaemia, hepatitis, heart conditions, HIV/AIDS, tuberculosis.
Antenatal risk factors/ complications	Hypertension; proteinuria; glycosuria; anaemia; urinary tract infection; HIV; malaria; undesired pregnancy; placenta praevia; previous Caesarean section; multiple gestation; abnormal lie; hospitalizations (date[s], place, diagnoses, test results, procedures, treatments)
Admission history and physical	Admission information (time, date, condition, diagnosis, referral information); general physical examination; vital signs (heart rate, blood pressure, temperature, respiratory rate, height, weight, any abnormalities); abdominal exam (fundal height, presentation, abnormalities noted; pelvic examination (stage of labour if in labour, abnormalities noted); admission complications (PROM, abruption, preterm labour, pyelonephritis, pre-eclampsia, eclampsia, fetal demise, sepsis, vaginal discharge, malaria).
Labour information	Onset of labour – if occurred (place/day/time); labour management (involved health staff, use of partograph, presentation, active management; complications (including date(s), signs and symptoms, diagnoses (examples include: abruption, hypertension, infection), procedures, treatments); active management of third stage of labour.
Delivery information	Pregnancy outcome and condition (undelivered, delivered-live birth, stillbirth (macerated/fresh), abortion, unviable/ectopic); method of delivery/procedure (D&C, vaginal delivery, assisted vaginal delivery, Caesarean section (elective or emergent) medical treatment); gestational age at delivery; neonatal information (weight, Apgar scores).
Postnatal events	Postnatal events (including date(s), signs and symptoms, diagnoses (examples include infection, haemorrhage, pre-eclampsia, depression).
Procedures/ Interventions	Antenatal, intrapartum, and postnatal complications (include date(s), signs and symptoms, diagnoses, procedures, treatments); procedures/interventions (can include blood transfusions, antibiotics, evacuation, hysterectomy, laparotomy, magnesium sulphate, antibiotics).
Laboratory information	Blood type and Rh; haematocrit/haemoglobin; blood chemistry; urinalysis; VDRL/ RPR; HIV; rubella.
Information on death	Death (place/day/time); Physiological and contributory causes (ICD-10); autopsy; categorical cause (direct, indirect, late, incidental).
Potentially avoidable factors	Did they encounter any problems when seeking or obtaining care for the mother? Were there delays in referral?
	Were there problems at the health-care facility (delay in getting attention, delay in diagnosis/treatment, lack of laboratory testing/medication/supplies, lack of trained staff, lack of respectful treatment)?
	Were there any barriers to obtaining care, such as geographical, financial, or social or other responsibilities?
Other contributing factors	Additional open-ended questions to capture any other contributing factors that were not already included; descriptive summary of the review.
Information on MDR	Date of Review(s); who performed review; who was interviewed (if applicable).

APPENDIX 4
Draft of community autopsy tool for maternal deaths

COPY OF "INFORMED CONSENT" FORM FOR INTERVIEWEE

Informed Consent for Verbal Autopsy interviews (for female decedents 12–49 years)

Hello. My name is _____and I am working with (AGENCY) a partner of the Ministry of Health. We are conducting a survey in this district that asks about health issues of women.

I am asking you to take part in this survey because I am trying to learn more about the causes of death among pregnant women or those that died soon after giving birth. I want to learn whether they went for antenatal care while pregnant and what type of health care they accessed, if at all. We are asking all households in this district that reported a death of female household member since January 1st, 2012 to participate in this survey. The Government and its stakeholders have been improving access to health care and the provision of health services in this district and three others. The information that you provide will help us understand the challenges women of child bearing age encounter when seeking antenatal care, delivery assistance and other health services.

I am visiting you today because we were informed about the death of (NAME OF WOMAN AGE 12–49 WHO HAS DIED). I am here now to ask you about the circumstances that led to her death. This information will help the government and its stakeholders to understand better ways through which they can improve neonatal and maternal health services and help us know whether the improvements in health care planned for your district are helping. The interview will take between 30 and 45 minutes to complete. Whatever information you provide will be kept strictly confidential and will not be shown to other persons.

Participation in this interview is voluntary, so if we should come to any question you don't want to answer, just let me know and I will go to the next question; or you can stop the interview at any time. You should be aware that your answers about the deceased may say something about your own health. However, we hope that you will participate in this survey since your views are important. If you decide to be in the study I will not tell anyone else what you say in the study. The information that you provide is strictly confidential.

At this time, do you want to ask me anything about the information we are collecting or the survey?

Do you want to participate?

May I begin the interview now?

No, consent for participation not given ( ): Interviewer Signature : _____

Yes, Consent for participation given ( ): Interviewer Signature : _____

Yes, Consent for participation given ( ): Respondent Signature : _____

OR Respondent Thumb Print

Date_____

If you have any questions about this survey, please contact:
Name
(Principal Investigator)
Institutional Affiliation
Telephone

If you ever have questions about your rights or ethics as a research subject, please contact:
Name
(Principal Investigator)
Institutional Affiliation
Telephone

UGANDA MATERNAL MORTALITY SURVEILLANCE
VERBAL AUTOPSY QUESTIONNAIRE (WOMEN 12–49)

SEQUENTIAL QUESTIONNAIRE #.

GPS CODES: (of Village)

DECIMAL DEGREES

LAT N/S + - .

LONG E 3 .

SECTION 1.1 INTERVIEWER VISITS

	1	2	3	FINAL VISIT
DATE				DAY / MONTH / YEAR 2 0 1
INTERVIEWER'S NAME				INTERVIER #
RESULT*				RESULT
TAKE NOTES HERE IF FOLLOW UP IS NEEDED (eg. TELEPHONE, DIRECTIONS,				
NEXT VISIT: DATE / TIME				TOTAL NUMBER OF VISITS

*RESULT CODES:
1 COMPLETED 2 NOT AT HOME 3 POSTPONED 4 REFUSED
5 PARTLY COMPLETED 6 NO APPROPRIATE RESPONDENT FOUND 7 OTHER (SPECIFY)

SECTION 1.2 ADDITIONAL DEMOGRAPHIC INFORMATION (PLEASE USE CORRECT SPELLING FROM LIST)

To be filled by data entry

DISTRICT

HEALTH SUB-DISTRICT

SUB-COUNTY

PARISH

VILLAGE / LOCALITY

NAME OF VHT MEMBER

HOUSEHOLD NUMBER (HHN)

NAME OF DESEASED WOMAN

NAME OF HOUSEHOLD HEAD

WHAT IS THE PRIMARY LANGUAGE OF THE INTERVIEW?

ENGLISH	1
RUKIGA	2
RUNYANKOLE	3
RUNYORO	4
RUTAGWENDA	5
RUFUMBIRA	6
RUTORO	7
LUGANDA	8
SWAHILI	9
OTHER _____	10

Informed Consent for Verbal Autopsy interviews (for female decedents 12–49 years)

Hello. My name is _____and I am working with (AGENCY) a partner of the Ministry of Health. We are conducting a survey in this district that asks about health issues of women.

I am asking you to take part in this survey because I am trying to learn more about the causes of death among pregnant women or those that died soon after giving birth. I want to learn whether they went for antenatal care while pregnant and what type of health care they accessed, if at all. We are asking all households in this district that reported a death of female household member since January 1st, 2012 to participate in this survey. The Government and its stakeholders have been improving access to health care and the provision of health services in this district and three others. The information that you provide will help us understand the challenges women of child bearing age encounter when seeking antenatal care, delivery assistance and other health services.

I am visiting you today because we were informed about the death of (NAME OF WOMAN AGE 12–49 WHO HAS DIED). I am here now to ask you about the circumstances that led to her death. This information will help the government and its stakeholders to understand better ways through which they can improve neonatal and maternal health services and help us know whether the improvements in health care planned for your district are helping. The interview will take between 30 and 45 minutes to complete. Whatever information you provide will be kept strictly confidential and will not be shown to other persons.

Participation in this interview is voluntary, so if we should come to any question you don't want to answer, just let me know and I will go to the next question; or you can stop the interview at any time. You should be aware that your answers about the deceased may say something about your own health. However, we hope that you will participate in this survey since your views are important. If you decide to be in the study I will not tell anyone else what you say in the study. The information that you provide is strictly confidential.

At this time, do you want to ask me anything about the information we are collecting or the survey?

Do you want to participate?

May I begin the interview now?

No, consent for participation not given ( ): Interviewer Signature : _____

Yes, Consent for participation given ( ): Interviewer Signature : _____

Yes, Consent for participation given ( ): Respondent Signature : _____
or Respondent Thumb Print

Date_____

If you have any questions about this survey, please contact:
Name
(Principal Investigator)
Institutional Affiliation
Telephone

If you ever have questions about your rights or ethics as a research subject, please contact:
Name
(Principal Investigator)
Institutional Affiliation
Telephone

SIGNATURE OF VA SUPERVISOR: VA SUPERVISOR CODE:

_____

SECTION 2. BASIC INFORMATION ABOUT RESPONDENT

NO.	QUESTIONS AND FILTERS	CODING CATEGORIES	SKIP
201	RECORD THE TIME AT START OF INTERVIEW **(in 24 hours)**	HOUR ..... [ ][ ] **AND** MINUTES ..... [ ][ ]	
202	NAME OF THE DECEASED	_____ (NAME OF DECEASED)	
202A	What is your name?	_____ (NAME OF PRIMARY RESPONDENT)	
203	What is your relationship to the deceased?	FATHER ..... 1 MOTHER ..... 2 SPOUSE ..... 3 SISTER/BROTHER ..... 4 CHILD ..... 5 OTHER RELATIVE _____ 6 (SPECIFY) NO RELATION ..... 8 REFUSE 9	
204	Did you live with the deceased in the period leading to her death?	YES ..... 1 NO ..... 2 DON'T KNOW ..... 8 REFUSE 9	
205	How long had the deceased lived in in this district? **RECORD '98' IF DON'T KNOW DAY OR MONTH** **RECORD '9998' IF DON'T KNOW YEAR**	MONTHS ..... 1 [ ][ ] **OR** YEARS ..... 2 [ ][ ] ALWAYS / SINCE BIRTH ..... 777 DON'T KNOW ..... 998 REFUSE 999	

SECTION 3. INFORMATION ON THE DECEASED AND DATE/PLACE OF DEATH

302	On what day, month and year was (NAME) born? **RECORD '98' IF DON'T KNOW DAY OR MONTH** **RECORD '9998' IF DON'T KNOW YEAR**	DAY ..... [ ][ ] MONTH ..... [ ][ ] YEAR ..... [ ][ ][ ][ ]	
303	In what day, month and year did (NAME) die? **RECORD '98' IF DON'T KNOW DAY OR MONTH** **PROBE IF YEAR WAS 2013 (THIS YEAR) OR 2012 (LAST)** **RECORD '9998' IF DON'T KNOW YEAR**	DAY ..... [ ][ ] MONTH ..... [ ][ ] YEAR ..... [ ][ ][ ][ ]	
304	How old was (NAME) when she died? **RECORD AGE IN COMPLETED YEARS.** **COMPARE AND CORRECT 302, 303 AND/OR 304 IF INCONSISTENT.**	AGE IN YEARS ..... [ ][ ]	
304A	**CHECK 304:** AGE AT DEATH 12 - 49 [1] ↓ AGE AT DEATH <12 OR 50 AND ABOVE [2] →		**END**

