The Design and Evaluation of Maternal Mortality Programs

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The views expressed in this publication are the views of the authors and do not necessarily represent those of the United Nations Development Programme.

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Preface

Women's health has long been a priority area of concern and activity for the United Nations Development Programme (UNDP). In order for gains in women's health to be sustainable, capacity development is key. UNDP is proud to present this manual, *The Design and Evaluation of Maternal Mortality Programs*, as part of its continuing commitment to learning and sharing lessons and experiences for developing human and institutional capacity in developing countries.

This is a technical document with a development aim. In its technical sense, the manual provides guidance and tools for the design and evaluation of maternal mortality programs – it is about what practitioners call "operations research" or "health systems research." But its broader purpose is one of development – to enhance the ability of people and institutions in developing countries to identify key challenges and generate effective responses to them. The manual offers a way of thinking about project design and evaluation, rather than just a set of instructions and forms to do it. In both its form and its function, the manual is about building capacity and ownership. With it, technical cooperation resources can be used to support local development efforts more effectively.

At another level, of course, the manual is about improving the health of women. Women are crucial to the social and economic development of their societies, as members of the work force and the backbone of households. They are the creators of new life, and the caretakers of daily life. Although saving a woman's life has tremendous benefits for her family and her community, it is the horrible and needless deaths of the women themselves that is our call to action. The technology to avert the vast majority of maternal deaths has been known for decades, yet it is still unavailable to large numbers of women in developing countries. Beyond the social and economic benefits, this manual is about saving women's lives *for their own sakes*.

The strategies and instruments presented in the manual were developed for and tested by the Prevention of Maternal Mortality (PMM) Network – a collaboration between Columbia University and multidisciplinary teams in West Africa. Since its inception almost 10 years ago, the activities of the PMM Network have embodied many of the concepts at the forefront of development thinking today. In fact, the experience of the PMM Network represents one of the field's great success stories in capacity development. Given continuing doubts about the effectiveness and sustainability of technical cooperation efforts, a review of the factors contributing to the success of the PMM Network is valuable and instructive.

The PMM Network was comprised of 11 teams carrying out operations research projects on maternal mortality in Ghana, Nigeria and Sierra Leone. A twelfth team from Columbia University in New York, with a Regional Office in Accra, Ghana, provided technical support and coordinated Network activities. Capacity development was always a central objective of the PMM Network, and the demands of the research or the service activities were never allowed to compromise this commitment. Three principles characterize the approach to development taken by the Network:

1. Collaboration for capacity development must be based on effective partnerships which acknowledge the contributions of all parties.

Respectful collaboration has been a hallmark of the PMM Network. In this collaboration, the contributions of the various parties were acknowledged and valued from the beginning. The African teams brought their professional training and experience – obstetricians and midwives, social scientists and community medicine specialists, women and men in the community working together – as well as knowledge of their countries and customs. The Columbia team brought knowledge of the world literature, of operations research, and of participatory program development. African team members with expertise or experience in particular areas were involved as consultants in technical cooperation visits to other teams. Additionally, the funding agency – the Carnegie Corporation of New York – brought financial support in a form that was conducive to collaboration allowing sufficient time and space for program development, implementation and learning. More importantly, Carnegie provided an enabling environment for participation among many actors and so facilitated the development of new skills and approaches.

2. Ideas and programs must be based in the realities of lived experience.

At the heart of the approach to development practices applied in the PMM Network is the recognition that sources of learning must incorporate local experience; that for ideas and programs to take root within communities or within institutions, they must reflect the needs and realities of lived experience. Simply instructing individuals or institutions to change their behavior or to do things differently does not work, as history has taught us.

An atmosphere of mutual learning permeated the projects in West Africa. Before designing projects, the teams had extensive discussions with various parties – women and men in the community, providers of both traditional and modern health care, traditional leaders and government officials. The knowledge gained from these discussions helped shape the projects. Through listening to the experiences of the people concerned, the PMM teams realized that the solution to maternal mortality must be multisectoral. Improving medical care for women with serious complications is central, but the teams did not forget that many things affect people's ability to use services. The approach to program design described in the manual reflects this perspective.

3. External support agents must take the role of facilitator rather than director.

The role of a facilitator is to ensure local ownership so that people, whether in a ministry or a village, can contribute to and sustain a process of change. Facilitation is a time-consuming process, but one that is integral to capacity development.

In its technical support and coordination of the Network, the Columbia University team put into practice what is too often only the rhetoric of capacity development. It accepted that effective partnerships are not always easy, and viewed such difficulty as a necessary part of the capacity development process. It gave high priority to activities such as workshops (to which all Network members were invited) which built consensus and a shared sense of purpose. Ongoing cooperation, problem-solving, and sharing of lessons learned was a central feature of these workshops and the Network process.

In 1997, technical cooperation from Columbia University came to an end, and the PMM Network now continues as an entirely African entity. This by itself would be a fitting ending to a capacity development success story, but the capacity development process does not stop here. The African members of the Network have now committed themselves to sharing their expertise and experience with other colleagues in Africa and supporting the formation of new multidisciplinary teams, not only in Ghana, Nigeria, and Sierra Leone, but also in the countries of francophone West Africa and of East Africa. Technical cooperation with these new colleagues will focus on the design, implementation and evaluation of maternal mortality programs in their local areas.

This manual represents a distillation of project design and evaluation methods used by the PMM Network over 8 years of working together. We hope that it will be useful to the members of the "second-generation" Network as they carry on with their important work and share the knowledge they have gained with colleagues in other parts of Africa.

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1. Introduction

The World Health Organization (WHO) and UNICEF estimate that each year 585,000 women die from causes related to pregnancy and childbirth.[1] The disparity between developed and developing countries is greater for maternal mortality than for any other commonly-used index of health. Whereas levels of infant mortality are, on average, 10 times higher in developing than in developed countries, maternal mortality in developing countries is more than 100 times higher than in industrialized countries.[2,3]

Most maternal deaths are due to five obstetric complications: hemorrhage, sepsis, unsafe induced abortion, hypertensive disorders of pregnancy, and obstructed labor. While the vast majority of maternal deaths occur in developing countries, this does not mean that only women in developing countries develop medical complications during or after pregnancy.[4] Women in every country and every population develop complications, but women in developing countries are much less likely to get prompt adequate treatment, and are therefore more likely to die.

For an individual woman, the risk of maternal death is influenced both by the risk associated with pregnancy and by the number of times she becomes pregnant. Each time a woman becomes pregnant, she runs the risk of maternal death again, and the risk adds up over her lifetime. In developing countries, where both mortality and fertility tend to be high, the lifetime risk of maternal death can be astoundingly high. In some countries of Africa, it is estimated that 1 in 7 women will die of complications of pregnancy or delivery, compared with only 1 woman in several thousand in Europe and North America.[5]

In addition to the women who die, many more suffer from serious but not fatal health problems as a result of pregnancy or childbirth. Most women who have obstetric complications recover, but some suffer long-term disabilities including sterility and vesicovaginal fistula (VVF). VVF is a condition in which prolonged obstructed labor produces a hole between the vagina and the urinary system, resulting in chronic incontinence.[6] This is not only painful, but if left untreated (as is usually the case in developing countries) it can lead to social stigmatization and isolation.[7] Sterility commonly results from untreated or recurrent pelvic infection. Beyond frustration and disappointment, sterility can have profound social and economic consequences for women in societies where women's value is largely determined by the children they bear. There is little reliable information on the prevalence of maternal morbidity, but the number of women affected is sure to be several times greater than the number who die.[8] Fortunately, interventions that reduce maternal deaths will also reduce maternal morbidity.

Pregnancy-related complications are the number one cause of death and disability among women of reproductive age worldwide.[9] They account for the loss of more than twice as many disability-adjusted life-years (DALYs) than do STDs, HIV, or TB. There is no single cause for men that comes close to the magnitude of maternal mortality and morbidity. And what makes the persistence of high levels of maternal mortality and morbidity all the more tragic is that cost effective interventions (defined by the World Bank as those that cost less than US $100 per DALY saved) have been known for decades but are still not widely available or accessible in developing countries.

The Safe Motherhood Initiative (SMI) was officially launched at an international conference held in Nairobi, Kenya in 1987. Since 1987, awareness of the problem has been raised among policy makers, health professionals, and the general public. A variety of small studies have helped clarify the extent and nature of the problem.[10] They have also pointed the way to solutions.[11,12,13,14,15]

Now the task is to develop full-scale programs that use this knowledge. In order to do this, governments of developing countries may, if they wish, call on a variety of agencies for financial and technical assistance. But in the long run, the reduction of maternal mortality is the country's responsibility. Therefore, one of the most important ways in which United Nations and other agencies can assist governments is by helping them to identify cost-effective program designs and build local capacities to implement and sustain them.

We hope this manual will be useful in this process. This manual is intended to assist local personnel in gathering and interpreting the information they need to design and evaluate programs. The kind of information called for is different from much of what has been collected in the past. Much of the research to date has addressed such questions as "How many women die?" and "What do they die of?" Now, we need to focus on such questions as "What is preventing women from receiving life-saving treatment?" and "How is our program progressing?" This kind of approach has various names, including "health systems research" and "operations research." The identifying characteristic of such research is that it provides results that can be incorporated directly into program activities.

Operations research on maternal mortality is a relatively new field.[16] The largest body of experience to date is that of the Prevention of Maternal Mortality (PMM) Network in West Africa. The PMM Network began in 1988 with funding from the Carnegie Corporation of New York.[17] In its first phase, the Network consisted of a dozen multidisciplinary teams – seven in Nigeria, 2 each in Ghana and Sierra Leone, and a technical assistance team at Columbia University in New York. In 1997, it became an entirely African institution – the Regional Prevention of Maternal Mortality (RPMM) Network, with the coordinating office in Accra, Ghana.

Over the years, the PMM teams have worked to design and evaluate programs to help women who develop pregnancy-related complications to get life-saving care. These programs were designed to fit the particular geographic, economic, political and cultural circumstances in which each of the teams worked. The programs also were designed to be sustainable and replicable. The findings of the Network projects were reported at an international conference in Accra in 1996. A Book of Abstracts is available[18], and the full proceedings of the conference will be published as a special supplement to the *International Journal of Gynecology and Obstetrics* in 1997. Much of the content of this manual draws on the experience of the PMM Network.

This manual is written not only for specialists in the area of maternal mortality, but also for planners and managers who are including efforts to reduce maternal deaths in their activities. And while the focus is on programs at the local or district level, it also contains information and tools for people working at the state or national level. These sections are adapted from *Guidelines for Monitoring the Availability and Use of Obstetric Services*, forthcoming from UNICEF and WHO.[19]

In Chapter 2, we begin with an overview of what is known about maternal mortality and the types of activities that reduce maternal deaths. We then discuss the limitations of traditional measures of impact for evaluating maternal mortality programs, and explain the rationale for process indicators. In Chapter 3 on "Needs Assessment", we describe the kinds of questions that need to be answered to design a program, and we discuss methods for gathering the information needed. Using the findings of the needs assessment to select program interventions is the subject of Chapter 4. The importance of understanding the causal pathways that lead from a proposed intervention to the desired outcome is emphasized. In Chapter 5, we demonstrate how process indicators can be derived directly from the causal pathways – an approach that can be used to derive process indicators for any intervention – and we discuss some practical issues in monitoring and evaluation. Chapter 6 deals with the dissemination of information gathered. The appendices contain sample data collection instruments and materials developed in the PMM Network and at Columbia University, for you to use and adapt as needed. The materials in Appendix A are relevant to maternal mortality programs at all levels. Appendix B contains instructions and forms designed specifically for guiding programs at the regional or national level.

2. A Strategy for Program Design and Evaluation

The strategy proposed in this manual is based upon two central concepts. First, women with obstetric complications must have access to emergency medical treatment if maternal deaths are to be substantially reduced. And second, the best way to evaluate progress in the reduction of maternal deaths is through the use of process and output indicators. These two concepts are discussed in detail below.

2.1 Which Activities Will Reduce Maternal Deaths?

In societies where maternal mortality is high there are usually many problems – poverty, illiteracy, low status of women, poor sanitation and nutrition, poor transportation, inadequate medical services. If we solved all of these problems, maternal mortality would decline substantially. But in many situations, this is not feasible in the near future. However, it is possible to reduce maternal deaths before solving all of these problems. What program planners, therefore, want to know is, "What are the 3 or 4 feasible activities which will substantially reduce maternal deaths in our population in the near future?"

If we are to select a few activities, then we need to be as sure as possible that these activities really will reduce maternal deaths. In other words, we need to be careful about the "causal chain" linking maternal deaths and the program activities.[20] There are several conditions that must exist for a maternal death to occur. First, the woman must become pregnant. Second, she must develop a medical problem. Third, in order for the woman to die, the complication must either be treated inadequately (e.g., treated too late or not treated) or not treatable. A variety of studies have found that at least nine in 10 serious obstetric complications can be successfully treated with medical procedures that have been available for decades.[21]

Thus, in order to reduce maternal mortality, any proposed interventions must ultimately:

> reduce the likelihood that a woman will become pregnant;
>
> reduce the likelihood that a pregnant woman will experience a serious complication of pregnancy or childbirth; or
>
> reduce the likelihood of death among women who experience complications.

This manual focuses on interventions designed to reduce deaths among women who experience complications, for reasons explained below.

Reducing fertility is, without doubt, an effective way to reduce the number of maternal deaths in the society.[22] This can be easily illustrated by the lifetime risk of maternal

death, which is a function of both the likelihood of surviving a single pregnancy and the number of pregnancies an average woman has. The lifetime risk can be reduced by either lowering the number of pregnancies or improving survival among pregnant women. Family planning programs help prevent maternal deaths chiefly through reducing the number of pregnancies. A wide literature already exists on the evaluation of family planning programs.[23] Consequently, that topic is not covered in this manual.

Reducing the incidence of complications among pregnant women has long been the focus of maternal health programs. During the last decade, however, the potential of various activities to avert complications has been re-examined.[24,25,26,27] What these analyses show is that most obstetric complications can neither be predicted nor prevented.

That statement sounds unbelievable to many people. After all, it is well known that certain groups of women have much higher risks of death than do others. For example, numerous studies have shown that a woman's chance of maternal death is affected by her age.[28] Typically, mortality is lowest among women giving birth in their 20s. To illustrate this, we use data from a classic study in Matlab, Bangladesh.[29] These data were gathered before the successful family planning program reduced fertility.

As Figure 1 shows, the higher risk of maternal death associated with being less than 20 or more than 30 years old is reflected in the maternal mortality ratio (column 2) and the relative risk of maternal death (column 3).

However, if one looks at the sheer number of deaths, the picture is very different. The 10-year age group with the largest number of maternal deaths – women 20-29 – actually has the smallest relative risk. The reason for this apparent paradox is that there were many more births in this age group than in any other. So, even though their risk was relatively low, women in their 20s experienced more deaths than any other group.

Figure 1. Maternal Mortality and Fertility by Age in Matlab, Bangladesh, 1968-70

Age	Maternal Mortality Ratio*	Relative Risk of Maternal Death	Number of Live Births**	Number of Maternal Deaths
10-14	17.7	3.9	509	9
15-19	7.4	1.6	3,907	29
20-29	4.5	1.0	11,286	51
30-39	5.8	1.3	4,667	27
40-49	6.7	1.5	447	3

* Maternal deaths per 1,000 live births.
** Computed from number of maternal deaths and MMR reported by authors.

Relative risk is most appropriately used as a guide for clinical practice. Physicians and nurses can use relative risk to help them tailor advice and treatment to individual patients. Public health planners, in contrast, are less concerned with particular individuals than with preventing as many deaths in the population as possible. Therefore, for planning public health programs, the number of deaths is a more relevant indicator than the relative risk. Screening pregnant women to identify those at high risk will neglect low-risk women when, in fact, most complications and deaths will occur in this group.

One may reason that, if obstetric complications cannot be predicted, perhaps they might be prevented by early treatment of illness during pregnancy. This does not, however, seem to be effective either:

> In a rural area of the Gambia, pregnant women were provided exemplary prenatal care as part of a research project of Britain's Medical Research Council. Risk screening was done twice during pregnancy, and urine tests were performed to detect toxemia. Each woman was visited once a month and any illness detected was treated. There was, however, no medical facility nearby at which serious obstetric complications could be treated. Despite having personalized antenatal care provided by the Medical Research Council, the level of maternal mortality was astronomically high: the equivalent of more than 2,000 maternal deaths per 100,000 live births. Reviewing the data at the end of the project, the researchers found that risk factors were not helpful in identifying which women were most likely to die.[30]

What such studies show is that most obstetric complications cannot be predicted or prevented. There is one major exception to this statement: complications resulting from unsafe induced abortion can be prevented. Providing access to safe abortion services would prevent a substantial proportion of maternal deaths – nearly one-fifth of maternal deaths in developing countries (excluding China).[31] While family planning can play a role in averting unwanted pregnancies, international experience has shown that it does not obviate the need for safe abortion services. Even with very effective methods of contraception, substantial proportions of women will experience unwanted pregnancies.[32] Furthermore, there is growing awareness that many pregnancies (especially among young women) are the result of non-consensual sex.[33]

Although most obstetric complications cannot be predicted or prevented, they can be treated. Since all pregnant women are at risk of obstetric complications, they need to have access to emergency obstetric care (EmOC). With adequate treatment, the vast majority of maternal deaths can be avoided. Therefore, prompt access to emergency obstetric care should be central to any effort to reduce deaths among pregnant women. For these reasons, interventions designed to reduce maternal deaths by improving access to EmOC are the focus of this manual. The specific services that constitute EmOC are described in the next chapter.

This approach is based on several premises: 1) a proportion of pregnant women will develop obstetric complications; 2) the majority of these complications cannot be predicted or prevented; and 3) women who suffer complications will therefore need prompt EmOC to save their lives and prevent long-term morbidity. This has important implications for program planning. It means that the focus is on providing services for women with complications, rather than all pregnant women. It also has important implications for evaluation in that the data can be collected from health facilities – i.e., population surveys are not required.

Finally, a word on cost. Providing emergency obstetric care does not usually entail building costly facilities. In many developing countries, facilities that are supposed to provide emergency obstetric services already exist. It may be that equipment has gone without repair, drugs are not available, or physicians lack training. Modest inputs and improved management and supervision are often all that are required for EmOC services in such facilities to function. Health centers and small hospitals can also provide life-saving services. Many countries can improve access to EmOC services by upgrading existing facilities and retraining existing staff. Programs to improve EmOC services are, by their very nature, not vertical; they are implemented within the existing health system. And because of this, activities undertaken to improve emergency obstetric services often have additional benefits in other areas. For example, a ready supply of blood at the hospital will help in the treatment of people injured in traffic or industrial accidents, as well as women with postpartum hemorrhage.

2.2 The 3 Delays Model

While EmOC services are necessary if maternal mortality is to be reduced, they may not be sufficient. Even when services are functioning well, women with obstetric complications face a variety of barriers to using them. Some of these barriers are economic – e.g., lack of money to pay for transport or services. Some of these barriers are cultural – e.g., the low value placed on women's lives. Some are geographic – e.g., long distances and poor roads. Anything that causes delay in getting treatment may cost women their lives.

While there are many factors that can cause delay, they can be grouped using a simple model called The 3 Delays (Figure 2). The model specifies the three types of delay that contribute to the likelihood of maternal death:

(1) delay in deciding to seek care;
(2) delay in reaching a treatment facility; and
(3) delay in receiving adequate treatment at the facility.[34]

This model serves as the basis for developing indicators, discussed later in this book.

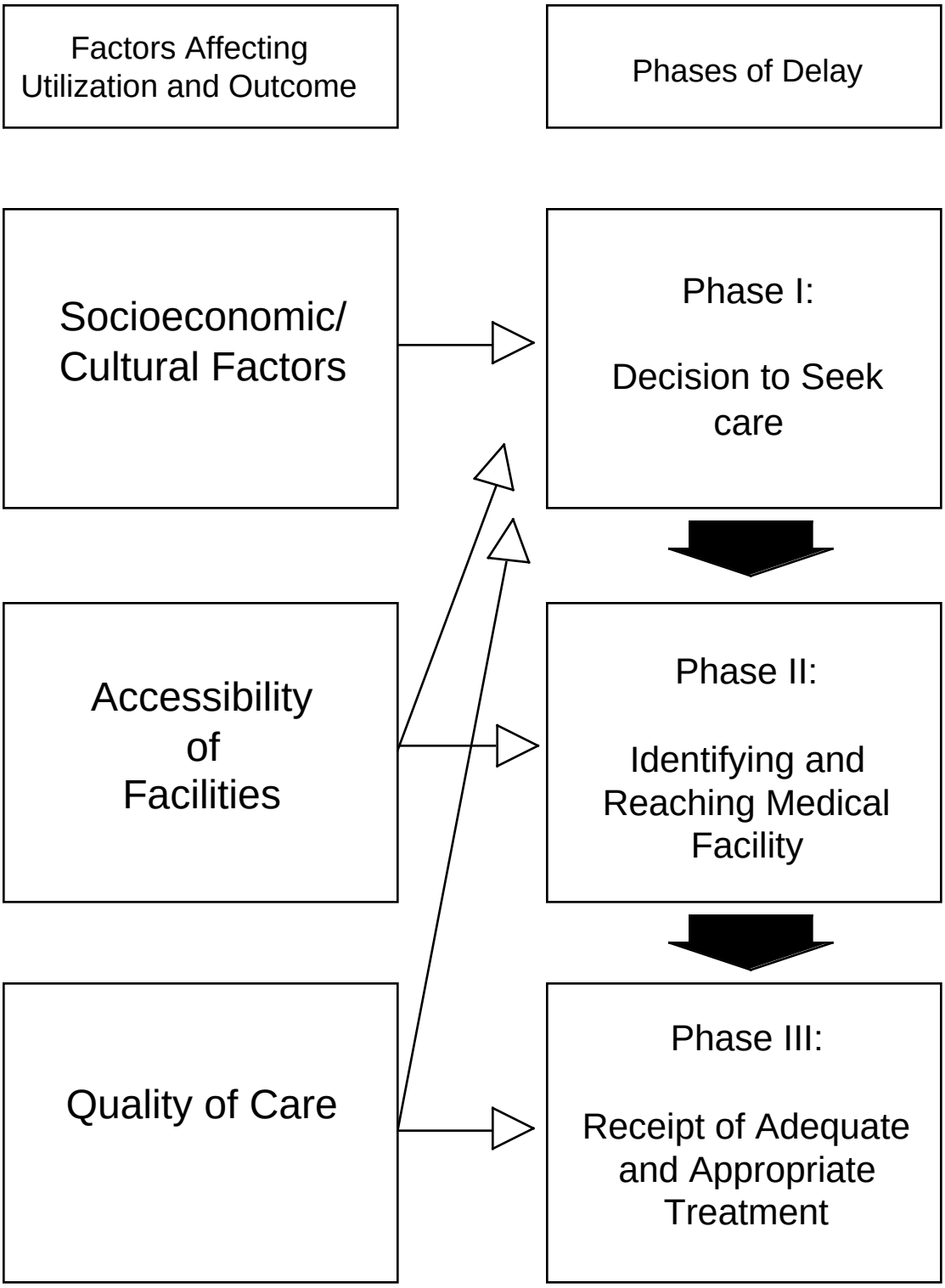
2.2.1 Delay 1: Deciding to seek care

The decision to seek care is the first step that must occur if a woman with a complication is to receive EmOC. This decision may be influenced by many factors. First of all, there is the ability of the woman and her family or attendants to recognize a life-threatening complication. They must also know where to go for help. Medical personnel often assume that lack of information in the community is a major obstacle to treatment. In a given situation, this may or may not be true. It may be that people know when help is needed but choose not to go to the hospital because they know that it lacks a physician with obstetric skills. Simple, efficient methods for assessing the importance of various factors are discussed in the next chapter.

Cultural factors can play an important role in the decision to seek care. For example, in areas where stoicism is valued, and women are respected if they suffer in silence, family members may have difficulty identifying prolonged labor. Women's status and autonomy may also affect the decision to seek care. For example, in some communities no one will take a woman to the hospital unless her husband has given his permission. There are stories of cases in Northern Nigeria in which the woman developed a complication while the husband was away, and thus died.

The distance to the health facility, availability and efficiency of transportation, and cost of health care and transportation all influence people's readiness to seek care. In addition, the reputation of the facility can play a key role. People may not seek medical help promptly or at all if they believe the services to be of poor quality.

Figure 2: The Three Delays Model



2.2.2 Delay 2: Reaching a medical facility

Once the decision to seek care has been made, the woman must reach a facility where EmOC is available. Accessibility of health facilities will thus influence delay at this stage. Accessibility is a function of distance from the health facility, availability and efficiency of transportation, and cost.

Accessibility is also a function of the services offered at various levels of the health system. For example, the distance to a functioning EmOC facility is increased if personnel at nearby health centers cannot offer even basic EmOC services.

2.2.3 Delay 3: Receiving treatment

It is important to remember that many women die in hospitals, having overcome barriers in Phases 1 and 2. The provision of emergency obstetric care is dependent on a number of factors, including number and training of staff, availability of drugs and supplies, and the general condition of the facility. In addition, there is the crucial element of management. A facility can have all the staff and supplies required, and yet provide very poor care. This is important to remember in evaluating performance. For example, a checklist of supplies and equipment does not tell you if care is actually being provided or how long it takes.

2.3 Using Process and Output Indicators

To many people, it seems obvious that the best way to measure the success of health programs is to measure their impact on the outcome of interest. In the field of maternal mortality, "impact" indicators include maternal mortality rates and ratios, and the lifetime risk of maternal death. While this approach might seem straightforward, it is not. For a variety of technical reasons, it is extremely difficult to use impact measures to monitor progress in reducing maternal deaths.[35] At the level of individual projects or district-level programs, it is virtually impossible. (See Figure 3.)

An alternative approach is to use "process" and “output” indicators. These are designed to measure changes in the steps leading up to the desired outcome. In general, “processes” refer to program activities and “outputs” refer to the results of these activities. Outputs are really just intermediate program results that lie between program activities and the desired outcome of the program. The objective is to make inferences about program success by measuring changes in the process and output indicators.

For example, suppose we are operating a maternal mortality program in a rural area with few health facilities. Process indicators could show that:

(a) hospital services have been improved (drugs, supplies and equipment have been purchased; staff have been trained; a blood bank has been established, etc.);

while output indicators could show that:

(b) the number of women with complications receiving treatment at the hospital has increased;

(c) the time from admission to treatment has decreased; and

(d) the proportion of women admitted with complications who survive has increased.[a]

If we observe these changes in the process and output indicators, then we can be reasonably sure that more of the women who develop obstetric complications are getting adequate medical treatment, and that therefore fewer maternal deaths are occurring in the population. In an urban setting, where many treatment options exist, the analysis would be more complicated because multiple facilities would need to be considered.

The evaluation strategy proposed in this book is to assess progress in reducing maternal deaths by using process and output indicators. We realize that policy makers and funders may expect to see program evaluations that use maternal mortality ratios. However, for most programs it is neither feasible nor desirable to collect the data necessary to calculate maternal mortality ratios. For this reason, the use of process and output indicators to monitor maternal mortality programs is gaining wider acceptance.[36,37]

Using process and output rather than impact indicators to monitor programs is not as radical as it may sound at first. In the field of family planning, process and output indicators (e.g., number of contraceptives distributed, number of users, etc.) have long been considered valuable indicators of program performance. A similar situation is occurring with respect to child survival interventions, with the use of measures such as utilization of oral rehydration solution and immunization coverage. In these program areas, process indicators are commonly used for evaluation purposes, even though fertility and infant mortality are easier to measure than is maternal mortality.

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[a] The inverse of this – i.e., 1-% surviving, or the proportion of women admitted with complications who die – is the "case fatality rate." This is an informative indictor, the use of which is discussed later in this manual.

Figure 3. Why Not Use "Impact" Indicators?

Maternal mortality is the most common cause of death among women of reproductive age in developing countries.[38] Nevertheless, maternal deaths (like all deaths among young adults) are infrequent events, especially compared to deaths among infants. This has important implications for program evaluation. Because the number of maternal deaths per year in a study population will be relatively small, it is difficult to tell whether fluctuations are due to program interventions or to chance. To use deaths as the indicator of success, therefore, means that the study population will need to be very large. This increases the difficulty and cost involved. Of course, the easiest way to study a large population is to use routinely collected vital registration data. Unfortunately, in most of the countries where maternal mortality is high, vital registration systems are neither complete nor reliable.[39]

In order to overcome some of these difficulties, innovative survey designs have been developed and tested.[40] The most successful of these is the "sisterhood" method.[41] The conventional survey method consists of asking adult residents of a household whether there has been a maternal death in the household during the last 2-3 years.[42] With the sisterhood method, the interviewer asks each of the adults in the household whether they have any sisters, and whether any of their sisters ever died of maternal causes. Since the adults in a household (e.g., a husband and wife) often have different sets of sisters, this increases the number of women on whom information can be gathered from visiting a single house. Thus, the sisterhood method is very efficient.