NO.	QUESTIONS AND FILTERS	CODING CATEGORIES	SKIP
305	What was her occupation, that is, what kind of work did she mainly do? **(PLEASE SELECT OCCUPATION FROM LIST)**	_____ _____ ☐☐☐	
306	What was the highest level and year (step/grade) of formal education the deceased attended? **(CIRCLE ONE CODE IN LEVEL AND ONE CODE [YEAR] IN SECOND COLUMN)**	Level / Year in Level NONE ..... 0 PRIMARY ..... 1 — 1 SECONDARY ..... 2 — 2 TERTIARY ..... 3 — 3 4 5 6 7 DON'T KNOW ..... 8 — 8 REFUSE ..... 9 — 9	
307	What was her marital status?	NEVER MARRIED ..... 1 MARRIED/LIVING WITH A PARTNER ..... 2 WIDOWED ..... 3 DIVORCED/SEPARATED ..... 4 DON'T KNOW ..... 8 REFUSE 9	
309	Where did she die?	OWN HOME ..... 01 TBA's WORK AREA / HOME ..... 02 **PUBLIC SECTOR** GOVT. HOSPITAL ..... 03 GOVT. HEALTH CENTER ..... 04 OTHER PUBLIC SECTOR _____ (SPECIFY) 05 **PRIVATE MED. SECTOR** PVT. HOSPITAL/ CLINIC ..... 08 OTHER PRIVATE MED. SECTOR _____ (SPECIFY) 09 OTHER _____ 96 DON'T KNOW ..... 98 REFUSE 99	→ 309C → 309C → 309C
309B	What was the name of the health facility where she died?	NAME _____	
309C	Did she go to any (other) health facility for treatment prior to death?	YES ..... 1 NO ..... 2 DON'T KNOW ..... 8 REFUSE 9	→ 401
309D	What was the name of the health facility where she received treatment? **(REVIEW LIST PROVIDED)** **ASK: "Any other health**	NAME _____ NAME _____ NAME _____	

SECTION 4. HISTORY OF INJURIES/ACCIDENTS

NO.	QUESTIONS AND FILTERS	CODING CATEGORIES	SKIP
401	Did she suffer from any injury or accident that led to her death?	YES ..... 1 NO ..... 2 DON'T KNOW 8	→ 404
402	What kind of injury or accident did the deceased suffer?	ROAD TRAFFIC ACCIDENT ..... 01 FALL ..... 02 DROWNING ..... 03 POISONING ..... 04 BURNS ..... 05 VIOLENCE/ASSAULT ..... 06 OTHER _____ 96 (SPECIFY) DON'T KNOW 98	
403	Was the injury or accident intentionally inflicted by someone else?	YES ..... 1 NO ..... 2 DON'T KNOW 8	
404	Do you think that she committed suicide?	YES ..... 1 NO ..... 2 DON'T KNOW 8	→ 501
405	Did she suffer from any animal/insect bite that led to her death?	YES ..... 1 NO ..... 2 DON'T KNOW 8	→ 501
406	What type of animal/insect?	DOG ..... 1 SNAKE ..... 2 CROCODILE ..... 3 INSECT ..... 4 OTHER _____ 6 (SPECIFY) DON'T KNOW 8	

SECTION 5. RESPONDENT'S ACCOUNT OF ILLNESS/EVENTS LEADING TO DEATH

501 Could you tell me about the illness/events that led to her death? **Record verbatim**

CONTINUE ON FOLLOWING PAGE

NO.	QUESTIONS AND FILTERS	CODING CATEGORIES	SKIP
	CONTINUATION OF SECTION 5. RESPONDENT'S ACCOUNT OF ILLNESS/EVENTS LEADING TO DEATH		
502	What do you think was the primary or basic cause of death? **OR** "Based on our conversation, would you say _____is the primary cause of death? PRIMARY CAUSE OF DEATH ACCORDING TO RESPONDENT		
503	In addition to this primary cause, do you think there are any additional or secondary causes of death? **OR** "Based on our conversation, would you say _____is a secondary cause of death? SECONDARY CAUSE OF DEATH ACCORDING TO RESPONDENT		

SECTION 6. MEDICAL HISTORY

NO.	QUESTIONS AND FILTERS	CODING CATEGORIES	SKIP
600	I would like to ask you some questions concerning previously known medically diagnosed conditions the deceased had; injuries and accidents that the deceased suffered; and signs and symptoms that the deceased had/showed when she was ill. Some of these questions may not appear to be directly related to her death. Please bear with me and answer all the questions. They will help us to get a clear picture of all possible symptoms that the deceased had.		
601	Please tell me if the deceased had been told by a medical provider that she had any of the following illnesses:	**(CIRCLE ONE RESPONSE FOR EACH LINE)** YES NO DK	
	A. High blood pressure?	1 2 8	
	B. Stroke?	1 2 8	
	C. Diabetes?	1 2 8	
	D. Asthma?	1 2 8	
	E. Epilepsy?	1 2 8	
	F. Malnutrition?	1 2 8	
	G. Tuberculosis?	1 2 8	
	H. Mental disorder (including depression)?	1 2 8	
	I. Hepatitis or other liver disease?	1 2 8	
	J. Pulmonary problems?	1 2 8	
	K. Cardiac or heart problems?	1 2 8	
	L. Malaria?	1 2 8	
	M. HIV/AIDS?	1 2 8	
	N. Cancer?	1 2 8	
	IF N. CANCER IS "Yes", ASK ABOUT SPECIFIC TYPE OR SITE:		
601A	Was she ever tested for HIV/AIDS?	YES ..... 1 NO ..... 2 DON'T KNOW ..... 8 REFUSE 9	→ 602
601B	Do you know what her HIV status was (during her last test)?	YES ..... 1 NO ..... 2 DON'T KNOW ..... 8 REFUSE 9	→ 602
601C	Was she HIV positive or HIV negative?	HIV + (POSITIVE) ..... 1 HIV - (NEGATIVE) ..... 2 DON'T KNOW ..... 8 REFUSE 9	→ 602
601D	How long ago had she been diagnosed as HIV positive? **(IF LESS THAN 1 YEAR - NOTE NUMBER OF MONTHS** **IF GREATER THAN 12 MONTHS - NOTE NUMBER OF YEARS)**	MONTHS AGO ..... 1 ☐☐ **OR** YEARS AGO ..... 2 ☐☐ DON'T KNOW 9 9 8	
601E	Was she taking medication (ARV, Septrin) for HIV?	YES ..... 1 NO ..... 2 DON'T KNOW ..... 8 REFUSE 9	→ 602
601X	What medication was she taking for HIV? Was she taking ARV or Septrin for HIV?	ARV 1 SEPTRIN 2 BOTH ARV AND SEPTRIN 3 DON'T KNOW ..... 8 REFUSE 9	→ 602 → 602
601F	How long has she been taking **ARV** for HIV? **(IF LESS THAN 1 YEAR - NOTE NUMBER OF MONTHS** **IF GREATER THAN 12 MONTHS - NOTE NUMBER OF YEARS)**	MONTHS AGO ..... 1 ☐☐ **OR** YEARS AGO ..... 2 ☐☐ DON'T KNOW 9 9 8	

NO.	QUESTIONS AND FILTERS	CODING CATEGORIES	SKIP
602	Other than those medical conditions (and diseases) you mentioned, were there any other medically diagnosed illness?	YES ..... 1 NO ..... 2 DON'T KNOW ..... 8 REFUSE 9	→603
602A	Can you specify the illness?	ILLNESS _____	
603	In the month(s) leading up to her death, was she taking any of the following medicines? A. Iron B. Vitamins C. Antibiotics D. Analgesics E. Medication for malaria F. Medication for HIV/AIDS G. Medication for TB	YES NO DK RF 1 2 8 9 1 2 8 9 Specify: 1 2 8 9 _____ 1 2 8 9 _____ 1 2 8 9 _____ 1 2 8 9 _____ 1 2 8 9 _____	

SECTION 7. SYMPTOMS AND SIGNS ASSOCIATED WITH ILLNESS OF WOMEN

"Now, I would like to ask you some specific questions about conditions or illnesses that women have."

701	Did she have an ulcer or swelling in the breast?	YES ..... 1 NO ..... 2 DON'T KNOW 8	→703 →703
702A	For how long did she have an ulcer or swelling in the breast?	DAYS ..... 1 ☐☐ **OR** MONTHS ..... 2 ☐☐ DON'T KNOW 9 9 8	
702B	Was she breastfeeding?	YES ..... 1 NO ..... 2 DON'T KNOW 8	
703	Did she have excessive vaginal bleeding during menstrual periods?	NOT HAVING MENSTRUAL PERIOD ..... 0 YES ..... 1 NO ..... 2 DON'T KNOW 8	→707 →705 →705
704	For how long did she have the excessive vaginal bleeding **during** menstrual periods?	DAYS ..... 1 ☐☐ **OR** MONTHS ..... 2 ☐☐ DON'T KNOW 9 9 8	
705	Did she have vaginal bleeding **in between** menstrual periods?	YES ..... 1 NO ..... 2 DON'T KNOW 8	 →707 →707
706	For how long did she have vaginal bleeding **in between** menstrual periods?	DAYS ..... 1 ☐☐ **OR** MONTHS ..... 2 ☐☐ DON'T KNOW 9 9 8	
707	Did she have abnormal vaginal discharge?	YES ..... 1 NO ..... 2 DON'T KNOW 8	 →801 →801
708	For how long did she have abnormal vaginal discharge?	DAYS ..... 1 ☐☐ **OR** MONTHS ..... 2 ☐☐ DON'T KNOW 9 9 8	

SECTION 8: SYMPTOMS AND SIGNS ASSOCIATED WITH PREGNANCY

NO.	QUESTIONS AND FILTERS	CODING CATEGORIES	SKIP
801	Was she pregnant when she died, or had she been pregnant within 2 months of death?	YES ..... 1 NO ..... 2 DON'T KNOW 8	
802	Did she die during or following a miscarriage or abortion?	YES ..... 1 NO ..... 2 DON'T KNOW 8	
803A	How many live births did she have?	LIVE BIRTHS ..... [ ][ ] DON'T KNOW 9 8	**IF '0',** → 803D → 803D
803B	Of those live births, how many have died?	LIVE BIRTHS THAT DIED ..... [ ][ ] DON'T KNOW 9 8	**IF '0',** → 803D → 803D
803C	Of those who died, how many died within the first month of life?	DIED IN 1ST MONTH ..... [ ][ ] DON'T KNOW 9 8	
803D	Did she ever have a child that was born dead, after 7 months of pregnancy?	YES ..... 1 NO ..... 2 DON'T KNOW 8	→ 803F → 803F
803E	How many of those pregnancies were born dead (still born)?	STILLBIRTHS ..... [ ][ ] DON'T KNOW 9 8	
803F	Sometimes women lose their pregnancies due to miscarriage or abortion. Did she ever lose or abort a pregnancy prior to 7 months of pregnancy? **NOTE: IF THE WOMEN HAD AN ECTOPIC PREGNANCY, COUNT THAT PREGNANCY AS AN ABORTION**	YES ..... 1 NO ..... 2 DON'T KNOW 8	→ 804 → 804
803G	How many of those pregnancies ended in a miscarriage or abortion?	MISCARRIAGES/ABORTIONS ..... [ ][ ] DON'T KNOW 9 8	
804	**ADD THE NUMBER OF LIVE BIRTHS, STILL BIRTHS, ABORTIONS STATED IN 803A, 803E, AND 803G. ASK,** 'In total, [NAME] had __ __completed pregnancies in her life?'	RECORD TOTAL # OF COMPLETED PREGNANCIES [ ][ ] DON'T KNOW 9 8	
805	**REVIEW Q801 & Q802. IF 'YES' TO EITHER OF THESE QUESTIONS CONTINUE TO Q806. OTHERWISE, THANK THE RESPONDENT AND END INTERVIEW**	**Q801 or Q802** **IF YES** .... 1 **IF NO/DK** 2	→ 806 → **END**