The sisterhood method, however, is of limited usefulness for evaluating programs. Its most serious limitation is that the estimate of maternal mortality it provides refers to a period about 10 years before the survey.[43] For example, if you used this method to gather baseline data for program evaluation in 1997, it would provide you with an estimate of maternal mortality around 1987. You would then have to wait more than 10 years to see if the program had any effect.

All maternal mortality surveys (including sisterhood surveys) are also limited in their ability to discriminate between real and apparent changes in maternal mortality. For example, if the original sisterhood study conducted in the Gambia in 1989 were repeated in 1999, and it showed a 25% decline in maternal mortality, the nature of the statistics is such that you could not be certain (at the 95% confidence level) that the change was real and not due to chance.[44]

Finally, there is always the danger of undercounting maternal deaths. For example, when the results of a sisterhood study were compared with population surveillance data in Matlab, Bangladesh, about one-fifth of maternal deaths had been missed.[45] These were mostly deaths of unmarried women, and deaths due to complications of abortion.[46,47]

Process and output indicators are not poor substitutes for indicators based on impact. Process and output indicators provide information that can be used to plan programs. They point to problems that need to be addressed – in the availability, utilization, and quality of services. Impact indicators do not provide such information. Knowing that Country X has a high maternal mortality ratio doesn't tell us what to do about it.

Process and output indicators also have advantages in evaluating program success. Impact indicators might provide information on whether or not there was a change in the event of interest (e.g., maternal death), but they provide no information on how the effect was achieved. Most programs will have many components. Without information on processes and outputs (e.g., changes in number of cesarean sections performed, time from hospital admission to definitive treatment, etc.), we cannot know which elements of a successful program are critical and worthy of replication. Moreover, without information on process and outputs, it is dangerous to conclude that the program was responsible for any impact observed.[48] (See Figure 4.)

Figure 4. What Happens Without Information on Process

In 1991, a paper appearing in *The Lancet* reported the dramatic success of a maternal mortality program in Matlab, Bangladesh.[49] Direct obstetric deaths were reduced by two-thirds in the program's intervention area, while they remained unchanged in the control area. The program consisted of several components: the posting of trained midwives at rural health posts; establishment of a maternity clinic, staffed by female physicians, available round-the-clock; and a system for referral and transport of women with complications. The success of the program was attributed mainly to the posting of the midwives. The paper contained little information on process and output indicators. Because the researchers were able to demonstrate the program's impact on mortality, the results carried considerable weight among policy makers. Key international agencies mobilized resources to support the training and posting of midwives to rural villages.[50]

A few years later a new team of researchers began to look for a fuller explanation for the decline. They collected and reviewed additional data in Matlab, this time focussing on process and output indicators. They found that the midwives provided valuable treatment to many women with complications in the intervention area. They also found that: 1) the maternity clinic staff provided life-saving services to many of the women referred by the midwives; 2) while a substantial number of women coming to the clinic were referred by the midwives, even more women came to the clinic on their own; and 3) many women who came to the clinic were subsequently referred and transported by ambulance to the district hospital, where surgery and blood transfusions were available.[51]

The new process and output data revealed that the program's success depended upon the existence of functioning health facilities where women with complications could get life-saving treatment. The program also benefitted from an effective chain of referral from the midwives to the clinic and from the clinic to the hospital. Referrals by the midwives, however, accounted for only a minority of the women with complications seen at the facilities. Without this information on process and output, incorrect or incomplete conclusions could be drawn.

3. Needs Assessment – What Do You Need to Know?

Prior to starting new activities or modifying existing ones, you need to find out what emergency obstetric care (EmOC) services are available, how they are functioning, and what factors might limit people's utilization of them. This can be done by conducting a needs assessment. The needs assessment will help you to decide what must be done to improve the situation, and what resources will be required.

It is important not to make assumptions about how to address the problem without verifying them. Unchecked assumptions in the planning phase can lead to seriously misguided programs. For example, when discussing the apparent underutilization of some health facilities, it is not uncommon for people to assume that the problem is in the community – that people are uninformed, or that superstitions or customs are interfering. But, even relatively simple research (such as focus group discussions in the community) may show that these assumptions are wrong. Often people know when and where to go for medical care, but they don't go because they are aware that the facility has no drugs, the staff are usually not present, or patients are treated disrespectfully.[52] Thus, it is a good idea to verify basic assumptions before committing to a particular program design. This is true even for program planners born and raised in the area.

In addition to guiding program design, information collected during the needs assessment provides baseline data against which to measure progress. The needs assessment should also reveal whether the existing systems of record-keeping will need to be modified or supplemented in order to collect information for monitoring and evaluation.

Figure 5 shows the key questions that will need to be answered in the needs assessment. It also shows the information that will be required to do so, depending on the level at which you are working. Your project may cover a relatively small area, focussing on a single facility, or perhaps a district hospital and a few health centers. Or you may be working at the provincial level, responsible for improving obstetric services in a number of districts. You may even be monitoring maternal mortality prevention activities at the national level. Whatever the level, however, the process of planning and evaluation will be the same conceptually. You will want answers to the same basic set of questions: Are emergency obstetric services available? Are women with life-threatening complications using them? Are the services of good quality?

Figure 5. Information for Planning and Evaluating Maternal Mortality Programs at Various Levels

What You Need to Know	Information Needed		
	Local/District Level	**State/Province Level**	**National/International Level**
Are life-saving services available?	• EmOC functions performed at facility • Number and distribution of functioning EmOC facilities	• Number and distribution of functioning EmOC facilities per 500,000 population	• Number and distribution of functioning EmOC facilities per 500,000 population
How many women are using life-saving services?	• Number of women with complications admitted to EmOC facilities • Met need: proportion of expected complicated cases in the population admitted to EmOC facilities	• Met need: proportion of expected complicated cases in the population admitted to EmOC facilities	• Met need: proportion of expected complicated cases in the population admitted to EmOC facilities
How many life-saving procedures are being performed?	• Number of cesarean sections (or other procedure) performed • Number of cesarean sections as a proportion of all births in population	• Number of cesarean sections as a proportion of all births in population	• Number of cesarean sections as a proportion of all births in population
What is the quality of the care provided?	• Case fatality rate among women with complications admitted to facility • Time from admission to treatment	*Review of local data will be informative; aggregation of data generally not recommended*	*Review of local data will be informative; aggregation of data generally not recommended*
How should services be improved?	• Treatment of complicated cases • Availability of drugs, supplies, blood, equipment • Staff skills, coverage, attitudes		
How can utilization of services by the community be improved?	• Cost of services; availability and cost of transport • People's confidence in health services • People's ability to recognize complications that need treatment		
What are the costs of upgrading/ expanding existing services to provide EmOC?	• Cost of improvements at health facility	• Aggregate cost of improvements at health facilities • Average cost of improvements at health facilities	• Aggregate cost of improvements at health facilities • Average cost of improvements at health facilities

Depending on the level of the health system at which you are working, the level of detail which you will need to answer these questions will differ. In general, people working at the local level will be concerned with "micro" issues, such as the functioning and utilization of facilities in particular communities. People working at higher levels will be concerned with "macro" questions, such as the geographic distribution of facilities. Answering these "macro" questions will require aggregating information collected at the local level, and comparing the findings to a standard. Information gathered at the local level is thus the basis for state and national level monitoring.

This manual focusses on the process of gathering and using information for planning and evaluating programs at the local level. But because people working at the state and national levels need to use information collected at the local level, it will be helpful to them as well. Additional guidance for people working at the state and national level is provided in Appendix B. This includes a discussion of how to sample facilities and aggregate data, as well as forms for carrying out these procedures.

As Figure 5 shows, people working at the local level will want to gather various kinds of information and explore questions in considerable depth. At higher levels of analysis, as a matter of practicality, fewer kinds of information will be used. Consider the monitoring of the number of life-saving procedures being performed: a program manager at the local level might choose to assess several different life-saving procedures (e.g., use of antibiotics and oxytocics), while a state or national level researcher might count only cesarean sections.

Figure 5 also reflects how the answers to some questions lose meaning in the aggregate: "How should services be improved?", for example, pertains to the particular facility; "How can utilization of services be improved?" pertains to the particular community. People working at the state or national level will want review the local information on such topics, but not necessarily aggregate them.

The key questions for the needs assessment are discussed briefly in the paragraphs below. Relevant data collection instruments (which are provided in Appendix A) are also described.

3.1 Are Life-saving Services Available?

As discussed earlier, emergency obstetric services are central to the prevention of maternal deaths. Therefore, as part of your needs assessment, you will need to gather data from health facilities to ascertain whether life-saving obstetric procedures are actually being performed (regardless of whether or not they are "supposed" to be). The needs assessment first focusses on assessing EmOC services at district hospitals and health centers. You may be interested in assessing services at lower level facilities as well, which can be done using similar procedures. Assessing needs at the community level is a later step, which is discussed in Section 3.6.

In order to assess services at facilities, it is helpful to select a few important EmOC functions for study. Figure 6 lists functions that can be used to identify the level of care a facility is actually providing. These are not intended to serve as a complete list of services that should be available at a facility. Rather, they are "signal functions" that can be used for classification and monitoring. Using a short, defined list of signal functions to assess services is especially helpful when a program covers a large area and numerous facilities because it facilitates comparability of results.

If a facility review reveals that a facility is providing all of the first 6 functions listed, it may be considered a "Basic EmOC" facility. This is a facility that can perform most, but not all, EmOC services. A facility that is providing all 8 functions is considered a "Comprehensive EmOC" facility. The difference between Basic and Comprehensive EmOC is the capacity to give blood and perform surgery (e.g., cesarean section). In general, it is expected that a facility at the level of a health center would be providing Basic EmOC services, while a district hospital would be providing Comprehensive EmOC services.

Figure 6. Signal Functions of Emergency Obstetric Care (EmOC)

Facility Level	**Signal Functions**
Health Center	**Basic EmOC =** Antibiotics (injectable) Oxytocics (injectable) Anticonvulsants (injectable) Manual removal of placenta Removal of retained products Assisted vaginal delivery
District Hospital	**Comprehensive EmOC =** All Basic EmOC functions plus: Cesarean section Blood transfusion

The short list of signal functions does not mean that other functions are not important. For example, at the level of the Basic EmOC facility, administration of intravenous fluids can be extremely helpful in stabilizing a woman's condition before referring her to the hospital. At a Comprehensive EmOC facility, the ability to perform surgery of course

entails a number of other important capabilities, e.g., administering anesthesia. People working with only a few facilities may thus wish to expand the list of functions examined in the needs assessment.

The Facility Functioning Assessment Form, provided in Appendix A.1, is a tool for use at district hospitals and health centers. It asks whether each of the 8 key life-saving procedures listed in Figure 6 was performed at least once in the last 3 months. Based on the answers to these questions, the facility may be classified as providing Comprehensive EmOC, providing Basic EmOC, or not providing EmOC. In this way, district hospitals that are not actually providing Comprehensive EmOC and health centers that are not providing Basic EmOC can be targeted for improvement.

The results of facility assessments can be used to assess whether there are a sufficient number of functioning EmOC facilities relative to the population. There should be at least 1 Comprehensive and 4 Basic EmOC facilities per 500,000 population.[53] It is also important to examine whether facilities are distributed so that most people have access to them. Marking the location of EmOC facilities on a map is a good way of doing this.

3.2 How Many Women Are Using Life-saving Services?

Once you know whether life-saving services are available, you will want to know whether women are coming to the facilities for treatment. Here the focus is on utilization by women with obstetric complications, rather than overall utilization of obstetric services. The number of "institutional deliveries" is sometimes used as an indicator of safe motherhood activities. But in order to reduce maternal deaths, it is women with complications – not women having normal deliveries – who urgently need to be using health facilities. And in many developing countries, having all births take place in facilities is not a realistic goal for the foreseeable future. The priority is thus serving women with complications.

What is needed is a measure of the number of women with obstetric complications who receive treatment at EmOC facilities. Ideally, we would be able to count this directly from facility registers.[b] Unfortunately, record-keeping systems in many countries are not designed to collect such information. Maternity ward registers often lack columns for recording obstetric complications. In these situations, it is important that record-keeping systems be upgraded as early as possible, and before services are improved,

[b] Note that we are counting women who have complications upon admission. Although some women who come to the hospital for normal deliveries may develop complications while in the hospital, our primary objective is to ensure that women who develop complications outside the hospital are brought in for treatment. If, however, record-keeping systems are setup in such a way that it is easier to count all women with complications, that is acceptable too. Of course, the same criteria for defining complications should be used in either case.

so that you will have baseline data for monitoring changes in utilization by women with complications over time. If it is discovered in the needs assessment that a facility register lacks a column for recording obstetric complications, then modifying these registers and training staff to use them should be the first priority. Even where the actual registers are suitably designed, staff may still need training in how to record information so that those women who arrive with life-threatening conditions can be easily counted. An example of a modified register head used successfully in West Africa is provided in Appendix A.2. An alternative is that if the facility maintains good patient files, it would also be possible to go through these to count the number of women with complications. But in the long run, a well-designed register is likely to be a more efficient means of collecting these data for ongoing monitoring.

A consistent definition of what will be counted as an obstetric complication is needed to ensure that the data are comparable over time and among facilities or geographic areas. For monitoring of programs to reduce maternal deaths, it makes sense to restrict the definition of an "obstetric complication" to only those conditions which carry a serious threat of death. It is also helpful to restrict the conditions counted to "direct" obstetric complications (i.e., those directly related to pregnancy or childbirth), because they are less likely to vary in incidence from place to place than are "indirect" obstetric complications (e.g., infectious conditions such as malaria, hepatitis, tuberculosis).

A sample Facility Data Summary form for recording obstetric complications on a monthly basis is provided in Appendix A.3. The form specifies each complication to be counted, by type, so that the likelihood of confusion is reduced. These are: hemorrhage, obstructed/prolonged labor, ruptured uterus, post-partum sepsis, pre-eclampsia/eclampsia, induced/septic abortion, and ectopic pregnancy. Still, training and supervision of the person abstracting the data is important, and further specification of how each of these conditions is to be defined is advised.

The form can be used to monitor the number of women with complications at any health facility. Because the form is designed for hospitals, however, not all parts of the form will be relevant to lower level facilities. The form can be used to collect information on a number of other key indicators; these are described in Sections 3.3 and 3.4.

If you are assessing how many women are using life-saving services in a large area such as a region or a country, a useful indicator is "met need" for EmOC. Met need for EmOC is the proportion of women with obstetric complications who receive treatment at EmOC facilities. The number of women with complications in the population, however, is unknown. Therefore, we use an estimate. A conservative estimate is that 15% of pregnant women will develop complications that require emergency medical attention.[54] (This proportion may be considerably higher in some settings, e.g., where the incidence of unsafe abortion is high.)

The forms in Appendix B contain step-by-step instructions for the calculation of met need. The first step is to estimate the number of women expected to develop

complications (assuming that this will be 15% of all pregnant women). Unfortunately, we do not know the actual number of women who become pregnant per year, because spontaneous and induced abortions are too difficult to count. Therefore, we use births as a proxy for pregnancies. To obtain the number of births per year, we multiply the population size by the crude birth rate. Then, multiplying this figure by 0.15, we arrive at an estimate of the expected number of women with complications in the population in a year. This is the denominator.

The numerator is the number of women with complications admitted to health facilities. Dividing the numerator by the denominator and multiplying by 100 thus gives an estimate of the met need – the proportion of women with obstetric complications in the population who receive EmOC.

If met need is less than 100%, this indicates that some women who need EmOC services are not receiving them. If met need is 100%, it is reasonable to conclude that most women who need EmOC services are receiving them. Since the true incidence of complications in the population may be greater than 15%, it is possible that even if met need is 100%, there may still be women in need of life-saving services who are not receiving them. It is also for this reason that the level of met need may turn out to be greater than 100%. Therefore, if a met need of more than 100% is found, this should not be taken to mean that there is necessarily a problem with the data – e.g., overdiagnosis of complications.

3.3 How Many Life-saving Procedures Are Performed?

At the level of individual facilities, this question could be specified in a number of ways: the number of blood transfusions to obstetric patients, the number of dilation and curettage procedures for incomplete abortion, the number of obstetric patients receiving anti-convulsant drugs or antibiotics, or the number of cesarean sections performed. These same indicators can then be used for project monitoring and evaluation. The choice of indicator(s) should be made keeping in mind the quality of records. For example, records on surgical procedures are often better kept than those on the administration of drugs. Also, some important life-saving procedures that do not require special equipment (e.g., manual removal of placenta) are probably less likely to be recorded.

In some situations, and particularly for large areas, it will not be feasible to monitor so many different indicators, and it will make sense to choose one or two. One of the key procedures used to treat obstetric complications is the cesarean section. Without it, many women with obstructed labor (and some with eclampsia) will die. Cesarean section is also the procedure for which information is most often available. This is because operating theater registers are usually among the best kept records in a hospital. These two features make cesarean section a particularly good choice for monitoring the performance of life-saving procedures.

It is expected that a minimum of 5% of all births in a population will involve complications that require cesarean sections. Because of the potential for overuse of the procedure, a maximum level of 15% of all births has also been set.[55]

The Facility Data Summary form, provided in Appendix A.3, shows how to collect information on the number of cesarean sections on a monthly basis.

3.4 What Is the Quality of Life-saving Services?

One way of assessing the quality of obstetric care is to calculate the proportion of women admitted to a hospital with complications who die. This proportion is called the obstetric case fatality rate (CFR). For many years, people have calculated a similar proportion called the "hospital maternal mortality rate" – the maternal deaths as a proportion of all births (or live births) in the hospital. We discourage use of the latter, because it fluctuates as the number of normal births in the hospital changes. Moreover, its meaning is unclear – it is certainly not an indicator of the level of maternal mortality in the population, because in many countries most deaths take place outside the hospital. CFR does not measure the population level of maternal mortality either, for the same reason. But it does reflect the quality of EmOC in the facility by measuring the likelihood of survival once women with complications reach the hospital. (CFR is also influenced by the condition in which the patient arrives.) The goal for CFR is to have no more than 1% of women reaching the facility with complications die.[56] A recent survey of first referral hospitals in 10 districts in India found CFRs ranging from 1% to 7%, indicating that the quality of services in many districts was relatively good.[57]

Calculating CFR is not recommended for health facilities that refer most women with serious complications to higher-level facilities for treatment. This is because women with poor prognoses are likely to be referred out, resulting in a low CFR that is unrelated to the quality of care received. CFRs should therefore only be calculated for facilities that are the usual endpoint of the referral chain, such as a district hospital.

It is important to remember that CFR is most meaningful at the level of individual facilities. If CFRs from several different facilities in a state or country are aggregated, important information will be lost. An average CFR of 2% for all hospitals in Country X may sound good, but it may conceal the fact that while hospitals in the capital are doing well, some hospitals in the provinces have CFRs of over 25%. A more useful way to analyze CFR at the state or national level is to plot CFRs from individual facilities as separate points on a graph (a “scattergram”). Another way is to assess the proportion of facilities with CFRs at various levels – e.g., X% of facilities have CFRs less than 1%, Y% of facilities have CFRs between 1% and 5%, and Z% of facilities have CFRs greater than 5%.

The number of women with complications admitted to the facility is the denominator of the CFR. Thus, the ability to calculate this indicator also depends on the establishment of systems for counting the number of women with complications admitted (as

described in section 3.2). Records of deaths, including cause of death, are usually available. The Facility Data Summary Form (Appendix A.3) is designed to collect data on the number of obstetric deaths that occur in a facility, by complication. It also provides rows and instructions for calculating CFR. If the number of women with complications is sufficiently large, trends in CFR can be monitored on a monthly basis. Monthly data make it possible for program managers to respond rapidly to changes in the indicator. If the number of women with complications per month is small, the CFR will be subject to large monthly fluctuations, and instead, quarterly or even annual measurements will need to be used.

As discussed earlier, prompt treatment is critical to preventing maternal deaths. Unfortunately, all too often there are delays even after a woman with a complication arrives at a facility for treatment. Measuring the time interval from admission to treatment is another way of assessing the quality of care provided. When using this indicator, it is crucial to set clear criteria (before starting the study) concerning which women will be included and what constitutes "treatment." In order to avoid "comparing apples and oranges," it is important not to include in the study women with widely varying needs – e.g., women with postpartum hemorrhage and women having normal deliveries. Confining the study to women who require emergency cesarean section, for example, clearly defines both the population and the "treatment."

3.5 How Should Services Be Improved?

If a particular hospital is not performing critical EmOC functions, or has an unacceptably high CFR, the next step is to ask why. The answers to this question are expected to provide information directly relevant to improving the situation.

There are many reasons why a health facility may not be providing adequate EmOC. It may be lack of drugs and supplies, or that equipment such as the blood bank or anesthesia machine is broken. Staff may not have the training to perform life-saving obstetric procedures. Or if staff are skilled, they may not be readily available on a 24-hour basis, or even for more than a fraction of the day. Poor procedures for managing complicated cases can also be a problem.

A good place to start in investigating what needs to be done is to make a site visit and carry out a straightforward inventory of key staff, equipment and supplies. Sample checklists of minimum required personnel and materials for the hospital and health center levels are provided in Appendices A.4 and A.5. Such checklists can also be useful for ongoing monitoring and supervision visits once the program has begun.

While an inventory checklist is a good way of identifying what human and material resources are lacking, it cannot tell you why they are lacking. For this, interviews with health facility staff are required. Health facility staff may be helpful in identifying the reasons for the problems, and perhaps even in identifying solutions. Interviews may also include questions on whether protocols for the treatment of obstetric

complications exist, and whether they are practiced. It is important to interview a variety of staff – e.g., midwives, nurses, doctors and technicians – to avoid bias and get a well-rounded picture. Interviewing only the chief medical officer, for instance, could give a very distorted impression of things. The midwife in charge of the maternity ward is often most knowledgeable about the day-to-day functioning of the facility with regard to obstetric patients. A sample interview guide for use with health facility staff is provided in Appendix A.6.

Another method of identifying specific areas in need of improvement is to conduct case reviews of women admitted with obstetric complications (both survivors and non-survivors). This could involve both qualitative and quantitative information gathered from health facility staff, patients and/or relatives, and health facility records. Whatever methods and sources used, the focus of this inquiry should be identification of factors – sometimes called "critical events" – that contribute to delays in treatment. Important quantitative data include time of arrival and time of life-saving treatment (such as surgery, administration of drugs, and blood transfusion), and cost of treatment and supplies. Qualitative information includes how treatment decisions were made, the process involved in deciding to seek care, and the patient's and/or her family's experience at the facility. Guides for collecting both types of data are provided in Appendices A.7 and A.8.

3.6 How Can Utilization Be Improved?

Community-level needs assessment is an important part of designing any program to reduce maternal deaths. Even when facilities are functioning well, there may be significant barriers to women with complications using them. The research required to shed light on these barriers is relatively simple and inexpensive – usually community focus groups or in-depth interviews are sufficient. A community survey is not necessary.

Poor utilization of EmOC is frequently blamed on ignorance or traditional beliefs in the community. As noted earlier, however, the community's justified lack of confidence in poor quality services is often a more important factor. If this is the case, improving services and informing the community about the improvements may go a long way toward reducing maternal deaths. Some community members may not use the facility because they feel they are not treated with respect by health staff. This also would need to be addressed at the facility. Another possibility is that there are financial and geographic barriers to women reaching care. Or perhaps transport is only available on certain days. Or there may be a need to educate communities and traditional birth attendants on the signs of life-threatening complications and the importance of seeking prompt medical care. This is the kind of information that can only be learned from the community. Understanding the reasons for poor utilization will help you to design programs that allow women with complications to get the care they need.
Community data should be gathered from men as well as women, since men are often influential in determining whether women will seek treatment or not. Special groups such as traditional birth attendants, village leaders, and transport owners may also be

helpful in identifying barriers and potential solutions. A sample Community Focus Group Discussion Guide is provided in Appendix A.9.

3.7 What Will Upgrading/Expanding Services Cost?

When governments and international agencies consider implementing or replicating programs to reduce maternal deaths, they will want to know how much the programs will cost. Information on cost is key to dispelling the common assumption that improving EmOC will be prohibitively expensive. Activities to reduce maternal deaths will almost always be carried out within existing health systems, whether government or private. This usually means that most of the funds required have already been paid out – the hospital has been built, the doctors educated, etc. In many instances, therefore, what people in the ministry of health, for example, will be interested in is information on the cost of the additional inputs required to upgrade or expand EmOC services. This is called the "marginal" cost. Unfortunately, such information is rarely collected as a part of evaluation.

An example of a form for collecting data on the marginal cost of improving EmOC at hospitals is provided in Appendix A.10. Such improvements can often be collaborative efforts, with resources mobilized from governments, private agencies, and communities. The form in Appendix A.10 has been designed to measure the contributions of each.

Collecting information on the cost of community activities is also useful, as they are often more expensive than people expect. For example, conducting a community information, education and communication (IEC) campaign might include the cost of producing IEC materials for distribution, booking venues for IEC events, providing refreshments or other hospitality, and traveling to different locations. In addition, community activities often require donations of time or other resources by important opinion leaders who are not employed within the health system – traditional leadership, for example. Most community activities also require the dedication of ongoing efforts and resources to sustain their effects over time.

3.8 Data Sources and Instruments

Figure 7 summarizes the data sources and relevant tools or instruments for collecting each kind of information required for the needs assessment.

Figure 7. Information, Data Sources and Instruments for Needs Assessment

What You Need to Know	Data Source(s)	Tool or Instrument
Are life-saving services available?	Facility site visits	Facility Functioning Assessment Form (Appendix A.1)
How many women are using life-saving services?	Facility register(s)	Suggested register headings (Appendix A.2) Facility Data Summary Form (Appendix A.3)
How many life-saving procedures are being performed?	Operating room log book Blood bank log book Patient treatment notes	Facility Data Summary Form (Appendix A.3)
What is the quality of the care provided?	Facility register(s) and death records (to calculate CFR)	Facility Data Summary Form (Appendix A.3)
How should services be improved?	Supervision visits Health facility staff Case reviews	Supervision Visit Checklist (Appendices A.4 & A.5) Health Facility Staff Interview Guide (Appendix A.6) Health Facility Questionnaire and Patient/Family Interview Guide for Case Studies of Women with Obstetric Complications (Appendices A.7 and A.8)
How can utilization of services by the community be improved?	Community members	Community Focus Group Discussion Guide (Appendix A.9)
What are the costs of upgrading/ expanding existing services to provide EmOC?	Project records	Summary Form for Costs of Hospital Improvements (Appendix A.10)

4. Program Design

The information gathered during the needs assessment will help to determine which interventions are most important in a particular setting. For example, if it is found that cesarean sections are not being performed at the district hospital because there is no one trained to do them, a priority might be to arrange for such training. If women with complications are arriving at the hospital in poor condition because fluids and antibiotics are not available at the health center, then the program should address this shortage. If women are unable to reach health facilities due to lack of transport or funds, community interventions are needed.

The logic is straightforward (but often overlooked): the choice of program interventions should be grounded in the findings of the needs assessment. A case study of the use of needs assessment findings in program planning is presented in Figure 8 below.

In addition to the choice of activities, the order of implementation is also important. It is crucial not to begin community mobilization activities unless some EmOC services are already available and functioning. Obviously, if the facilities are not able to deal with obstetric emergencies, people should not be encouraged to use them. Therefore, in the following discussion we begin with improving the availability and quality of EmOC, then discuss improving transportation between health facilities, and then discuss mobilizing and educating communities. This does not mean that community activities are unimportant, it just acknowledges that they depend on a functioning health system in order to reduce maternal deaths.

The order of implementation is important for another reason, as well. If new activities are all introduced at the same time, their individual effects may be difficult to distinguish. For example, if services at the hospital are improved and community mobilization activities launched in the same month, it will not be possible to say which was responsible for any observed changes in utilization. For this reason, it may be useful to allow some time between the introduction of new activities. When activities are phased in this way, it may be possible to examine the effect of the first, and then the effect of the first combined with the second. For example, we might be able to say that after services at the hospital were improved, mean monthly utilization by women with complications increased by X%, and that after community activities were launched, an additional increase of Y% took place. Such information on the relative contributions of different activities can help set priorities for future program efforts. A method for planning for the implementation of activities will be described in Section 4.2.