SECTION 8. CONTINUED: ANTENATAL CARE

806	Did she receive any antenatal care during her last pregnancy?	YES ..... 1 NO ..... 2 → 814 DON'T KNOW ..... 8 → 814	
807	Where did she receive antenatal care?	OWN HOME ..... 01 → 811 TBA's WORK AREA / HOME ..... 02 → 811 **PUBLIC SECTOR** GOVT. HOSPITAL ..... 03 GOVT. HEALTH CENTER ..... 04 OTHER PUBLIC SECTOR _____ 07 (SPECIFY) **PRIVATE MED. SECTOR** PVT. HOSPITAL/ CLINIC ..... 08 OTHER PRIVATE MED. SECTOR _____ 09 (SPECIFY) OTHER _____ 96 DON'T KNOW ..... 98 REFUSE 99	
808	What was the name of the place where she received antenatal care?	_____	
809	What type of health care person provided most of her antenatal care?	DOCTOR ..... 1 CLINICAL OFFICER/MEDICAL ASSISTANTS ..... 2 NURSE ..... 3 MIDWIFE ..... 4 TRADITIONAL BIRTH ATTENDANT ..... 5 RELATIVE ..... 6 OTHER _____ 7 (SPECIFY) DON'T KNOW 8	
810	How many months pregnant was she at her first antenatal visit?	WEEKS ..... 1 **OR** MONTHS ..... 2 DON'T KNOW 9 9 8	
811	Did she seek antenatal care because she had medical problems or because she wanted to care for her pregnancy?	SHE HAD MEDICAL PROBLEMS. ..... 1 WANTED CARE FOR PREGNANCY ..... 2 DON'T KNOW 8	
813	How many antenatal visits did she have during her last pregnancy? **IF RESPONDENT DOESN'T KNOW, HE/SHE SHOULD ASK IF SHE HAD ATTENDED AT LEAST 4 VISITS.**	VISITS ..... AT LEAST 4 7 7 DON'T KNOW 9 8	
814	Was she pregnant at the time of death? That is, was the baby still inside her when she died?	YES ..... 1 NO ..... 2 → 817A DON'T KNOW ..... 8 → 817A	
815	How long was she pregnant?	WEEKS ..... 1 **OR** MONTHS ..... 2 DON'T KNOW 9 9 8	

NO.	QUESTIONS AND FILTERS	CODING CATEGORIES	SKIP
816	How many babies was she pregnant with? (Singleton, twins, triplets…..)	BABIES ..... ☐☐ DON'T KNOW 9 8	
817A	Did she die while pregnant or during labour (was the baby still in)? **(NOTE: IF THE BABY WAS OUT - LABOUR WAS COMPLETE)**	YES, while pregnant ..... 1 → 819 YES, while in labour ..... 2 NO ..... 3 → 822 DON'T KNOW ..... 8 → 822	
817B	At what time (day or night) did labour start? **READ CHOICES 1-7**	Early Morning (After daybreak) ..... 1 Late Morning ..... 2 Early Afternoon ..... 3 Late Afternoon ..... 4 Early Evening ..... 5 Evening to Midnight ..... 6 Midnight to Dawn ..... 7 DON'T KNOW 8	
817C	How soon after labour started did she receive assistance with labour and delivery? **IF THE ANSWER IS IN DAYS: ESTIMATE NUMBER OF HOURS**	HOURS ..... ☐☐ 98 DON'T KNOW 99 DID NOT RECEIVE ASSISTENCE	
817D	Who assisted [NAME] during labour?	NO ONE ASSISTED - MOTHER BY HERSELF .. 0 DOCTOR ..... 1 CLINICAL OFFICER / MEDICAL ASSISTANT .... 2 NURSE ..... 3 MIDWIFE ..... 4 TRADITIONAL BIRTH ATTENDANT ..... 5 RELATIVE ..... 6 OTHER _____ 7 (SPECIFY) DON'T KNOW 8	
818B	How many hours or days was she in labour before she died?	HOURS ..... 1 ☐☐ **OR** DAYS ..... 2 ☐☐ DON'T KNOW 9 9 8	
818C	Which part of the baby's body came out first?	NO PART CAME OUT ..... 0 HEAD ..... 1 BUTTOCKS ..... 2 LEG ..... 3 ARM ..... 4 CORD ..... 5 OTHER _____ 6 (SPECIFY) DON'T KNOW ..... 8 NOT APPLICABLE 9	
819	**IF SHE DIED IN LABOUR ASK:** Did she have convulsions before labour, during labour, or both, before and during labour? **IF SHE DIED WHILE PREGNANT BUT NOT IN LABOUR ASK:** Did she have convulsions while pregnant?	BEFORE LABOUR / WHILE PREGNANT .... 1 DURING LABOUR ..... 2 BEFORE AND DURING LABOUR ..... 3 NO CONVULTIONS ..... 4 DON'T KNOW 8	
820	**IF SHE DIED IN LABOUR:** Did she have foul smelling vaginal discharge before labour, during labour, or both? **IF SHE DIED PREGNANT BUT NOT IN LABOUR ASK:** Did she have foul smelling vaginal discharge while pregnant?	BEFORE LABOUR / WHILE PREGNANT .... 1 DURING LABOUR ..... 2 BEFORE AND DURING LABOUR ..... 3 NO DISCHARGE ..... 4 DON'T KNOW 8	
821	**IF SHE DIED IN LABOUR:** Did she have fever before labour, during labour, or both? **IF SHE DIED PREGNANT BUT NOT IN LABOUR ASK:** Did she have fever while pregnant?	BEFORE LABOUR / WHILE PREGNANT ..... 1 DURING LABOUR ..... 2 BEFORE AND DURING LABOUR ..... 3 NO FEVER ..... 4 DON'T KNOW 8	

NO.	QUESTIONS AND FILTERS	CODING CATEGORIES	SKIP
821A	**IF SHE DIED IN LABOUR ASK:** "Did she experience bleeding before labour, during labour, or both, before and during labour?" **IF SHE DIED PREGNANT BUT NOT IN LABOUR ASK:** "Did she experience bleeding while pregnant?"	BEFORE LABOUR / WHILE PREGNANT ..... 1 DURING LABOUR ..... 2 BEFORE AND DURING LABOUR ..... 3 NO BLEEDING ..... 4 DON'T KNOW 8	→ 848
821B	Did she have pain with the bleeding?	YES ..... 1 NO ..... 2 DON'T KNOW 8	848
822	Did she give birth in the last 2 months before her death? **(INCLUDING JUST BEFORE DYING)**	YES ..... 1 NO ..... 2 DON'T KNOW 8	→ 839 → 839
823	How many hours, days or weeks after giving birth did she die? **IF LESS THAN 1 HOUR, RECORD "00" IN HOURS**	HOURS ..... **1** ☐☐ **OR** DAYS ..... **2** ☐☐ **OR** WEEKS ..... **3** ☐☐ DON'T KNOW 9 9 8	
824	How many months pregnant had she been when she delivered? **(NOTE: IF 7 MONTHS OR LESS - GO TO Q839)**	MONTHS ..... ☐☐ DON'T KNOW 9 8	**IF <= 7 MNTHS GO TO 839**
825	Did she experience excessive bleeding during pregnancy, during delivery, or up until the time of death? **(PLEASE REVIEW ALL RESPONSE OPTIONS AND SELECT APPROPRIATELY)**	YES, DURING PREGNANCY ..... 1 YES, DURING DELIVERY ..... 2 YES, UP UNTIL THE TIME OF DEATH ..... 3 NO ..... 4 DON'T KNOW 8	→ 829
826	Was there excessive bleeding before labor started?	YES ..... 1 NO ..... 2 DON'T KNOW 8	
827	Was there excessive bleeding during labor before delivering the baby?	YES ..... 1 NO ..... 2 DON'T KNOW 8	
828	Was there excessive bleeding after delivering the baby?	YES ..... 1 NO ..... 2 DON'T KNOW 8	
829	Did she have convulsions before or after delivering the baby? **(PLEASE REVIEW ALL RESPONSE OPTIONS AND SELECT APPROPRIATELY)**	NO ..... 1 BEFORE DELIVERY ..... 2 DURING DELIVERY ..... 3 AFTER DELIVERY ..... 4 BOTH BEFORE AND AFTER DELIVERY 5 DON'T KNOW 8	
830	Did she have fever before or after delivering the baby? **(PLEASE REVIEW ALL RESPONSE OPTIONS AND SELECT APPROPRIATELY)**	NO ..... 1 BEFORE DELIVERY ..... 2 DURING DELIVERY ..... 3 AFTER DELIVERY ..... 4 BOTH BEFORE AND AFTER DELIVERY 5 DON'T KNOW 8	
831	Did she have foul-smelling discharge after delivering the baby?	YES ..... 1 NO ..... 2 DON'T KNOW 8	

NO.	QUESTIONS AND FILTERS	CODING CATEGORIES	SKIP
832A	Did her water break?	YES ..... 1 NO ..... 2 DON'T KNOW 8	→ 833
832B	How many hours passed between her water breaking and birth?	YES ..... 1 NO ..... 2 DON'T KNOW 8	
833	How many hours or days was she in labor before delivery?	HOURS ..... 1 [ ][ ] **OR** DAYS ..... 2 [ ][ ] DON'T KNOW 9 9 8	
835	What part of the baby's body came out first? **CIRCLE "6" AND SPECIFY "C/S" IF BABY DELIVERED BY CAESAREAN SECTION AND CIRCLE "2" IN Q836**	HEAD ..... 1 BUTTOCKS ..... 2 LEG ..... 3 ARM ..... 4 CORD ..... 5 OTHER _____ ..... 6 DON'T KNOW 8	
836	What type of delivery was it?	NORMAL VAGINAL DELIVERY ..... 0 FORCEPS/VACUUM ..... 1 CAESAREAN SECTION ..... 2 ASSISTED BREECH DELIVERY ..... 3 OTHER _____ 6 (SPECIFY) DON'T KNOW 8	
834A	How many babies did she have this pregnancy? (singleton, twins, triplets.....)	BABIES ..... [ ][ ] DON'T KNOW 98	
832	After the baby was delivered, did the placenta come out on its own or was it extracted, or was it retained?	PLACENTA CAME OUT ON ITS OWN ..... 1 PLACENTA WAS EXTRACTED ..... 2 PLACENTA WAS RETAINED ..... 3 DON'T KNOW 8	
833	How long after the baby was delivered did the placenta come out?	MINUTES ..... 1 [ ][ ] **OR** HOURS ..... 2 [ ][ ] DON'T KNOW 9 9 8	
837	Where did she give birth?	OWN HOME ..... 01 TBA's WORK AREA / HOME ..... 02 **PUBLIC SECTOR** GOVT. HOSPITAL ..... 03 GOVT. HEALTH CENTER ..... 04 OTHER PUBLIC SECTOR _____ (SPECIFY) 07 **PRIVATE MED. SECTOR** PVT. HOSPITAL/ CLINIC ..... 08 OTHER PRIVATE MED. SECTOR _____ (SPECIFY) 09 OTHER _____ (SPECIFY) 96 DON'T KNOW ..... 98 REFUSE 99	

NO.	QUESTIONS AND FILTERS	CODING CATEGORIES	SKIP
838A	Who assisted with the delivery?	NO ONE ASSISTED - MOTHER BY HERSELF .. 0 DOCTOR ..... 1 CLINICAL OFFICER/MEDICAL ASSISTANT .... 2 NURSE ..... 3 MIDWIFE ..... 4 TRADITIONAL BIRTH ATTENDANT ..... 5 RELATIVE ..... 6 OTHER _____ 7 (SPECIFY) DON'T KNOW 8	
838B	Was the baby born alive or still born?	ALIVE ..... 1 STILL BORN ..... 2 DON'T KNOW 8	→ 848 → 848
838C	Did the baby (babies) have any health problems once delivered? **IF YES, SPECIFY:** _____	YES ..... 1 NO ..... 2 DON'T KNOW 8	
838D	Is the infant alive? / Are the infants alive?	YES ..... 1 NO ..... 2 DON'T KNOW 8	→ 848
838E	How long after birth, did the infant die? **IF LESS THAN 1 HOUR, RECORD "00" IN HOURS**	HOURS ..... 1 **OR** DAYS ..... 2 **OR** WEEKS ..... 3 **OR** MONTHS ..... 4 DON'T KNOW 9 9 8	848
839	Did she experience a miscarriage or abortion recently? **(NOTE: IF Q824 "7 MONTHS OR LESS" - CIRCLE YES & CONTINUE)**	YES ..... 1 NO ..... 2 DON'T KNOW 8	→ 848 → 848
840	Did she die during the miscarriage/abortion?	YES ..... 1 NO ..... 2 DON'T KNOW 8	→ 842 → 842
841	How many days before death did she have the miscarriage/abortion?	DAYS ..... DON'T KNOW 9 8	
842	How long had she been pregnant when she had the miscarriage/abortion?	MONTHS ..... DON'T KNOW 9 8	
843	Did she have heavy bleeding after the miscarriage/abortion?	YES ..... 1 NO ..... 2 DON'T KNOW 8	
844	Did she have fever after the miscarriage/abortion?	YES ..... 1 NO ..... 2 DON'T KNOW 8	
845	Did she have foul smelling vaginal discharge after the miscarriage/abortion?	YES ..... 1 NO ..... 2 DON'T KNOW 8	
846	Did the miscarriage/abortion occur by itself, spontaneously?	YES ..... 1 NO ..... 2 DON'T KNOW 8	→ 848 → 848
847	Did she try to terminate the pregnancy?	YES ..... 1 NO ..... 2 DON'T KNOW 8	

NO.	QUESTIONS AND FILTERS	CODING CATEGORIES	SKIP
848	Did she have surgery immediately after birth or abortion?	YES ..... 1 NO ..... 2 DON'T KNOW 8	
849	During the last 3 months of pregnancy, did she suffer from any of the following illnesses: **IF THEY HAVE ALREADY RESPONDED DON'T ASK AGAIN BUT PLEASE DO CIRCLE RESPONSES APPROPRIATELY**	**YES NO DK**	
	01 Vaginal bleeding?	VAGINAL BLEEDING 1 2 8	
	02 Foul smelly vaginal discharge?	FOUL SMELLY VAGINAL DISCHARGE ... 1 2 8	
	03 Swelling of fingers, face, and legs?	PUFFY FACE 1 2 8	
	04 Headache?	HEADACHE 1 2 8	
	05 Blurred vision?	BLURRED VISION 1 2 8	
	06 Convulsion?	CONVULSION 1 2 8	
	07 Febrile illness?	FEBRILE ILLNESS 1 2 8	
	08 Severe abdominal pain that was not labor pain?	SEVERE ABDOMINAL PAIN (NOT LABOR PAIN) 1 2 8	
	09 Pallor and shortness of breath (both present)?	PALLOR/SHORTNESS OF BREATH (BOTH) 1 2 8	
	10 The water has broken before the expected time?	WATER BROKE BEFORE EXPECTED. 1 2 8	
	11 Did she suffer from any other illness?	OTHER ILLNESS _____ 1 2 8 (SPECIFY)	

SECTION 9. SIGNS AND SYMPTOMS NOTED DURING THE FINAL ILLNESS

NO.	QUESTIONS AND FILTERS	CODING CATEGORIES	SKIP
	READ: "Now I am going to ask you some questions about the signs and symptoms that [NAME] showed during the illness or health problem that led to her death within the last 3 months leading to the time of her death. Some of the questions may not appear to be directly related to her death. Please bear with me and answer all the questions. They will help us get a clear picture of all possible symptoms that the deceased had."		
901A	Was she ill before she died?	YES ..... 1 NO ..... 2 DON'T KNOW 8	→ 902
901B	For how long was she ill before she died? **IF LESS THAN 1 HOUR, RECORD "00" IN HOURS**	HOURS ..... 1 **OR** DAYS ..... 2 **OR** MONTHS ..... 3 DON'T KNOW 9 9 8	
902	Did she have a fever?	YES ..... 1 NO ..... 2 DON'T KNOW 8	→ 907
903	For how long did she have a fever?	DAYS ..... 1 **OR** WEEKS ..... 2 **OR** MONTHS ..... 3 DON'T KNOW 9 9 8	
904	Was the fever continuous or on and off?	CONTINUOUS ..... 1 ON AND OFF ..... 2 DON'T KNOW 8	
905	Did she have fever only at night?	YES ..... 1 NO ..... 2 DON'T KNOW 8	
906	Did she have chills/rigor?	YES ..... 1 NO ..... 2 DON'T KNOW 8	
907	Did she have a cough?	YES ..... 1 NO ..... 2 DON'T KNOW 8	→ 913 → 913
908	For how long did she have a cough?	DAYS ..... 1 **OR** WEEKS ..... 2 **OR** MONTHS ..... 3 DON'T KNOW 9 9 8	
909	Was the cough severe?	YES ..... 1 NO ..... 2 DON'T KNOW 8	
910	Was the cough productive with sputum?	YES ..... 1 NO ..... 2 DON'T KNOW 8	
911	Did she cough out blood?	YES ..... 1 NO ..... 2 DON'T KNOW 8	
912	Did she have excessive night sweats?	YES ..... 1 NO ..... 2 DON'T KNOW 8	

NO.	QUESTIONS AND FILTERS	CODING CATEGORIES	SKIP
913	Did she have difficulty in breathing?	YES ..... 1 NO ..... 2 DON'T KNOW 8	 → 918 → 918
914	For how long did she have difficulty in breathing? **IF LESS THAN 1 HOUR, RECORD "00" IN HOURS**	HOURS ..... 1 **OR** DAYS ..... 2 **OR** WEEKS ..... 3 **OR** MONTHS ..... 4 DON'T KNOW 9 9 8	
915	Was she unable to carry out daily routines due to difficulty in breathing?	YES ..... 1 NO ..... 2 DON'T KNOW 8	
916	Was she breathless while lying flat?	YES ..... 1 NO ..... 2 DON'T KNOW 8	
917	Did she have wheezing?	YES ..... 1 NO ..... 2 DON'T KNOW 8	
918	Did she have chest pain?	YES ..... 1 NO ..... 2 DON'T KNOW 8	 → 928 → 928
919	For how long did she have chest pain?	HOURS ..... 1 **OR** DAYS ..... 2 **OR** WEEKS ..... 3 **OR** MONTHS ..... 4 DON'T KNOW 9 9 8	
920	Did chest pain start suddenly or gradually?	SUDDENLY ..... 1 GRADUALLY ..... 2 DON'T KNOW 8	
921	When she had severe chest pain, how long did it last?	LESS THAN HALF AN HOUR ..... 1 HALF AN HOUR TO 24 HOURS ..... 2 LONGER THAN 24 HOURS ..... 3 DON'T KNOW 8	
922	Was the chest pain located below the breastbone (sternum)?	YES ..... 1 NO ..... 2 DON'T KNOW 8	
923	Was the chest pain located over the heart and did it spread to the left arm?	YES ..... 1 NO ..... 2 DON'T KNOW 8	
924	Was the chest pain located over the ribs (sides)?	YES ..... 1 NO ..... 2 DON'T KNOW 8	
925	Was the chest pain continuous or on and off?	CONTINUOUS ..... 1 ON AND OFF ..... 2 DON'T KNOW 8	
926	Did the chest pain get worse while coughing?	YES ..... 1 NO ..... 2 DON'T KNOW 8	
927	Did she have palpitations?	YES ..... 1 NO ..... 2 DON'T KNOW 8	

NO.	QUESTIONS AND FILTERS	CODING CATEGORIES	SKIP
928	Did she have diarrhea?	YES ..... 1 NO ..... 2 DON'T KNOW 8	 → 933 → 933
929	For how long did she have diarrhea?	DAYS ..... 1 ☐☐ **OR** WEEKS ..... 2 ☐☐ **OR** MONTHS ..... 3 ☐☐ DON'T KNOW 9 9 8	
930	Was the diarrhea continuous or on and off?	CONTINUOUS ..... 1 ON AND OFF ..... 2 DON'T KNOW 8	
931	At any time during the final illness was there blood in the stool?	YES ..... 1 NO ..... 2 DON'T KNOW 8	
932	When the diarrhea was most severe, how many times did she pass stools in a day?	NUMBER ..... ☐☐ DON'T KNOW 98	
933	Did she vomit?	YES ..... 1 NO ..... 2 DON'T KNOW 8	 → 937 → 937
934	For how long did she vomit?	DAYS ..... 1 ☐☐ **OR** WEEKS ..... 2 ☐☐ **OR** MONTHS ..... 3 ☐☐ DON'T KNOW 9 9 8	
935	Did the vomit look like a coffee-colored fluid or bright red/blood red or some other?	COFFEE-COLORED FLUID ..... 1 BRIGHT RED/BLOOD RED ..... 2 OTHER _____ .....6 (SPECIFY) DON'T KNOW 8	
936	When the vomiting was most severe, how many times did she vomit in a day?	NUMBER ..... ☐☐ DON'T KNOW 98	
937	**CHECK QUESTIONS 814 AND 817 TO SEE IF SHE DIED DURING PREGNANCY OR DURING LABOR** NO ☐1 ↓ YES ☐2 → 937		
938	Did she have abdominal pain?	YES ..... 1 NO ..... 2 DON'T KNOW 8	 → 940 → 940
939	For how long did she have abdominal pain?	DAYS ..... 1 ☐☐ **OR** MONTHS ..... 2 ☐☐ DON'T KNOW 9 9 8	
940	Did she have abdominal distension?	YES ..... 1 NO ..... 2 DON'T KNOW 8	 → 944 → 944

NO.	QUESTIONS AND FILTERS	CODING CATEGORIES	SKIP
941	For how long did she have abdominal distension?	DAYS ..... 1 **OR** MONTHS ..... 2 DON'T KNOW 9 9 8	
942	Did the distension develop rapidly within days or gradually over months?	RAPIDLY WITHIN DAYS ..... 1 GRADUALLY OVER MONTHS ..... 2 DON'T KNOW 8	
943	Was there a period of a day or longer during which she did not pass any stool?	YES ..... 1 NO ..... 2 DON'T KNOW 8	
944	Did she have any mass in the abdomen?	YES ..... 1 NO ..... 2 DON'T KNOW 8	→ 947 → 947
945	For how long did she have the mass in the abdomen?	DAYS ..... 1 **OR** MONTHS ..... 2 DON'T KNOW 9 9 8	
946	Where in the abdomen was the mass located?	RIGHT UPPER ABDOMEN ..... 1 LEFT UPPER ABDOMEN ..... 2 LOWER ABDOMEN ..... 3 ALL OVER ABDOMEN ..... 4 DON'T KNOW 8	
947	Did she have difficulty or pain while swallowing solids?	YES ..... 1 NO ..... 2 DON'T KNOW 8	→ 949 → 949
948	For how long did she have difficulty or pain while swallowing solids?	DAYS ..... 1 **OR** WEEKS ..... 2 **OR** MONTHS ..... 3 DON'T KNOW 9 9 8	
949	Did she have difficulty or pain while swallowing liquids?	YES ..... 1 NO ..... 2 DON'T KNOW 8	→ 951 → 951
950	For how long did she have difficulty or pain while swallowing liquids?	DAYS ..... 1 **OR** WEEKS ..... 2 **OR** MONTHS ..... 3 DON'T KNOW 9 9 8	
951	Did she have headache?	YES ..... 1 NO ..... 2 DON'T KNOW 8	→ 954 → 954