Figure 8. Case Study: Needs Assessment and Program Design in Zaria, Nigeria

At the Hospital

Needs Assessment Findings: Interviews with doctors and nurses and a review of records at the teaching hospital revealed two main reasons for delays in treatment. First, drugs and surgical supplies needed to be purchased from pharmacies outside the hospital before treatment could begin. Second, the operating theater was not functional, primarily due to a broken anaesthetic machine. Average time from admission to treatment for women needing emergency surgery was almost 4 hours.

Program Design: Given these findings, the team decided to refurbish the operating theater, labor room and recovery room and to equip these facilities with the necessary supplies. Emergency obstetric supplies were pre-packaged and sold to patients at wholesale cost. In cases where relatives arrived unable to pay, treatment was started immediately, while relatives went home to collect money. The team also upgraded the hospital blood bank.

At the Health Center

Needs Assessment Findings: A lack of drugs and materials – such as IV infusions, ergometrine, antibiotics, and antimalarials – was identified as a major constraint to providing basic emergency obstetric care at the rural health center. Moreover, patients referred to the teaching hospital were responsible for arranging their own transportation, which often contributed to substantial delay.

Program Design: The team equipped the health center with supplies and established a revolving fund to ensure that life-saving drugs were on hand. A used ambulance requiring a new battery was made available by the Ministry of Health for the transport of referred patients to the hospital. Finally, to upgrade the quality of service, the team organized refresher courses for health center staff in obstetric first aid and indications for referral.

In the Community

Needs Assessment Findings: Focus group discussions in the community revealed several factors contributing to delays in seeking treatment. Women could not leave home without their husbands' consent. When the husband was not available, often no one else would give permission. Other factors contributing to delay in seeking care were the high cost of transportation, drugs and medical supplies, and the traditional custom of women laboring in solitude.

Program Design: Based on these findings, the team planned a public education campaign on recognition of complications and need for early referral. They also worked with community leaders to establish round-the-clock availability of local transport and a revolving fund for emergency obstetric care.

Finally, the monitoring and evaluation activities should be planned at the same time that the program is designed. This is to ensure that collection of data – and collection of the right data – begins prior to (if possible) or at the same time as program activities begin.

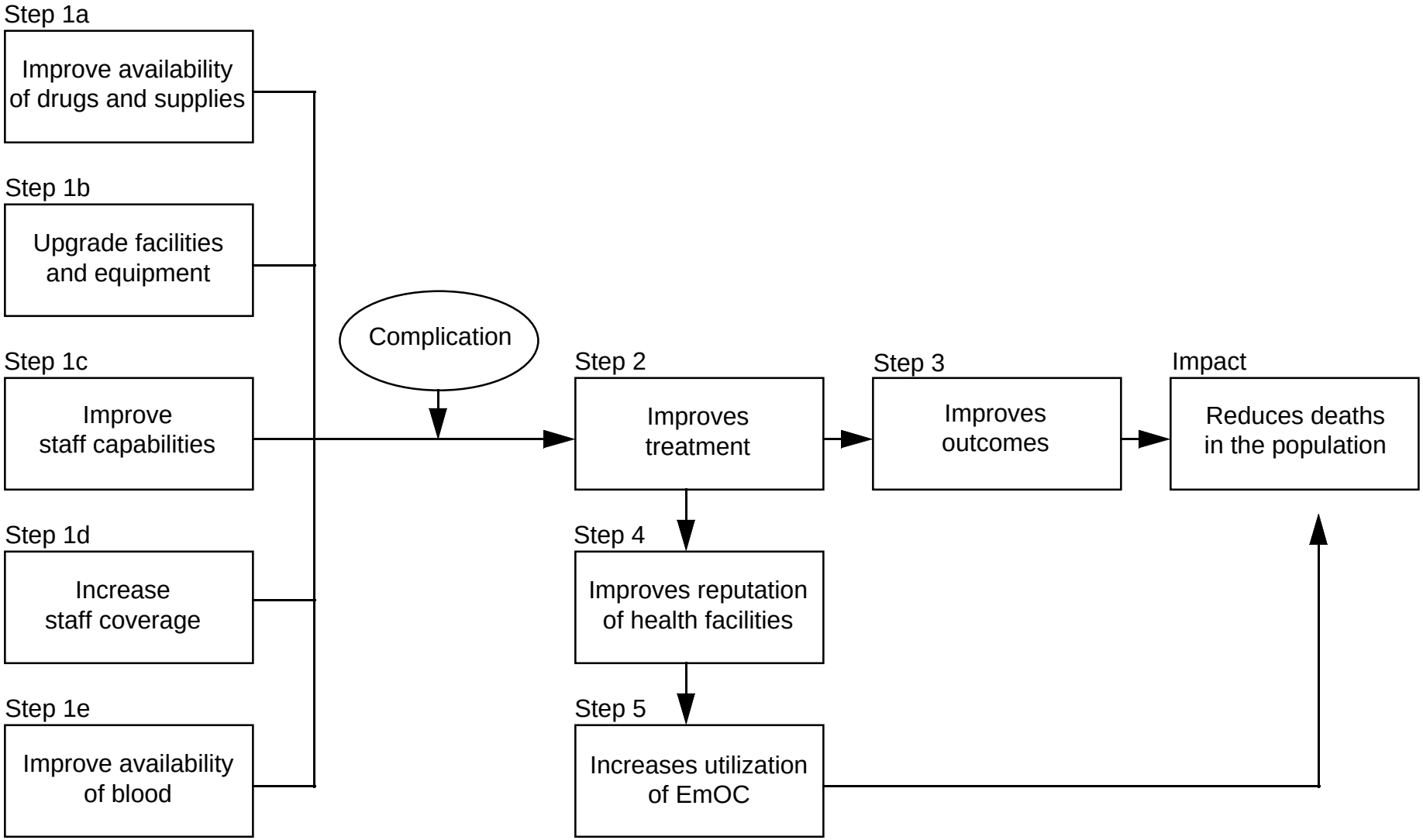
4.1 Designing Interventions

Thinking about the various components of a program, and how they work together, is a key part of planning. It is often helpful to draw a diagram that shows the steps that make up the "causal pathway" leading from an intervention to a reduction in maternal deaths. Specifying the steps in the causal pathway is a good way to see whether any crucial steps have been forgotten. In the following sections, several key interventions to reduce maternal mortality are presented, and illustrated with examples drawn from the PMM Network. The causal pathways from these interventions to the desired outcome – a reduction in maternal deaths – are presented graphically.

4.1.1 Interventions to improve EmOC services

Figure 9 presents the causal pathways for five key activities to improve the availability and quality of emergency obstetric care. Each of the interventions is discussed briefly below.

Figure 9
Improve Availability and Quality of Care



▶ Improve availability of drugs and supplies

Lack of drugs and supplies in health facilities contributes to delay of treatment in many developing countries. When such shortages occur, relatives of the patient are generally sent out to private pharmacies to purchase the needed items before treatment can begin.

In some situations, the problem can be remedied by improving the system of supply from the government's central storehouse to the district. In many situations, however, what is needed is a way to work around the problem.

> The PMM teams in Africa have experimented with a variety of revolving fund plans. In the district hospital in Bo, Sierra Leone, there is now a 24-hour pharmacy which is independent of the country's procurement system. It sells commonly-prescribed drugs which have been bought from a commercial supplier in Europe, and the drugs are replaced with proceeds from the sales.[58]
>
> The Zaria and Sokoto teams in Nigeria have established systems in which emergency obstetric "packs" that contain the drugs and supplies needed to treat serious complications are kept available in the obstetrics department at all times. Revolving fund mechanisms are in place to maintain the supplies.[59,60]

Other variations can be developed to fit local circumstances. The point of all of them is to decrease the delay in providing treatment by having necessary drugs and supplies in stock.

Some readers may be distressed by the idea of asking poor people to pay for supplies. Whether or not this is acceptable will depend on local circumstances.[61,62,63] At the moment, however, the alternative to having people pay for supplies is generally for the frantic relatives to be sent out into the town to search for the supplies. The town may be new to them, prices may be inflated, and if it happens to be night, pharmacies are likely to be closed.[64]

▶ Upgrade facilities and equipment

When the need for EmOC is pointed out, policy makers sometimes respond that providing EmOC will be very expensive. They assume that it means building new facilities and hiring new cadres of health workers. In reality, in many countries there are considerable resources already allocated to the health system that are under-utilized. For little additional cost, these can be upgraded to provide EmOC. This is not to imply that all the resources needed are available. But there are often substantial improvements that can be made largely by using existing resources.

The Freetown, Sierra Leone PMM team found an operating theater that was not being used for lack of a structure upon which to mount a lamp. The lamp itself was also sitting unused in storage. At little cost, the team installed a beam and affixed the lamp. With the purchase of a laparotomy set and other equipment, an obstetric operating theater was put into service. The team also used low-cost equipment where possible. For example, instead of buying expensive sterilizing equipment, they purchased a kerosene stove and several large pots in which equipment is boiled.[65]

The Accra PMM team renovated an abandoned warehouse and converted it into a functioning village health post with a trained midwife on staff. By mobilizing resources from the community, the Ministry of Health, and private charitable organizations, the team only needed to contribute 10% of the US $12,000 required.[66]

- **Improve staff capabilities**

Upgrading the skills of staff – physicians, midwives or nurses – is an important part of extending EmOC out toward the people who need it. For example, in many countries there are district hospitals staffed by general practice physicians who do not perform cesarean sections. Instead, they refer all women who need surgery to the nearest teaching hospital (which is often in the country's capital). Similarly, in many countries midwives are not trained or authorized to do such life-saving procedures as manual removal of retained placenta. There is no technical reason for such policies, and they result in many deaths.[67]

In Sokoto, the PMM team arranged for obstetrician specialists to come for periodic visits. During their stay, they trained local general physicians in emergency obstetric procedures while also treating women with complications.[68]

The Kumasi PMM team in Ghana arranged training for midwives at the Juaben Health Center. They noted that a substantial proportion of manual removals of placenta, vacuum extractions and episiotomy repairs were subsequently performed by the midwives.[69]

The Enugu, Nigeria PMM team found that privately-owned facilities were important providers of EmOC in their area, but that much of the care in these facilities was provided by relatively unskilled auxiliaries. Working with the proprietors, the team arranged EmOC training courses for the auxiliaries, including a clinical rotation at nearby hospitals.[70]

Of course, the lessons learned about training in other fields should be applied here, whenever possible. For example, it is preferable to train the whole surgical team

together (physician, nurse, anesthetist). Also, phased training – which allows people to use a few new skills before learning more – is preferable to one long training course.[71,72]

► Increase staff coverage at facilities

As with the problem of drugs and supplies, lack of 24-hour availability of key staff is endemic in developing countries. The district hospitals and health centers in many countries function for only a fraction of the day (often morning), and are virtually inactive the rest of the day and all of the night. This may be true even when there are a number of doctors on staff.

The reality of the situation is that government salaries in many places have not kept up with inflation (or currency devaluation), and therefore staff supplement their salaries by having private practices. Perhaps it is not possible to change this situation, but in many places a rotation roster could be put in place so that the hospital would always be adequately staffed.

Another cause of inadequate coverage, even in teaching hospitals, is the practice of doctors being "on call" but off the premises. In such situations, when an emergency cesarean section is needed in the middle of the night, then a car must be found (often the ambulance) to go collect the doctor. Such delays can be fatal to the woman.

> The Calabar, Nigeria PMM team has created an "on-call room" in the obstetrics ward where doctors are expected to stay when on duty. In this way, the expenditure of a small amount of money (for paint, bed, air-conditioner, etc.), in conjunction with improved supervision and management, can make better use of existing staff.[73]

► Improve availability of blood at facilities

Improving access to blood for transfusions can expand the range of emergency services performed in a facility. Many district hospitals, at present, have no blood supply. In teaching hospitals, getting blood from the hospital's central blood bank sometimes wastes precious time. A blood bank need not be a very complicated or sophisticated arrangement. Technical advice can be obtained from the WHO or other organizations. Once the blood bank is functioning, it may then be appropriate to make blood donation part of the community mobilization drive.

> The Bo PMM team found an unused but functional large-capacity blood bank in the Ministry of Health storehouse, and arranged to have it transported to the district hospital in Bo. After using it for a while, they found that many units of blood were being wasted due to the irregularity of the electrical supply. They responded by purchasing a smaller, simpler

kerosene/electric refrigerator, and storing smaller quantities of blood which they would replace immediately upon using.[74] The Freetown team established a functional blood storage system using a UNICEF cold chain box.[75]

The causal pathway for improving EmOC services (see Figure 9)

Step 1 The first step of the hypothesized causal pathway is the intervention itself – improving the availability and quality of services. This could be any of a number of activities (Steps 1a-1e).

Step 2 The interventions in Steps 1a-1e are expected to lead to the second step in the pathway – improved treatment of complications.

Step 3 Improved treatment is expected to lead to improved outcomes – i.e., fewer deaths among women with obstetric complications treated.

Steps 4 & 5 Improved treatment is also expected to reduce maternal deaths by another route. Improved services can improve the reputation of the health system in the community (Step 4), which can in turn, lead to increased utilization of emergency obstetric services (Step 5).

Impact If the changes envisioned in steps 1 - 5 take place, then maternal deaths should be reduced in the population.

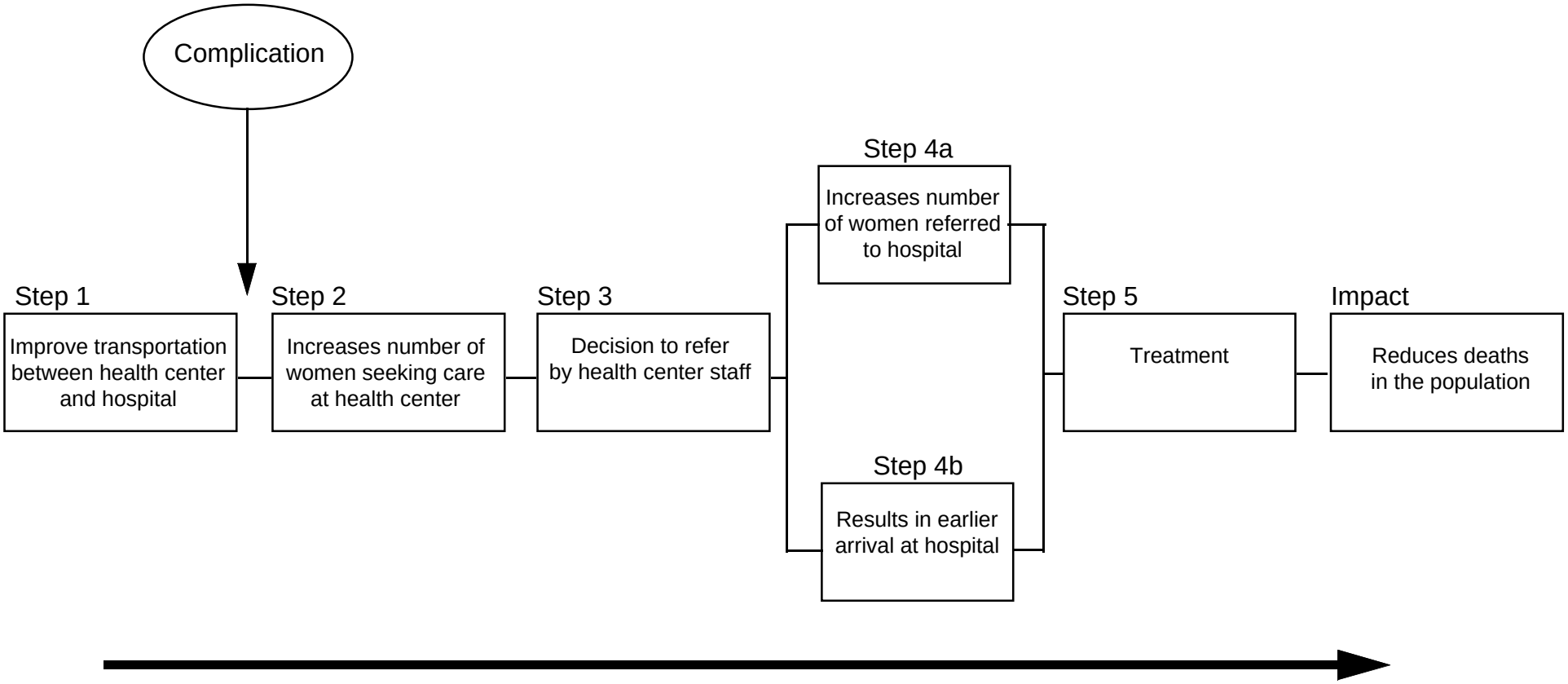
4.1.2 Interventions to improve transport

Interventions to improve transport of women with complications can be divided into two types: those aimed at transporting women between health facilities (e.g., from health center to hospital), and those aimed at transporting women from the community to the health system. The former generally entails some form of ambulance operated by the health system. The latter is more likely to be a part of community mobilization activities. Therefore the two are treated separately here.

Figure 10 shows the causal pathway for an intervention to improve transportation between health facilities. Depending on the situation, it may or may not be feasible to have an ambulance at every health center. While ambulances may seem like a relatively simple solution, in fact they are often not working or not around when they are needed. So, again, management and supervision are crucial. Where it is not possible to have an ambulance at every facility, it may be possible to have some way to call for the ambulance, as shown in the example below.

> The Bo team posted a single 4-wheel drive vehicle to the district hospital and motorbikes at surrounding government health centers. In the event of an emergency, health center staff would travel by motorbike to the hospital to summon the vehicle. This system was vulnerable to breakdowns and road accidents, and the travel time it took was substantial. Later, shortwave radios were installed in the health centers, at the hospital, and in the vehicle, which proved to be a more satisfactory system.[76]

Figure 10
Improve Transportation Between Health Center and Hospital



The causal pathway for improving transport between facilities (see Figure 10)

Step 1 The intervention is the first step – refurbishing or purchasing an ambulance (or other suitable vehicle) to transport women with complications from lower to higher level facilities, e.g., health centers to hospitals.

Step 2 Awareness of the improved transportation to the hospital is expected to increase the number of women with complications seeking care at the health center.

Step 3 Improvement in transportation between health facilities is also expected to affect the staff's decision to refer for further treatment those women whose complications cannot be treated at the health center. Factors affecting referral of patients could be assessed by interviews with staff at the referring facilities.

Step 4a Changes in the decision to refer are expected to have two important results in the fourth step. First, the availability of improved transportation should result in more referrals being completed.

Step 4b Second, the improved transportation is expected to reduce the time it takes for women to get from the health center to the hospital.

Step 5 Step 5 is the provision of treatment to women with complications at the hospital. The reduction in delay due to transport problems is expected to lead to improved outcomes among women who are referred for treatment.

Impact If all of these changes happen as planned, this should reduce the number of maternal deaths in the population.

4.1.3 Interventions to mobilize communities

- **Educate communities**

Community members need to be able to identify complications and seek care promptly. Educating people in the community – including traditional birth attendants (TBAs) – is one of the most important community-level interventions. The major obstetric complications are usually not difficult to recognize (see Figure 11). Certainly, discussing the signs and symptoms should be part of antenatal consultations and training for traditional healers. This information should be spread widely in the community – not just to pregnant women and traditional birth attendants. The TBA may not be there when a woman starts to bleed, and husbands and mothers-in-law may be the ones to decide whether to seek care, and from whom.

Figure 11. Community Education on Recognition of Complications

Seek emergency obstetric care if any of these occur:

Any vaginal bleeding before labor
Heavy bleeding during or after labor
Severe headaches and/or fits
Swollen hands and feet
Fever
Smelly vaginal discharge
Labor from morning till nightfall or vice versa
Any part of the baby showing except the head

After upgrading services in facilities, the Sokoto team launched a community education campaign to encourage greater utilization of services. Their messages focussed on recognition of complications and the need for prompt treatment. They used various means to disseminate these messages, including weekly meetings with community leaders, video shows, posters and flyers.[77]

The Kumasi PMM team disseminated similar messages, spreading word of the improved services at facilities. They made use of existing channels

of communication – Ministry of Health outreach and village health workers, public health nurses and midwives, and village health committees – and addressed a variety of audiences, including women's and church groups.[78]

The Calabar PMM team adopted a different approach, training a group of community educators to disseminate key messages.[79]

- **Improve community transport**

Even if there were an ambulance at every health center, women would still need to be able to reach the health center. This is where community mobilization is key.

The Freetown PMM team organized "action groups" of village men prepared to transport women by hammock to the nearest road in the event of a complication.[80]

The Sokoto team worked with the local transport unions, conducting sensitization and awareness workshops and establishing an emergency fuel fund for drivers who transport women with complications.[81]

The Zaria team motivated local drivers to agree to transport women with complications for a predetermined and reasonable fee.[82]

- **Establish emergency loan funds**

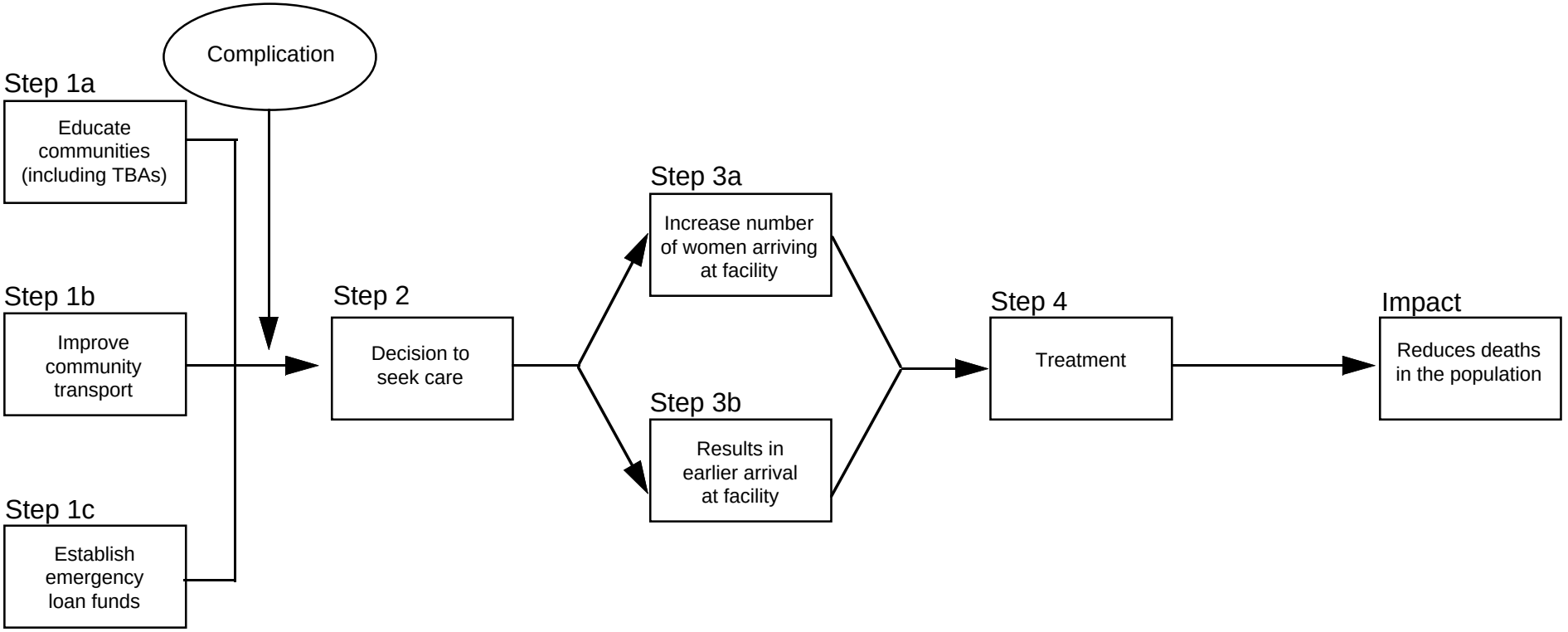
The cost of transport, hospital fees and supplies may add up to more money than most families have available on short notice. Emergency loan funds, run by community leaders, are a way to deal with this problem. In some societies – including various groups in West Africa – there are traditional savings clubs. In such societies, programs can build on this local expertise. Establishing an emergency fund presents opportunities to emphasize to community leaders the importance of prompt medical care for women who develop complications. It can also provide a forum for community education, e.g., at a ceremony to inaugurate the fund.

The Benin, Nigeria PMM team worked with the traditional clan leadership in their area to set up emergency loan funds for women with complications. With a small amount of seed money from the team, community members contributed several hundred dollars to establish the funds. The funds were managed entirely by the community, which decided upon a 6-month grace period with nominal interest charged thereafter. In the first year of operation, several hundred small loans were granted, and almost all were repaid in full.[83]

The Zaria team in Nigeria and the Bo team in Sierra Leone also worked with communities to set up loan funds. Again, the funds were managed entirely by the community.[84,85]

Figure 12 depicts the causal pathways for the three key community-level interventions described above.

Figure 12
Educate and Mobilize Communities



The causal pathway for mobilizing communities (see Figure 12)

Step 1 The first step is to carry out the community activities.

Step 2 Each of the community activities is expected to affect the decision to seek care, either by helping people recognize the need for medical care more quickly, or by improving their access to money and transportation.

Step 3a Community interventions are expected to have two important results. First, they should increase the number of women seeking care.

Step 3b Second, all of these interventions are expected to reduce the time it takes women to get to facilities.

Step 4 Step 4 is treatment provided at the facility. The number of women receiving treatment at the facility should be increased. The reduction in delay is expected to lead to improved outcomes among women with complications who reach the health facility.

Impact If steps 1 - 4 are accomplished, then maternal deaths in the population should be reduced.

4.2 The Implementation Plan

The implementation plan specifies the timing and order of program activities. It often takes the form of a timetable, and serves as an overall work plan for the program. The implementation plan can also include the timing of monitoring and evaluation activities, as a reminder that data collection procedures need to be in place before program activities begin. This will also help managers plan for periodic review of data collected and the writing of interim evaluation reports. For this reason, the implementation plan should be written at the same time as the monitoring and evaluation plan (section 5.2). An example of an implementation plan is provided in Appendix A.11.

5. Monitoring and Evaluation

It is hardly possible to overemphasize the importance of monitoring and evaluation of health programs. It is not enough to design and implement apparently worthwhile activities. We have to make sure they work on the ground. Process and output indicators are especially useful in this regard because they provide information not only for the final evaluation, but also for ongoing management and improvement of program components.

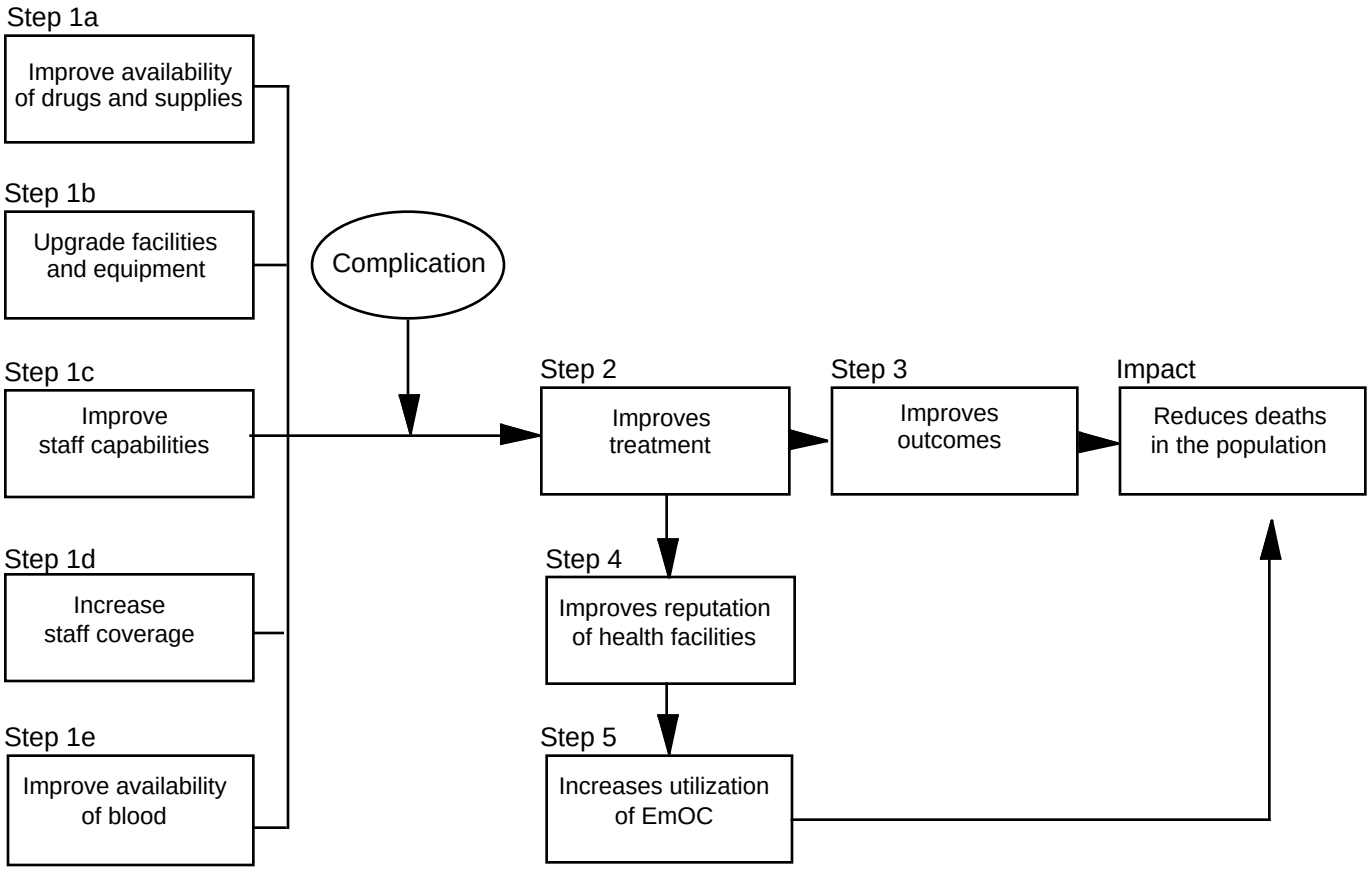
In this chapter, we will return to the causal pathway diagrams presented in Chapter 4, and use them to derive a set of process and output indicators for each intervention. The general idea is to use the diagrams to develop indicators for steps at several points along the hypothesized pathway between an intervention and the reduction in maternal deaths. Then by watching for changes in these indicators, it is possible to make inferences about program effect. Once you are familiar with this approach, you can use it to develop indicators for any program.