NO.	QUESTIONS AND FILTERS	CODING CATEGORIES	SKIP
952	For how long did she have the headache?	DAYS . . . . . 1 **OR** WEEKS . . . . . 2 **OR** MONTHS . . . . . 3 DON'T KNOW 998	
953	Was the headache severe?	YES . . . . . 1 NO . . . . . 2 DON'T KNOW 8	
954	Did she have a stiff or painful neck?	YES . . . . . 1 NO . . . . . 2 DON'T KNOW 8	→ 956 → 956
955	For how long did s/he have a stiff or painful neck?	DAYS . . . . . DON'T KNOW 98	
956	Did she have mental confusion?	YES . . . . . 1 NO . . . . . 2 DON'T KNOW 8	→ 959 → 959
957	For how long did she have mental confusion?	DAYS . . . . . 1 **OR** WEEKS . . . . . 2 **OR** MONTHS . . . . . 3 DON'T KNOW 998	
958	Did the mental confusion start suddenly, quickly within a single day, or slowly over many days?	SUDDENLY . . . . . 1 WITHIN A DAY (FAST) . . . . . 2 SLOWLY (MANY DAYS) . . . . . 3 DON'T KNOW 8	
959	Did she become unconscious?	YES . . . . . 1 NO . . . . . 2 DON'T KNOW 8	→ 962 → 962
960	For how long was she unconscious?	DAYS . . . . . 1 **OR** WEEKS . . . . . 2 **OR** MONTHS . . . . . 3 DON'T KNOW 998	
961	Did the unconsciousness start suddenly, quickly within a single day, or slowly over many days?	SUDDENLY . . . . . 1 WITHIN A DAY (FAST) . . . . . 2 SLOWLY (MANY DAYS) . . . . . 3 DON'T KNOW 8	
962	Did she have convulsions?	YES . . . . . 1 NO . . . . . 2 DON'T KNOW 8	→ 964 → 964
963	For how long did she have convulsions?	DAYS . . . . . 1 **OR** WEEKS . . . . . 2 **OR** MONTHS . . . . . 3 DON'T KNOW 998	
964	Was she unable to open the mouth?	YES, WAS UNABLE TO OPEN . . . . . 1 NO, WAS ABLE TO OPEN MOUTH . . . . . 2 DON'T KNOW 8	→ 966 → 966

NO.	QUESTIONS AND FILTERS	CODING CATEGORIES	SKIP
965	For how long was she unable to open the mouth?	DAYS ☐☐ DON'T KNOW 98	
966	Did she have stiffness of the whole body?	YES 1 NO 2 DON'T KNOW 8	→ 968 → 968
967	For how long did she have stiffness of the whole body?	DAYS ☐☐ DON'T KNOW 98	
968	Did she have paralysis of one side of the body?	YES 1 NO 2 DON'T KNOW 8	→ 971 → 971
969	For how long did she have paralysis of one side of the body?	DAYS 1 ☐☐ **OR** WEEKS 2 ☐☐ **OR** MONTHS 3 ☐☐ DON'T KNOW 998	
970	Did the paralysis of one side of the body start suddenly, quickly within a single day, or slowly over many days?	SUDDENLY 1 WITHIN A DAY (FAST) 2 SLOWLY (MANY DAYS) 3 DON'T KNOW 8	
971	Did she have paralysis of the lower limbs?	YES 1 NO 2 DON'T KNOW 8	→ 974 → 974
972	How long did she have paralysis of the lower limbs?	DAYS 1 ☐☐ **OR** WEEKS 2 ☐☐ **OR** MONTHS 3 ☐☐ DON'T KNOW 998	
973	Did the paralysis of the lower limbs start suddenly, quickly within a single day, or slowly over many days?	SUDDENLY 1 WITHIN A DAY (FAST) 2 SLOWLY (MANY DAYS) 3 DON'T KNOW 8	
974	Was there any change in color of urine?	YES 1 NO 2 DON'T KNOW 8	→ 976 → 976
975	For how long did she have the change in color of urine?	DAYS 1 ☐☐ **OR** WEEKS 2 ☐☐ **OR** MONTHS 3 ☐☐ DON'T KNOW 998	
976	During the final illness did she ever pass blood in the urine?	YES 1 NO 2 DON'T KNOW 8	→ 978 → 978
977	For how long did she pass blood in the urine?	DAYS 1 ☐☐ **OR** WEEKS 2 ☐☐ **OR** MONTHS 3 ☐☐ DON'T KNOW 998	

NO.	QUESTIONS AND FILTERS	CODING CATEGORIES	SKIP
978	Was there any change in the amount of urine she passed daily?	YES . . . . . 1 NO . . . . . 2 DON'T KNOW 8	→ 981 → 981
979	For how long did she have the change in the amount of urine passed daily?	DAYS . . . . . 1 [ ][ ] OR WEEKS . . . . . 2 [ ][ ] OR MONTHS . . . . . 3 [ ][ ] DON'T KNOW 9 9 8	
980	Did she pass too much urine, too little urine, or no urine at all?	TOO MUCH . . . . . 1 TOO LITTLE . . . . . 2 NO URINE AT ALL . . . . . 3 DON'T KNOW 8	
981	During the illness that led to death, did she have any skin rash?	YES . . . . . 1 NO . . . . . 2 DON'T KNOW 8	→ 985 → 985
982	For how long did she have the skin rash?	DAYS . . . . . [ ][ ] DON'T KNOW 98	
983	Was the rash on: 1 The face? 2 The trunk? 3 The arms and legs? 4 Any other place?	**Yes No DK** FACE . . . . . **1 2 8** TRUNK . . . . . **1 2 8** ARMS AND LEGS . . . . . **1 2 8** OTHER PLACE _____ **1 2 8** (SPECIFY)	
984	What did the rash look like?	MEASLES RASH . . . . . 1 RASH WITH CLEAR FLUID . . . . . 2 RASH WITH PUS . . . . . 3 DON'T KNOW 8	
985	Did she have red eyes?	YES . . . . . 1 NO . . . . . 2 DON'T KNOW 8	
986	Did she have bleeding from: 1 The nose? 2 The mouth? 3 The anus? 4 Any other place?	**Yes No DK** NOSE . . . . . **1 2 8** MOUTH . . . . . **1 2 8** ANUS . . . . . **1 2 8** OTHER PLACE _____ **1 2 8** (SPECIFY)	
987	Did she ever have shingles/herpes zoster?	YES . . . . . 1 NO . . . . . 2 DON'T KNOW 8	
988A	Did she have weight loss?	YES . . . . . 1 NO . . . . . 2 DON'T KNOW 8	→ 989A → 989A
988B	For how long did she have weight loss?	DAYS . . . . . 1 [ ][ ] OR WEEKS . . . . . 2 [ ][ ] OR MONTHS . . . . . 3 [ ][ ] DON'T KNOW 9 9 8	
988C	Did she look very thin and wasted?	YES . . . . . 1 NO . . . . . 2 DON'T KNOW 8	

NO.	QUESTIONS AND FILTERS	CODING CATEGORIES	SKIP
989A	Did she have mouth sores or white patches in the mouth or on the tongue?	YES ..... 1 NO ..... 2 DON'T KNOW 8	 → 990A → 990A
989B	For how long did she have mouth sores or white patches in the mouth or on the tongue?	DAYS ..... ☐☐ DON'T KNOW 98	
990A	Did she have any swelling?	YES ..... 1 NO ..... 2 DON'T KNOW 8	 → 991A → 991A
990B	For how long did she have the swelling?	DAYS ..... 1 ☐☐ **OR** WEEKS ..... 2 ☐☐ **OR** MONTHS ..... 3 ☐☐ DON'T KNOW 998	
990C	Was the swelling on: 1 The face? 2 The joints? 3 The ankles? 4 The whole body? 5 Any other place?	**Yes No DK** FACE ..... **1 2 8** JOINTS ..... **1 2 8** ANKLES ..... **1 2 8** WHOLE BODY ..... **1 2 8** OTHER PLACE _____ **1 2 8** (SPECIFY)	
991A	Did she have any lumps?	YES ..... 1 NO ..... 2 DON'T KNOW 8	 → 992A → 992A
991B	For how long did she have the lumps?	DAYS ..... 1 ☐☐ **OR** WEEKS ..... 2 ☐☐ **OR** MONTHS ..... 3 ☐☐ DON'T KNOW 998	
991C	Was the swelling on: 1 The neck? 2 The armpit? 3 The groin? 4 Any other place?	**Yes No DK** NECK ..... **1 2 8** ARMPIT ..... **1 2 8** GROIN ..... **1 2 8** OTHER PLACE _____ **1 2 8** (SPECIFY)	
992A	Did she have yellow discoloration of the eyes?	YES ..... 1 NO ..... 2 DON'T KNOW 8	 → 993A → 993A
992B	For how long did she have yellow discoloration of the eyes?	DAYS ..... 1 ☐☐ **OR** WEEKS ..... 2 ☐☐ **OR** MONTHS ..... 3 ☐☐ DON'T KNOW 998	
993A	Did she look pale (thinning/lack of blood) or have pale palms, eyes or nail beds?	YES ..... 1 NO ..... 2 DON'T KNOW 8	 → 994A → 994A

NO.	QUESTIONS AND FILTERS	CODING CATEGORIES	SKIP
993B	For how long did she look pale or have pale palms, eyes or nail beds?	DAYS ..... 1 **OR** WEEKS ..... 2 **OR** MONTHS ..... 3 DON'T KNOW 9 9 8	
994A	Did she have an ulcer, abscess, or sore anywhere on the body?	YES ..... 1 NO ..... 2 → 1001 DON'T KNOW ..... 8 → 1001	
994B	For how long did she have the ulcer, abscess, or sore?	DAYS ..... 1 **OR** WEEKS ..... 2 **OR** MONTHS ..... 3 DON'T KNOW 9 9 8	
994C	What was the location of the ulcer, abscess, or sore? **CIRCLE ALL THAT APPLY**	NECK ..... A ARMPIT ..... B GROIN ..... C FACE ..... D JOINTS ..... E ANKLES ..... F GENITALS ..... G WHOLE BODY ..... H OTHER PLACE _____ X (SPECIFY) DON'T KNOW ..... Y	

SECTION 10. TREATMENT AND HEALTH SERVICE USE FOR THE FINAL ILLNESS

NO.	QUESTIONS AND FILTERS	CODING CATEGORIES	SKIP
1001	Did she receive any treatment for the illness or health problem that led to death?	YES ..... 1 NO ..... 2 DON'T KNOW 8	→ 1008
1002	Do you know of any drugs she was given for the illness that led to death? Could you list them please? **PROBE FOR THE DIFFERENT CLASSES OF DRUGS COPY FROM PRESCRIPTION / DISCHARGE NOTES IF AVAILABLE**	_____ _____ _____	
1003	What additional type of treatment did she receive: 1 Oral rehydration salts (ORS) and/or intravenous fluids (drip) treatment? 2 Blood transfusion? 3 Treatment/food through a tube passed through the nose? 4 Any other treatment?	YES NO DK ORS/DRIP TREATMENT ..... 1 2 8 BLOOD TRANSFUSION ..... 1 2 8 THROUGH THE NOSE ..... 1 2 8 OTHER _____ 1 2 8 (SPECIFY)	
1004	Please tell me at which of the following places/facilities she received treatment during the illness that led to death: 1 Home? 2 Traditional healer? 3 Government health center? 4 Government hospital? 5 Private clinic? 6 Private hospital? 7 Pharmacy, drug seller, store? 8 Any other placer or facility?	YES NO DK HOME ..... 1 2 8 TRADITIONAL HEALER ..... 1 2 8 GOVERNMENT HEALTH CENTER ... 1 2 8 GOVERNMENT HOSPITAL ..... 1 2 8 PRIVATE CLINIC ..... 1 2 8 PRIVATE HOSPITAL ..... 1 2 8 PHARMACY, DRUG SELLER, STORE ..... 1 2 8 OTHER _____ 1 2 8 (SPECIFY)	
1005	In the month before death, how many contacts with formal health services did she have?	NUMBER OF CONTACTS ..... ☐☐ DON'T KNOW 9 8	
1006	Did a health care worker tell you or anyone the cause of death?	YES ..... 1 NO ..... 2 DON'T KNOW 8	→ 1008
1007	What did the health care worker say?	_____ _____ _____	
1008	Did she have any operation for the illness?	YES ..... 1 NO ..... 2 DON'T KNOW 8	→ 1101
1009	How long before death did she have the operation?	DAYS ..... 1 **OR** WEEKS ..... 2 ☐☐ DON'T KNOW 9 9 8	
1010	On what part of the body was the operation?	ABDOMEN ..... 1 CHEST ..... 2 HEAD ..... 3 OTHER _____ 6 (SPECIFY) DON'T KNOW 8	
	GO TO SECTION 11: ACCESS TO CARE		

SECTION 11: ACCESS TO CARE

NO.	QUESTIONS AND FILTERS	CODING CATEGORIES	SKIP
	READ: "Now, I would like to ask you about any problems [NAME OF WOMAN WHO DIED] had, that may have caused delays in **seeking and/or receiving health care for** the illness,health problem, or injury **that led to her death**."		
1101	As far as you know, was anyone aware that she needed medical help before she died?	YES ..... 1 NO ..... 2 DON'T KNOW 8	→ 1201 → 1103
1102	How long before her death was her illness, health problem, or injury recognized? **IF LESS THAN 1 HOUR, RECORD "00" HOURS**	HOURS ..... 1 **OR** DAYS ..... 2 **OR** WEEKS ..... 3 **OR** MONTHS ..... 4 DON'T KNOW 998	
1103	Did anyone believe her health problem (or injury) was life-threatening, very serious, a little serious,not serious?	LIFE-THREATENING ..... 1 VERY SERIOUS ..... 2 A LITTLE SERIOUS ..... 3 NOT SERIOUS ..... 4 DON'T KNOW 8	
1104	Did she (or someone else on her behalf) seek health care before she died?	YES ..... 1 NO ..... 2 DON'T KNOW 8	→ 1106
1105	What are the **reasons** why she (or someone else on her behalf) **DID NOT seek health care before she died?** **CIRCLE APPROPRIATE "LETTER" FOR EACH REASON GIVEN FOR NOT SEEKING HEALTH CARE BEFORE SHE DIED**		

	CIRCLE RESPONSE		CIRCLE RESPONSES
A SHE DIED SUDDENLY	A	**L** TRANSPORTATION WAS NOT AVAILABLE.	L
B SHE DIDN'T REALIZE HOW SICK/INJURED SHE WAS	B	**M** TRANSPORTATION TOO COSTLY/LACKED MONEY	M
C HER FAMILY DIDN'T REALIZE HOW SICK/INJURED SHE WAS	C	**N** TRANSPORTATION WOULD NOT TAKE HER TO FACILITY	N
D THOUGHT THERE WAS NO NEED FOR HEALTH CARE.	D	**O** LACKED MONEY TO PAY FOR HEALTH CARE	O
E THOUGHT IT WAS NORMAL/TEMPORARY PROBLEM	E	**P** HEALTH CARE TOO FAR AWAY OR INACCESSIBLE	P
F DECISION COULD NOT BE MADE ON WHERE TO GO	F	**Q** HEALTH CARE SERVICES NOT AVAILABLE	Q
G IT WAS MIDNIGHT/EARLY MORNING	G	**R** CONCERNS WITH PERSONNEL AT HEALTH FACILITY	R
H HAD NO ONE TO TAKE CARE OF HER CHILDREN	H	**S** SHE REFUSED TO SEEK CARE	S
I HAD NO ONE TO GO WITH HER	I	**T** FAMILY MEMBER STOPPED HER SEEKING CARE	T
J DID NOT TRUST SHE WOULD GET ADEQUATE CARE	J	**U** UNABLE TO COMMUNICATE FOR ASSISTANCE	U
K FEARED DISCOVERY SHE HAD INDUCED ABORTION	K	**V** OTHER _____ (SPECIFY)	V

→ 1201

GO TO 1201

SECTION 11: ACCESS TO CARE

NO.	QUESTIONS AND FILTERS	CODING CATEGORIES	SKIP
1106	Who was the main person to help her decide to seek health care before she died?	HERSELF ..... 0 HUSBAND/PARTNER ..... 1 HER MOTHER ..... 2 HER SISTER ..... 3 OTHER RELATIVE _____ (SPECIFY) .4 NEIGHBOR/FRIEND ..... 5 VHT MEMBER ..... 6 OTHER _____ (SPECIFY) 7 DON'T KNOW 8	
1107	How much **time passed between** the time she **felt sick or injured [or started labor, if pregnant]** and when the decision was made to **seek health care**?	HOURS ..... 1 ☐☐ **OR** DAYS ..... 2 ☐☐ **OR** WEEKS ..... 3 ☐☐ **OR** MONTHS ..... 4 ☐☐ DON'T KNOW 998	
1108	After the **decision was made** to seek health care for the health problem that led to death, did she arrive at the health care facility?	YES ..... 1 NO ..... 2 DON'T KNOW 8	→ 1113 → 1113
1109	Did she die at home while waiting for transportation to health facility/medical attention?	YES ..... 1 NO ..... 2 DON'T KNOW 8	→ 1201 → 1201
1110	How long had she been waiting at home for transport to reach her?	MINUTES ..... 1 ☐☐ **OR** HOURS ..... 2 ☐☐ DON'T KNOW 998	 → 1201
1111	Did she die on her way to get help / medical attention?	YES ..... 1 NO ..... 2 DON'T KNOW 8	 → 1201
1112	How long had she been on her way to get health care when she died?	MINUTES ..... 1 ☐☐ **OR** HOURS ..... 2 ☐☐ DON'T KNOW 998	→ 1201

SECTION 11: CONTINUED

	QUESTIONS AND FILTERS	CODING CATEGORIES	SKIP
1113	In what type of place did she seek and/or receive health care for the last time?_____	TRADITIONAL HEALER . . . . . 01 HEALTH POST . . . . . 02 GOV'T CLINIC . . . . . 03 GOV'T HOSPITAL . . . . . 04 PRIVATE FACILITY . . . . . 05 FAITH BASED FACILITY. . . . . 06 PHARMACY, DRUG STORE . . . . . 07 OTHER _____ 08 DON'T KNOW 88	
1114	Did she have trouble reaching the place where she received care and treatment?	YES . . . . . 1 NO . . . . . 2 DON'T KNOW 8	→ 1116
1115	What was the main reason she had trouble reaching that place?	LACKED TRANSPORT . . . . . 1 BAD OR NO ROADS . . . . . 2 PLACE FAR AWAY . . . . . 3 TRANSPORT TOO COSTLY . . . . . 4 LACK COMMUNICATION FOR TRANSPORT . . . . . 5 OTHER _____ 7 DON'T KNOW 8	
1116	What means of transportation did she or her family use to get to **[NAME THE PLACE]**?	WALKED . . . . . 0 CARRIED . . . . . 1 CART/HORSE/DONKEY . . . . . 2 PUBLIC BUS/MINIBUS. . . . . 3 TAXI/RENTED CAR . . . . . 4 CAR/TRUCK (OWNED) . . . . . 5 AMBULANCE. . . . . 6 E-RANGERS BODA BODA. . . . . 7 OTHER 8 _____ DON'T KNOW 9	
1117	How much total transportation time did it take her to reach this place of health care.	MINUTES. . . . . 1 ☐☐ **OR** HOURS. . . . . 2 ☐☐ **OR** DAYS. . . . . 3 ☐☐ DON'T KNOW 998	
1118	Did she have difficulties receiving treatment at any place she sought health care?	YES . . . . . 1 NO . . . . . 2 DON'T KNOW 8	→ 1120

SECTION 11: CONTINUED

	QUESTIONS AND FILTERS	CODING CATEGORIES	SKIP
1119	What difficulties did she have when she sought health care? **CIRCLE "1" FOR EACH DIFFICULTY SHE HAD WHEN SHE SOUGHT HEALTH CARE THERE.**	YES NO DELAY TO BE SEEN . . . . . 1 2 LACK OF QUALIF. STAFF . . . . . 1 2 LACK OF EQUIPMENT. . . . . 1 2 LACK OF SUPPLIES. . . . . 1 2 TREATED POORLY . . . . . 1 2 DENIED TREATMENT . . . . . 1 2 NO ELECTRICITY . . . . . 1 2 SENT TO OTHER PLACE . . . . . 1 2 OTHER _____ 1 2 (SPECIFY) DON'T KNOW . . . . . 1 2 DIED WITHOUT CARE 1 2	
1120	How much time passed between when she arrived at the facility and when she received treatment?	MINUTES . . . . . 1 ☐☐ **OR** HOURS . . . . . 2 ☐☐ **OR** DAYS . . . . . 3 ☐☐ DON'T KNOW . . . . . 998 NO CARE RECEIVED 777	
1121	How long was she at that place (total time) before she left or died?	HOURS . . . . . 1 ☐☐ **OR** DAYS . . . . . 2 ☐☐ **OR** WEEKS . . . . . 3 ☐☐ DON'T KNOW 998	
1122	Did she die at that place or did she leave there before dying?	LEFT BEFORE DYING 1 DIED THERE . . . . . 2 → 1201 DON'T KNOW . . . . . 8 → 1201	
1123	Why did she leave that place? **RECORD THE MAIN REASON WHY SHE LEFT THE PLACE**	TRANSFERRED . . . . . 1 REFERRED . . . . . 2 DISCHARGED BY HEALTH WORKER . . . . . 3 LEFT ON HER OWN . . . . . 4 FAMILY TOOK HER HOME. . . . . 5 OTHER _____ 7 (SPECIFY) DON'T KNOW 8	
	GO TO SECTION 12: RISK FACTORS		