There is a growing recognition in the field of international health that not all projects can be expected to measure impact. Instead, what is important is that the indicators used have an established connection with the goal of the program. This is the idea behind using process and output indicators.

Using process and output indicators differs from using impact indicators in that a number of kinds of information is usually required. By gathering information on several process and output indicators along a pathway, we are better equipped to make inferences about the effect of program activities on the desired outcome. Several of the interventions share common pathways, and hence indicators. This greatly simplifies data collection.

You will notice that the monitoring and evaluation indicators derived below correspond to the needs assessment questions outlined in Chapter 3. This should come as no surprise. The information needed to design a sensible program is the same information needed to assess how it is working – information on the availability, utilization, and quality of emergency obstetric services. Ideally, the information collected during the needs assessment should serve as the baseline information against which progress is measured.

Figure 13
Improve Availability and Quality of Care



STEP	PROCESS/OUTPUT INDICATORS	DATA SOURCES
1a	Availability of drugs and supplies Utilization of drugs and supplies	Checklist data Health facility data
1b	Availability of upgraded EmOC facility/equipment Utilization of upgraded EmOC facility/equipment	Project staff reports; staff interviews Health facilities data
1c	Number of trained staff Improved staff capabilities	Project staff reports Pre- and post-tests; case reviews
1d	Proportion of hours per week with skilled person on-call Proportion of hours per week with skilled person on-site	staff schedule; project staff reports staff schedule; project staff reports
1e	Availability of blood Utilization of blood	Checklist data Blood bank log
2	Time from arrival to definitive treatment Number of c-sections (or other procedure) performed	Case-reviews; time-motion studies Operating theatre log
3	Case fatality rate	Health facility data
4	Reputation of health system in community	Pre- and post- mini-surveys
5	Number of women with complications admitted to facility	Health facility data

5.1 Deriving Indicators

5.1.1 Indicators of improving services

Figure 13 shows again the causal pathways for five key interventions to improve the availability and quality of emergency obstetric care: improving availability of drugs and supplies; upgrading facilities and equipment; improving staff capabilities; increasing staff coverage; and improving availability of blood. It also shows the process and output indicator(s) that derive from each step in the pathway, as well as the sources for gathering data on these indicators. The derivation of indicators is discussed step-by-step below.

Step 1 The first step of the hypothesized causal pathway is the intervention itself (see Figure 13). The evaluation indicators for this step are direct measures of program process or output (e.g., availability of drugs and supplies, utilization of drugs and supplies, etc.).

Step 2 All of the interventions in Figure 13 can be expected to lead to the second step in the pathway – improved treatment of complications. A number of indicators can be developed to measure this, including a reduction in time from arrival to definitive treatment and an increase in the number of cesarean sections (or other life-saving procedures) performed.

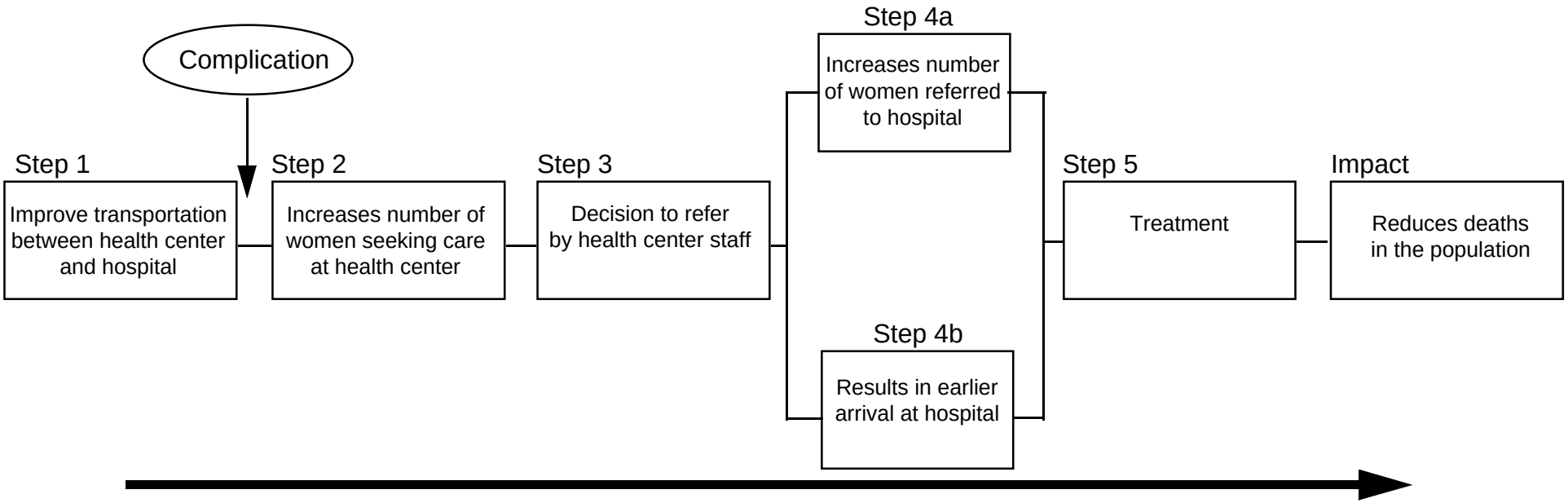
Step 3 Improved treatment can be expected to result in improved outcomes among women treated. The indicator for this step would be a reduction in case fatality rate (CFR) – the proportion of women admitted with obstetric complications who die.

Step 4 Improved treatment can also be expected to reduce maternal deaths by improving the reputation of the health system in the community (Step 4), which should, in turn, lead to increased utilization of emergency obstetric services (Step 5). The indicator for Step 4 would be the reputation of the health system in the community, as measured by opinion survey, for example.

Step 5 The indicator for Step 5 would be the number of women with obstetric complications admitted to the facility.

Impact Because we are using process and output indicators, this step is not measured. Impact is inferred from changes in the process indicators.

Figure 14
Improve Transportation Between Health Center and Hospital



STEP	PROCESS/OUTPUT INDICATORS	DATA SOURCES
1	Availability of transport Utilization of transport	Checklist data; project staff reports Transport vehicle log; interviews with community and leaders
2	Number of women with complications arriving at health center	Health center data
3	Decision to refer	Interviews with health center staff; health center data
4a	Number of completed referrals	Health center and hospital data
4b	Condition on arrival Time from referral to arrival at hospital	Case reviews; health center and hospital data; vehicle log Hospital data
5	Case fatality rate	Hospital data

5.1.2 Indicators of improving transport

Figure 14 shows the causal pathway for an intervention to improve transportation between health facilities.

Step 1 First there is the intervention step, with its immediate process and output indicators (e.g., the existence, functioning and/or utilization of an ambulance).

Step 2 Improved availability of transportation between facilities is expected to increase the number of women with complications seeking care at the health center. The indicator for this step is the number of women with complications admitted to this facility.

Step 3 Improvement in transportation between health facilities is also expected to affect the staff's decision to refer a woman for further treatment. The indicator for this step is the number of women with complications referred from the health center. Interviews with staff at the referring facilities may indicate how the intervention has changed their behavior.

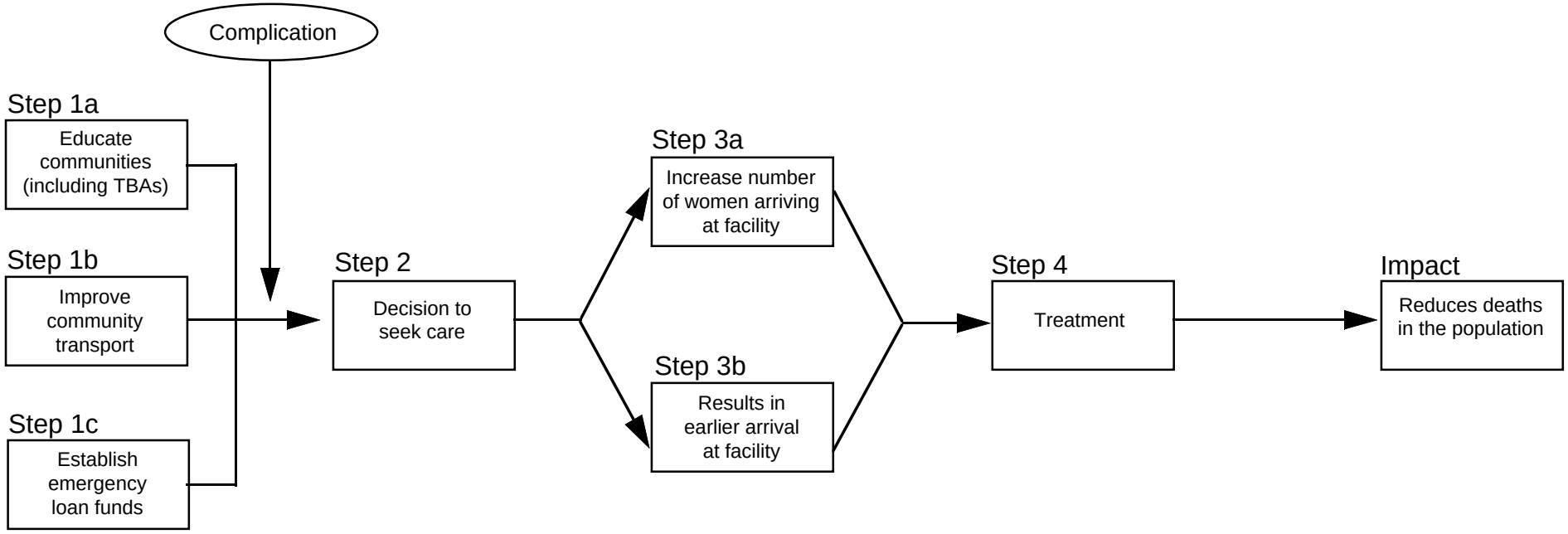
Step 4a Changes in the decision to refer are expected to have two important results. First, the availability of improved transportation should result in more referrals being completed. The indicator for this step is the number of completed referrals – i.e., women with complications admitted to the hospital who were referred from the health center.

Step 4b Second, the improved transportation is expected to reduce the time it takes for women to get from the health center to the hospital. There are at least two possible indicators here: the woman's physical condition on arrival at the referral facility; and time from decision to refer to arrival at the referral facility. We would recommend using condition on arrival, for several reasons. First, the data to measure this (e.g., blood pressure, temperature, etc.) can be gathered at the hospital, whereas data for tracking the interval from decision to refer to admission need to be gathered at both the health center and the hospital, which is more complicated. Secondly, it is easier to objectively define "condition on arrival" than to define "decision to refer."

Step 5 Improved outcomes among women with complications is expected to result from earlier arrival at the referral facility. Case fatality rate among women referred can be used as an indicator of this. However, caution must be taken in interpreting this indicator, since it will reflect improvements in services at the facility as well.

Impact As before, this step is not measured. Impact is inferred from changes in the process and output indicators.

Figure 15
Educate and Mobilize Communities



STEP	PROCESS/OUTPUT INDICATORS	DATA SOURCES
1a	Number of sessions held; number of people educated Knowledge of signs of complications	Project staff reports; attendance lists Pre- and post-tests / mini-surveys
1b	Availability of community transport Utilization of community transport	Village leader interviews; project staff reports Patient interviews; transport records
1c	Availability of emergency loans Utilization of emergency loans	Village leader interviews; project staff reports Village leader interviews; fund records
2	Decision to seek care	Community focus groups; mini-surveys
3a	Number of women with complications arriving at facility	Health facility data
3b	Condition on arrival	Health facility data
4	Case fatality rate	Hospital data

5.1.3 Indicators of mobilizing communities

Figure 15 depicts the causal pathways for the 3 key community-level interventions: educating communities (including TBAs); improving community transport; and establishing emergency loan funds.

Step 1 Immediate process and output indicators might be: the number of community education sessions held; the number of people participating in community education sessions; knowledge of signs of complications among participants in education sessions; the number of transport owners mobilized; the number of women transported; the number of loan funds established; the number of loans granted or repaid; etc.

Step 2 Each of these community-level interventions may affect the decision to seek care. Information on barriers to seeking care are best assessed qualitatively, through interviews and focus groups with members of the community, community leaders and TBAs. Mini-surveys[c] can be used to measure people's views about factors affecting the decision to seek care, and to assess change over time.

Step 3a Community interventions can have two important results in the third step. First, they should increase the number of women seeking care. The indicator for this step is the number of women with complications admitted to the facility.

Step 3b Second, all of these interventions are expected to reduce the time it takes women to get to facilities. For this step, the indicator is condition on arrival at the facility.

Another indicator for this step – time from onset of complication to arrival at facility – is generally not recommended. However, it may be useful in some situations. For example, since the determination of "time of onset" varies depending on the particular complications (e.g., for hemorrhage is would be the time bleeding began, for obstructed labor it would be onset of labor), this indicator is better suited to for use with a single type of complication. It is difficult to gather reliable data on this time interval, as it depends on asking the patient or her relatives when the complication began and they may not be able to give a precise time. Rough measures – e.g. days – can be used for some complications. Also, it is advisable to gather information on distance as well, so that time intervals can be validly compared.