SECTION 12. RISK FACTORS

NO.	QUESTIONS AND FILTERS	CODING CATEGORIES	SKIP
1201	Did she drink alcohol?	YES ..... 1 NO ..... 2 DON'T KNOW 8	 → 1206 → 1206
1202	How long had she been drinking? **RECORD '00' IF LESS THAN ONE YEAR**	YEARS ..... ☐☐ DON'T KNOW 9 8	
1203	How often did she drink alcohol?	DAILY ..... 1 FREQUENTLY (WEEKLY) ..... 2 ONCE IN A WHILE ..... 3 DON'T KNOW 8	
1204	Had she stopped drinking?	YES ..... 1 NO ..... 2 DON'T KNOW 8	 → 1206 → 1206
1205	How long before death did she stop drinking? **RECORD '00' IF LESS THAN ONE MONTH**	MONTH ..... ☐☐ DON'T KNOW 9 8	
1206	Did she smoke tobacco (cigarette, cigar, pipe etc.)?	YES ..... 1 NO ..... 2 DON'T KNOW 8	 → 1212A → 1212A
1207	How long had she been smoking? **RECORD '00' IF LESS THAN ONE YEAR**	YEARS ..... ☐☐ DON'T KNOW 9 8	
1208	How often did she smoke?	DAILY ..... 1 FREQUENTLY (WEEKLY) ..... 2 ONCE IN A WHILE ..... 3 DON'T KNOW 8	 → 1212A → 1212A → 1212A
1209	How many times did she smoke daily?	NUMBER OF TIMES ..... ☐☐ DON'T KNOW 9 8	
1210	Had she stopped smoking before death?	YES ..... 1 NO ..... 2 DON'T KNOW 8	 → 1212A → 1212A
1211	How long before death did she stop smoking? **RECORD '00' IF LESS THAN ONE MONTH**	MONTHS ..... ☐☐ DON'T KNOW 9 8	
1212A	**REVIEW Q804 & Q814.** **HAD SHE EVER BEEN PREGNANT?**	YES ..... 1 NO ..... 2 DON'T KNOW 8	 → 1213 → 1213
1212C	Do you know whether _____used local herbs during pregnancy or up until the time she died?	YES ..... 1 NO ..... 2 DON'T KNOW 8	 → 1212E → 1212E
1212D	When did she begin using local herbs for the 1st time? (in relation to this last pregnancy)	During pregnancy but before labour ..... 1 At the beginning of labour ..... 2 After delivery ..... 3 DON'T KNOW 8	
1212E	During her last pregnancy did she receive at least 2 doses of Fansidar for (IPT) malaria prevention?	YES ..... 1 NO ..... 2 DON'T KNOW 8	
1213	Did the deceased woman sleep under the bednet on regular basis in the last 3 months before death?	YES ..... 1 NO ..... 2 DON'T KNOW 8	 → 1301 → 1301
1214	Was the bednet treated for prevention of malaria (ITNs)	YES ..... 1 NO ..... 2 DON'T KNOW 8	

SECTION 13. DATA ABSTRACTED FROM DEATH CERTIFICATE			
NO.	**QUESTIONS AND FILTERS**	**CODING CATEGORIES**	**SKIP**
1301	Do you have a death certificate for the deceased?	YES ..... 1 NO ..... 2 DON'T KNOW 8	1401
1302	Can I see the death certificate? **COPY DAY, MONTH AND YEAR OF DEATH FROM THE DEATH CERTIFICATE.**	**DAY** **MONTH** **YEAR** ☐☐ ☐☐ ☐☐☐☐	
1303	**COPY DAY, MONTH AND YEAR OF ISSUE OF DEATH CERTIFICATE.**	**DAY** **MONTH** **YEAR** ☐☐ ☐☐ ☐☐☐☐	
1304	RECORD THE CAUSE OF DEATH FROM THE FIRST (TOP) LINE OF THE DEATH CERTIFICATE: _____		
1305	RECORD THE CAUSE OF DEATH FROM THE SECOND LINE OF THE DEATH CERTIFICATE (IF ANY): _____		
1306	RECORD THE CAUSE OF DEATH FROM THE THIRD LINE OF THE DEATH CERTIFICATE (IF ANY): _____		
1307	RECORD THE CAUSE OF DEATH FROM THE FOURTH LINE OF THE DEATH CERTIFICATE (IF ANY): _____		

SECTION 14. DATA ABSTRACTED FROM OTHER HEALTH RECORDS			
1401	OTHER HEALTH RECORDS AVAILABLE	YES ..... 1 NO 2	1411
1402	FOR EACH TYPE OF HEALTH RECORD SUMMARIZE DETAILS FOR LAST 2 VISITS (IF MORE THAN 2) AND RECORD DATE OF ISSUE		
1403	CERTIFICATE OF DEATH _____		
1404	POST MORTEM RESULTS (CAUSE OF DEATH) _____		
1405	MCH/ANC CARD and MOTHER'S PASSPORT (RELEVANT INFORMATION) _____		
1406	HOSPITAL PRESCRIPTION / MEDICINE PACKAGES OR BOTTLES (RELEVANT INFORMATION) _____		
1407	TREATMENT CARDS (RELEVANT INFORMATION) _____		
1408	HOSPITAL DISCHARGE (RELEVANT INFORMATION) _____		
1409	LABORATORY RESULTS (RELEVANT INFORMATION) _____		
1410	OTHER HOSPITAL DOCUMENTS SPECIFY: _____		
1411	RECORD THE TIME AT THE END OF INTERVIEW	HOURS ..... [ ][ ] MINUTES ..... [ ][ ]	

PLEASE INTERVIEWER - THANK THE RESPONDENT FOR THE INTERVIEW:

"Thank you for your participation in this interview, this information will be helpful in planning health services in this community"

INTERVIEWER'S OBSERVATIONS

TO BE FILLED IN AFTER COMPLETING INTERVIEW

COMMENTS ON SPECIFIC QUESTIONS:

ANY OTHER COMMENTS:

SUPERVISOR'S OBSERVATIONS

NAME OF THE FIELD EDITOR / SUPERVISOR 1: _____ DATE: _____

NAME OF THE OFFICE EDITOR SUPERVISOR 2: _____ DATE: _____

NAME OF THE DATA ENTRY CLERK / PERSONNEL: _____ DATE: _____

APPENDIX 5
Draft of summary form for maternal death in facility

ADMINISTRATIVE

Case Number .....

Region where death occurred .....

Hospital where death occurred .....

Date received Assessor #1 .....

Date Return Accessor #1 .....

Assessor #1 Signature

.....

Date received Assessor #2 .....

Date received Assessor #2 .....

Assessor #2 Signature

.....

Primary cause of death (ICD-10) .....

Final cause of death (ICD-10) .....

Autopsy .....

Contributory (Antecedent) cause of death #1 (ICD-10) .....

Contributory (Antecedent) cause of death #2 (ICD-10) .....

Contributory (Antecedent) cause of death #3 (ICD-10) .....

Location of death (category) .....

Location of death (specify) .....

.....

Preventable death .....

MATERNAL

Date of Birth ..... Age ..... Gravidity ..... Parity .....

Marital Status .....

Ethnicity .....

Religion .....

Educational Status .....

Literacy .....

Occupation .....

Live births .....

Stillbirths .....

Spontaneous Abortions .....

Induced Abortions .....

Ectopic pregnancies .....

Previous Cesareans .....

Previous pregnancy complications .....

Contraception use just prior to pregnancy .....

What type of contraception (e.g. Pill, DMPA, IUD) .....

PREEXISTING MEDICAL PROBLEMS

Hypertension .....

Diabetes .....

Anaemia .....

Hepatitis .....

Heart Problem .....

HIV positive .....

Tuberculosis .....

Preexisting medical problem (other)

.....

.....

DEATH AND ADMISSION INFORMATION

Date of admission ..... Time of admission .....

Date of delivery ..... Time of delivery .....

Date of death ..... Time of death .....

Day of death (week day – M, T, W, Th, Fr, Sa, Su) .....

Did death occur on a holiday? .....

Status of pregnancy on admission .....

Condition on admission .....

Other condition specify .....

Status of pregnancy at death .....

Gestation at death or at delivery (weeks) if died after delivery .....

Days since pregnancy ended (either by delivery, miscarriage, ectopic) .....

Reasons for admission

.....

.....

.....

Referral ..... If referred from where .....

If referred, time from identification of a problem to transfer to health facility 1 .....

If referred from one facility to another, time from planned transfer from facility 1 to facility 2 .....

Comments about referral process – include comments about communication, transportation used and any problems noted:

.....

.....

.....

.....

.....

ANTENATAL CARE

Received antenatal care ..... If yes, number of antenatal visits .....

If yes, where did she receive care? (list all) Clinic, health centre, sub/regional hospital, national referral hospital, private, other:

.....

.....

If yes, who provided care? (list all) Specialist, medical officer/general practitioner, advanced midwife, midwife, other:

.....

.....

ANTENATAL RISK FACTORS

Hypertension ☐ Placenta Previa ☐ Previous C/S ☐ Multiple gestation ☐ Abnormal lie ☐

Proteinuria ☐

Glycosuria ☐

Anaemia ☐

Urinary tract infection ☐

HIV positive ☐

Malaria ☐

Undesired pregnancy ☐

Antepartum Hospitalization ☐

If hospitalized, for what?

.....

Other antepartum risk factors (specify)

.....

.....

Comments on antenatal care – list any medications

.....

.....

.....

LABORATORY WORK-UP

Blood type and RH ☐

Hematocrit ☐ Hemoglobin

Blood Chemistry

.....

.....

Urinalysis

.....

.....

Other

.....

.....

VDRL ☐

RPR ☐

HIV ☐

Rubella ☐

PHYSICAL EXAM ON ADMISSION

GENERAL PHYSICAL EXAM

.....

.....

.....

.....

.....

VITAL SIGNS

Heart rate .....

Temp (Celsius) .....

Height .....

Weight .....

Systolic Blood Pressure .....

Diastolic Blood Pressure .....

Respiratory rate .....

Any abnormality .....

Systemic examination (any abnormality found):

.....

.....

ABDOMINAL EXAM

Fundal height (cm) .....

Presentation .....

Fundal height to gestational age discrepancy:

.....

Other abdominal abnormalities:

.....

.....

PELVIC EXAM

Stage of labour if in labour .....

Any pelvic abnormality noted .....

ANTEPARTUM ADMISSION COMPLICATIONS

PROM ☐ Abruption ☐ Placenta praevia ☐ Preterm labour ☐ Pre-eclampsia ☐

Eclampsia ☐ Fetal Demise ☐ Pyelonephritis ☐ Sepsis ☐ Malaria ☐

Other antepartum admission complications:

.....

.....

Differential diagnosis at admission:

.....

.....

.....

DELIVERY, PUERPERIUM AND NEONATAL INFORMATION

Did labour occur ..... If labour occurred, was a partograph used? .....

If labour occurred, duration of labour:

Labour phase ..... Active phase ..... Second stage ..... Third stage .....

Length of ruptured membranes ..... Was placenta complete? .....

DELIVERY

Estimated gestational age at delivery .....

Intrapartum hemorrhage ..... Intrapartum infection ..... Intrapartum pre-eclampsia/eclampsia .....

Obstructed labour .....

Comments on labour and delivery:

.....

.....

Was there active management of third stage of labour? ..... Was there a retained placenta? .....

Postpartum hemorrhage ..... Postpartum infection ..... Postpartum pre-eclampsia/eclampsia .....

Comments on puerperium:

.....

.....

NEONATE

Outcome ..... Birthweight (grams) ..... Apgar (1 min) ..... Apgar (5 min) .....

INTERVENTIONS (MARK YES/NO)

Early pregnancy		**Antepartum**		**Intrapartum**		**Postpartum**	
Evacuation	YES ☐ NO ☐	Transfusion	YES ☐ NO ☐	Instrumental delivery	YES ☐ NO ☐	Evacuation	YES ☐ NO ☐
Laparotomy	YES ☐ NO ☐	Version	YES ☐ NO ☐	Symphysiotomy	YES ☐ NO ☐	Laparotomy	YES ☐ NO ☐
Hysterotomy	YES ☐ NO ☐	Labour induction	YES ☐ NO ☐	Caesarean	YES ☐ NO ☐	Hysterotomy	YES ☐ NO ☐
Transfusion	YES ☐ NO ☐	Magnesium Sulfate	YES ☐ NO ☐	Hysterectomy	YES ☐ NO ☐	Hysterectomy	YES ☐ NO ☐
		Antibiotics	YES ☐ NO ☐	Transfusion	YES ☐ NO ☐	Transfusion	YES ☐ NO ☐
				Magnesium sulfate	YES ☐ NO ☐	Magnesium sulfate	YES ☐ NO ☐
				Antibiotics	YES ☐ NO ☐	Antibiotics	YES ☐ NO ☐
						Oxytocin	YES ☐ NO ☐
						Misoprostol	YES ☐ NO ☐

Other intervention

General Anaesthesia	YES ☐ NO ☐
Epidural	YES ☐ NO ☐
Spinal	YES ☐ NO ☐
Local	YES ☐ NO ☐
ICU ventilation	YES ☐ NO ☐
Invasive monitoring	YES ☐ NO ☐

Other interventions

.....

.....

.....

.....

CAUSE OF DEATH

Primary cause of death (ICD-10) .....

Final cause of death (ICD-10) .....

Autopsy ..... If autopsy done, please attach report

Was the final cause of death confirmed by pathology? .....

Contributory (Antecedent) cause of death #1 (ICD-10) .....

Contributory (Antecedent) cause of death #2 (ICD-10) .....

Contributory (Antecedent) cause of death #3 (ICD-10) .....

Case Summary (supply a short summary of the events surrounding the death):

.....

.....

.....

Barriers to Care and Remediable Factors (were any of these factors present (yes/no)

Did women or family recognize there was a problem? YES ☐ NO ☐

Did health provider recognize there was a problem? YES ☐ NO ☐

Was there a delay by the women seeking care? YES ☐ NO ☐

If delay, why? Include personal, family oriented, and community oriented problems including social and financial:

.....

.....

.....

Was there a delay in transport to care or between health facilities? YES ☐ NO ☐

If delay, why? Include communication, access, transport to facility and between facility problems:

.....

.....

.....

Was there a delay in receiving care at the facility? YES ☐ NO ☐

If delay why? Include lack or barriers at health facilities, lack of personnel or unskilled personnel, lack of equipment or supplies:

.....

.....

.....

.....

Was there a problem in the medical care received at the facility? YES ☐ NO ☐

If yes, was the problem antenatal? YES ☐ NO ☐

If yes, was the problem intrapartum? YES ☐ NO ☐

If yes, was the problem postpartum? YES ☐ NO ☐

If yes, was the problem with resuscitation? YES ☐ NO ☐

If yes, was the problem with anaesthesia? YES ☐ NO ☐

If yes, was the problem unprofessional conduct? YES ☐ NO ☐

Comments on potential avoidable factors, missed opportunities and substandard care:

.....

.....

ACTION ITEMS

Preventable death YES ☐ NO ☐

What have you and your facility learned from this case?

.....

.....

How will what you learned change your practice?

.....

.....

What recommendations and actions will you take in the future?

.....

.....

.....

.....

.....

.....

APPENDIX 6
Example of a Committee Worksheet

Committee Worksheet

Case number .....

CASE SUMMARY

1. Age .....
2. Ethnicity .....
3. Gravidity, parity, pregnancy outcome, gestational age, birth weight

   .....
4. Date of birth and date of death

   .....
5. Synopsis of events leading to death

   .....

   .....

QUESTIONS TO CONSIDER:

Prior to pregnancy

6. Did the mother have a serious pre-existing condition?
7. Was the pregnancy planned?
8. Was she using birth control? If not, why not?

During pregnancy

9. Did the mother receive appropriate and timely antenatal care?
10. If she had problems, were they appropriately treated? Did she comply with medical advice? If no, why not?

Intrapartum

11. Was the mother's labour monitored? Prolonged?
12. If she had any problems in labour or delivery, did she receive correct care in a timely fashion?
13. Did she deliver with a skilled birth attendant? At a health facility?
14. Did she need to be transferred before labour? During labour? After labour?

    If yes, was she transferred? If not, why not?

Postnatal

15. Was the mother appropriately resuscitated?
16. Was she appropriately cared for in the postnatal period?
17. Did she need to be transferred to appropriate level of care? If yes, was she transferred? If no, why not?
18. When she became ill, was she taken to care in a timely fashion? Was she treated?

Committee Opinion

19. Principal medical cause of death:

    .....

    .....

20. Was the death avoidable?

    .....

    .....

21. What factors could have been changed to decrease the risk of death from occurring?

    .....

    .....

22. Recommendations to reduce deaths from similar causes or circumstances:

    .....

    .....

    .....

    .....

APPENDIX 7. Community identification for suspected maternal deaths

MATERNAL MORTALITY SURVEILLANCE
COMMUNITY LISTING OF DEATHS TO WOMEN OF REPRODUCTIVE AGE

DISTRICT NAME: .....

PARISH NAME: .....

WARD NAME: .....

COMMUNITY NAME:	CKI NAME:	SUPERVISOR NAME:
Has there been any death of a woman aged 12–49 years since **1st January 2012** in this community? (NOTE: THIS FORM CAN BE ADAPTED FOR COMPILING INFORMATION AT THE HOUSEHOLD LEVEL)		1. Yes → How many deaths to WRA? ☐☐ 2. No 3. Does not know

Deaths in the community

Line #	Name	How old was (NAME) when she died?	In what Month and Year did she die?	Where did she die? Did she die at: (READ OPTIONS 1–4)	Was (NAME) pregnant when she died?	Did she die during childbirth?	Did she die within two months after the end of a pregnancy or childbirth?	When did the pregnancy end? (Month and Year)	Where did the pregnancy end? Did it end at: (READ OPTIONS 1-4)	Did any other woman die since 1st January 2011?
01		☐☐	MONTH ☐☐ YEAR 201	1. Home ..... 2. Hosp. ..... 3. Health C. ..... 4. Other	1. YES → (NEXT LINE) 2. NO	1. YES → (NEXT LINE) 2. NO	1. YES 2. NO	MONTH ☐☐ YEAR 201	1. Home ..... 2. Hosp. ..... 3. Health C. ..... 4. Other	1. YES → (NEXT LINE) 2. NO
02		☐☐	MONTH ☐☐ YEAR 201	1. Home ..... 2. Hosp. ..... 3. Health C. ..... 4. Other	1. YES → (NEXT LINE) 2. NO	1. YES → (NEXT LINE) 2. NO	1. YES 2. NO	MONTH ☐☐ YEAR 201	1. Home ..... 2. Hosp. ..... 3. Health C. ..... 4. Other	1. YES → (NEXT LINE) 2. NO
03		☐☐	MONTH ☐☐ YEAR 201	1. Home ..... 2. Hosp. ..... 3. Health C. ..... 4. Other	1. YES → (NEXT LINE) 2. NO	1. YES → (NEXT LINE) 2. NO	1. YES 2. NO	MONTH ☐☐ YEAR 201	1. Home ..... 2. Hosp. ..... 3. Health C. ..... 4. Other	1. YES → (NEXT LINE) 2. NO
04		☐☐	MONTH ☐☐ YEAR 201	1. Home ..... 2. Hosp. ..... 3. Health C. ..... 4. Other	1. YES → (NEXT LINE) 2. NO	1. YES → (NEXT LINE) 2. NO	1. YES 2. NO	MONTH ☐☐ YEAR 201	1. Home ..... 2. Hosp. ..... 3. Health C. ..... 4. Other	1. YES → (NEXT LINE) 2. NO
05		☐☐	MONTH ☐☐ YEAR 201	1. Home ..... 2. Hosp. ..... 3. Health C. ..... 4. Other	1. YES → (NEXT LINE) 2. NO	1. YES → (NEXT LINE) 2. NO	1. YES 2. NO	MONTH ☐☐ YEAR 201	1. Home ..... 2. Hosp. ..... 3. Health C. ..... 4. Other	1. YES → (NEXT LINE) 2. NO
06		☐☐	MONTH ☐☐ YEAR 201	1. Home ..... 2. Hosp. ..... 3. Health C. ..... 4. Other	1. YES → (NEXT LINE) 2. NO	1. YES → (NEXT LINE) 2. NO	1. YES 2. NO	MONTH ☐☐ YEAR 201	1. Home ..... 2. Hosp. ..... 3. Health C. ..... 4. Other	1. YES → (NEXT LINE) 2. NO

APPENDIX 8. Implementation planning tool

Draft MDSR planning tool

	PHASED IMPLEMENTATION				
COMPONENT	SITUATION ANALYSIS	YEAR 1	YEAR 2	YEAR 3	PROPOSED FINAL TARGETS
OVERALL SYSTEM INDICATORS					
MDSR policy in place[a]					Yes
Maternal death is a notifiable event (24 hours) / national policy requires notification[a,b]					Yes
MDSR guidelines, standards developed or updated, and implemented					Yes
Financial resources available[a]					Yes
National maternal mortality report published annually[b]					Yes
Designated lead person responsible for MDSR identified at all levels					Yes
National maternal death review committee meets regularly					Yes
– multi-disciplinary representation					yes
% of districts with maternal death review committees[b]					100%
% of districts with someone responsible for MDSR[b]					100%
IDENTIFICATION AND NOTIFICATION					
Guidelines to enhance detection					Yes
– Guidelines define information channels and flow					Yes
Facility:					
All maternal deaths are notified[a,b]					Yes
% within 24 hours[a,b]					>90%
Community:					
All maternal deaths are notified[a,b]					Yes
% within 24 hours[a,b]					>90%
% of communities with “zero reporting monthly”					100%
Electronic devices are used to get faster and more complete notification from communities[a]					Yes
District					
% of expected maternal deaths that are notified[b]					>90%
Electronic devices are used to get faster and more complete notification from communities[a]					Yes

Review					
Health facility					
% of hospitals with a review committee[b]					100%
% of health facility maternal deaths reviewed[b]					100%
% reviews that include recommendations[b]					100%
Community					
% of verbal autopsies conducted for suspected maternal deaths[a,b]					>90%
% of notified maternal deaths that are reviewed by district[b]					>90%
District					
District maternal mortality review committee exists[a,b]					Yes
– and meets regularly to review facility and community deaths[a ,b]					At least quarterly
– % of reviews that included community participation and feedback[a,b]					100%
Electronic devices are used to get faster and more complete notification from communities[a]					Yes
DATA QUALITY					
Guidelines on Cause of Death (COD) exist					yes
– Guidelines use ICD10 coding					Yes
Completeness of data collection					yes
Cross check data from facility and community on same maternal death[b]					5% of deaths cross-checked
Sample of WRA deaths checked to ensure they are correctly identified as not maternal[b]					1% of WRA rechecked
ANALYSIS					
Analysis plan developed					Yes
Calculate hospital maternal mortality ratio (usually for high volume deliveries)[b]					yes
Calculate hospital case fatality rates (may be done at facility level or district level)[b]					Yes
Analysis can produce district maternal mortality ratios[b]					yes
Analysis provides data for action for all stakeholders					Yes

RESPONSE					
Plan for response developed					Yes
Facility					
% of committee recommendations that are implemented[b]					>80%
– quality of care recommendations[b]					>80%
– other recommendations[b]					>80%
District					
% of committee recommendations that are Implemented[b]					>80%
REPORTS					
National Committee produces annual report[a,b]					Yes
– Annual report available publically[a]					Yes
District committee produces annual report[b]					Yes
– Discusses with key stakeholders including communities[a,b]					Yes
REVIEW OF THE SYSTEM					
The maternal death surveillance and response system is reviewed annually in terms of completeness of surveillance and quality of the response, including actions to improve quality of care[a]					Yes
QUALITY OF CARE					
Quality of care assessments are conducted in a sample of maternity facilities on a regular basis[a]					Yes
– Indicators are used to measure quality of care[a,b]					Yes

[a] Item from Commission on Information and Accountability Framework (may be adapted for use in planning and come from more than just MDSR framework)
[b] Suggested indicators from new technical guidance document (may be adapted for use in planning)