[c] A mini-survey contains a small number of questions, and responses for 10-12 people fit onto one page, making it easy to tabulate the data.

Step 4 The reduction in delay is expected to lead to improved outcomes among women with complications who reach the health facility. The case fatality rate can be used to monitor this. Again, caution should be used in interpreting CFR, as it will also reflect changes in services at the health facility.

Impact From the process and output indicators, the impact of these community interventions on maternal deaths in the population can be inferred. If the number of women with complications reaching a health facility increases, and the case fatality rate decreases, we can be reasonably sure maternal deaths in the population are being reduced.

5.2 Planning Monitoring and Evaluation Activities

The monitoring and evaluation plan specifies the indicators which will be used for each activity, where data will come from, how often data will be collected (or summarized if it is routinely-collected information), and who will collect the data. Development of a monitoring and evaluation plan before beginning new activities serves a number of purposes. First, it enables the planners to think through what they expect to happen. A second function is to define which data will need to be collected and when. A third purpose is to determine in advance what resources will be necessary for conducting monitoring and evaluation activities.

One way of thinking about the kinds of information you are going to need is to outline the final report which will be presented, and develop mock-ups of tables or charts which would illustrate the program's effects. These tables or charts can be used to cross-check that all of the necessary information is being collected.

A sample monitoring and evaluation plan is provided in Appendix A.12. The monitoring and evaluation plan should be developed at the same time the implementation plan is written. As noted earlier, this is to help ensure that the necessary data are collected right from the start of program activities. Moreover, funding agencies are increasingly requiring that proposals specify how monitoring and evaluation will take place.

Keep the monitoring and evaluation simple. Collect information on as few indicators as possible and limit the number of research methods used. A simple monitoring and evaluation plan has several advantages. First, it is more likely to be carried out than one which places heavy demands upon the time of the service providers and program managers. A related advantage is that a simple plan will require fewer resources. Since the overall goal of programs is to improve health, monitoring and evaluation efforts should not unnecessarily shift resources away from service provision.

5.3 Using Results for Program Management

In order to ensure that data are useful, it is important that they be available on a timely basis. They also need to be easy to use. It may be helpful to develop a standard reporting format which the people collecting the data can use to summarize data. Service providers or other personnel can construct simple charts or graphs to show changes in key indicators over time. Periodic meetings to discuss the trends shown on the graphs are useful for discussing the possible reasons behind any changes. Periodic review of the data collected should be built into the program's implementation plan. These times should be used as “decision points” – opportunities to assess how program activities are progressing and to make decisions on what modifications are required. In this way, program components that are identified early on as ineffective can be discontinued, while others can be modified or strengthened.

One way to encourage the timely use of information is to make sure that it is available to people in the program. For example, if program staff are just asked to report "raw" data on their activities to the district or national level, they are unlikely to use these data themselves. But if the program staff are responsible not only for collecting the data but also for calculating some of the key performance indicators, they are more likely to make use of them to guide their activities. Supervisors should be trained to include review of data in their supervisory tasks, but program staff are more likely to be diligent in collecting data when they use them in managing the program.

It should be noted that using results for program management implies some decentralization of decision-making. Data at the district or health center level will not be very useful if the manager does not have any power to make decisions based on the findings.

When interpreting the data you have collected, a **program diary** can be tremendously helpful. A program diary can be a simple notebook in which the program manager records, by date, any events or changes which may have an effect on the program. Entries should be made on a weekly basis and include both program and non-program events. For example, the dates of the posting of a new doctor, the arrival of a shipment of drugs and supplies, or an interruption of electrical service for the operating theater should all be recorded. Equally important, however, would be a transport strike, a sharp downturn in the economy, the closing of a nearby health facility, or the opening of a new road, because each of these factors may be expected to have an effect on utilization. Suppose that the number of women with complications coming to the hospital increases sharply in a short period. This type of information can be invaluable in considering what factors were responsible.

Even with a project diary, however, sometimes the reasons for a change (or lack of change) in an indicator will remain unclear. In these situations, a quick qualitative investigation into the matter can be useful. For example, suppose after conducting a

careful needs assessment, surgical capacity and blood storage capabilities at the hospital are improved, but the expected reduction in case fatality is not seen. A more detailed investigation of the functioning of the hospital using interviews with key staff, case reviews, and/or direct observation might reveal constraints that were missed at the outset, or new problems that had not been anticipated. Similarly, if hospital utilization does not increase as expected, focus groups in the community may be helpful in identifying barriers that need to be addressed.

In the interests of conserving space, we do not discuss how to use each individual indicator, but a few general principles apply. For most of the program indicators described below, changes can be reported in either absolute numbers or proportions. For example, in Figure 13, the availability of drugs and supplies is the first indicator listed. This can be measured either in absolute terms (using counts) or relative terms (using proportions). An example of reporting a change in absolute terms is: "Before the project there was no refrigerator in which blood could be stored, but the team purchased one." In this example, the previous "count" was 0, and this increased to 1. An example of using a proportion to report change is the following: "During the situation analysis, only 30 percent of the drugs and supplies on the checklist were present in the hospital's obstetric ward. During the last year of the project, monthly supervision visits found that 85-97 percent of items on the list were available." While program personnel can construct checklists themselves, it is good to use standard lists if these exist. Using standard lists helps promote comparability of results from different studies. Often, government agencies have standard lists of drugs and supplies that can be used in checklist, or international agencies have produced them.[86,87]

Some indicators are best reported using categories. This is especially true of some of the newer indicators, such as admission-to-treatment interval, and condition on arrival among women admitted with obstetric complications. For example, one might report the proportions of admission-to-treatment intervals that fell into the following categories: less than 1 hour, 1-6 hours, more than 6 hours. Categories should reflect meaningful differences. For example, for the woman waiting for life-saving care, the difference between 1 hour and 4 hours is much greater than that between 21 and 24 hours. For some indicators, considerable thought will be required to construct categories. For example, to group women with complications based on condition on arrival, it will be necessary to define categories in terms of ranges of blood pressure, temperature, etc. Often, 3 categories will be sufficient – e.g., poor, fair, good.

Figure 16. Summary: Key Features of the Strategy for Program Design and Evaluation

Use of existing data for initial assessment and as baseline data. The strategy emphasizes using facility-based data, many of which are already being collected, to guide program design, and then using these data as a baseline against which to measure progress.

Integration of program design and evaluation. This is recommended for all public health programs, but it is especially important for maternal mortality and other reproductive health programs which rely heavily on process and output indicators.

Use of process and output indicators. We make inferences about program impact and the contributions of program components based on careful monitoring of process and output indicators, as well as attention to external factors which could affect the project.

Use of output data based on service utilization. The strategy for design and evaluation of maternal mortality programs relies heavily on the collection of service utilization data. This is because utilization of prompt emergency medical care is key to the reduction of maternal mortality.

Collection of cost data. Data on cost of interventions is useful for informing decision-makers about the replicability and sustainability of programs.

Use of both quantitative and qualitative data. Quantitative data are used to assess the availability, utilization and quality of services. They answer the questions “how much?” or “how many?”. Qualitative data provide insight into the reasons for observed patterns in the availability, utilization and quality of services. They answer the question “why?”. Qualitative data are useful at various stages of the program, but especially in program design.

Periodic review of data for program management. An advantage of using process and output indicators is that they provide information that is useful to program managers over the course of the program. The indicators respond rapidly to changes and are meant to be reviewed on an ongoing basis.

6. Disseminating Information

The best-laid monitoring and evaluation plans and most carefully conducted evaluation research will have little impact unless the right people receive the information. People who should have access to the monitoring and evaluation information include the following: service providers; program managers; local policy makers; national policy makers; funding agencies.

The strategies for making information available and useful to these groups will vary. The report for policy makers will not be the same as the information required by program managers responsible for day-to-day activities. Consider publicizing the research results in a number of different ways. Think about who the different audiences are, and what each needs to know about the program. The best way to reach some audiences (e.g., Ministry personnel) is to hold a national workshop. Media coverage of such events is a great way to spread the message even more widely. Other audiences are best reached through newsletters, and still others through international journals. Some general guidelines are the following:

Involve people who could use the information as early as possible. Results from monitoring and evaluation activities are more likely to be used if the program planners or service providers feel that they have been involved in the decision-making process. Having them collect data is usually not perceived as involvement enough. To make them feel a part of the process it is a good idea early on to discuss with them issues such as the indicators and methods which will be used. Officials from public and private agencies should also be kept informed in a timely manner. These people may provide good ideas and help in solving potential obstacles the program may face.

Provide information as early as possible. This can take the form of periodic updates on the program and should start early. Program planners and service providers are more likely to use the results of monitoring and evaluation activities if they have been kept informed.

Present important information verbally as well as in written reports. Whenever possible, small workshops, meetings or other occasions should be used to present important information. A set of guidelines for making clear charts, graphs and visual aids for presentations is included in Appendix A.13.

Keep reports simple and concise. The more concise and easy-to-read reports are, the more likely they are to be read. Periodic monitoring reports might consist of two or three simple tables or charts, and a couple of pages of text which describes and analyzes the data and includes recommendations. Suggested sections for a more extensive report required at the end of a project cycle, and recommended page lengths, are listed in Figure 17 below.

Figure 17. Outline of Interim or Final Reports

1. Executive Summary (2 pages)
2. Background/Introduction (2 pages)
3. Methods used (3 pages)
4. Results (8-10 pages)
5. Conclusions and Recommendations (4 pages)
6. Appendices: Maps, tables, instruments (if necessary)

used

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Appendix A Instruments and Materials

- -

A.1 Facility Functioning Assessment Form

1. Name of facility: _____
2. Location of facility: _____
3. Contact information: _____

4. Type of facility: *(Check one)*	(a) Hospital_____	(b) Maternity_____	(c)Health center_____
	(d) Clinic	(e) Other (specify)	
5. Type of operating agency: *(Check one)*	(a) Government_____	(b) Private	

Check Yes or No for each of the following items (a-h)

6. Were the following services performed at least once during the last 3 months?	Yes	No
(a) Parenteral antibiotics		
(b) Parenteral oxytocics		
(c) Parenteral sedatives/anticonvulsants		
(d) Manual removal of placenta		
(e) Removal of retained products		
(f) Assisted vaginal delivery		
(g) Blood transfusion		
(h) Caesarean section		

Box: Determination of EmOC status
(Use Q6. Check only ONE.)

- If **ALL** of 6a–h = Yes, check: ___COMPREHENSIVE EmOC
- If **ALL** of 6a–f = Yes **AND** 6g **OR** 6h = No, check: ____ BASIC EmOC
- If **ANY** of 6a–f = No, check: ____ NOT EmOC

7. What sources of data were used to complete this form?
(e.g., maternity ward register, delivery book, general admissions register, patient notes, staff interviews, etc.)

_____

_____

_____

8. Date of assessment: _____

9. Conducted by: (Name & Title) _____

A.2 Suggested Register Headings

Data Needs for Monitoring and Evaluation of Programs to Prevent Maternal Deaths

Information on obstetric complications is key to evaluating programs to prevent maternal deaths. Information on treatment is also useful. Yet columns for gathering this information are often lacking in official registers. Minor modifications to existing registers are often all that are necessary.

Below is an example of the type of modification done by the teams in the PMM Network. The columns on "Complications of Pregnancy" and "Treatment Given" were added to this Ministry of Health register by the PMM Team from Kumasi, Ghana.

Nominal roll for maternity patients*

Unit No.	Serial No.	Name of Patient	Usual Address	Age	Occupation	Ward	Parity	Duration of Pregnancy	Date of Admission	Date of Discharge	Duration of Stay	Type of Delivery	Outcome				Condition on Discharge	**Complication of Pregnancy**	**Treatment Given**
													Single Birth		Multiple Birth				
													M	F	M	F			

*Kumasi PMM Team

.3 Facility Data Summary Form
(and accompanying notes on data collection)

Summary Hospital Data Form

Year: _____

Team: _____ Hospital: _____

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year's Total
OBSTETRIC ADMISSIONS *Line 1*													
DELIVERIES *Line 2*													
C-SECTIONS *Line 3*													
MATERNAL DEATHS													
Haemorrhage (ante- and post-partum) *Line 4*													
Obstructed/prolonged labor *Line 5*													
Ruptured uterus *Line 6*													
Post-partum sepsis *Line 7*													
Pre-eclampsia/eclampsia *Line 8*													
Induced/septic abortion *Line 9*													
Ectopic pregnancy *Line 10*													
Total maternal deaths due to major obstetric causes *Sum of Lines 4 thru 10 = Line 11*													
Other maternal deaths due to obstetric causes *Line 12*													
OBSTETRIC COMPLICATIONS													
Haemorrhage (ante- and post-partum) *Line 13*													
Obstructed/prolonged labor *Line 14*													
Ruptured uterus *Line 15*													
Post-partum sepsis *Line 16*													
Pre-eclampsia/eclampsia *Line 17*													
Induced/septic abortion *Line 18*													
Ectopic pregnancy *Line 19*													
Total obstetric complications due to major causes *Sum of Lines 13 thru 19 = Line 20*													
Other direct obstetric complications *Line 21*													
CASE FATALITY RATE													
Haemorrhage (ante- and post-partum) *Line 4 â Line 13*													
Obstructed/prolonged labor *Line 5 â Line 14*													
Ruptured uterus *Line 6 â Line 15*													
Post-partum sepsis *Line 7 â Line 16*													
Pre-eclampsia/eclampsia *Line 8 â Line 17*													
Induced/septic abortion *Line 9 â Line 18*													
Ectopic pregnancy *Line 10 â Line 19*													
Case fatality rate due to major obstetric causes *Line 11 â Line 20*													
Other direct causes *Line 12 â Line 21*													

Specific notes on completing the Summary Hospital Data Form

Fill out one form for each year. If data are available for pre-intervention years, use the blank forms provided.

For the most part, the form is self-explanatory. The first 21 lines are numbered, and where calculations are required (for case fatality rates), the lines from which the data should be taken and the procedure to be used are noted on the form. For example, to get "Case fatality rate due to major obstetric causes", the number of "Total maternal deaths due to major obstetric causes" from Line 11 should be divided by the number of "Total obstetric complications due to major causes" from Line 20. This calculation should be done for each month, and also for the yearly totals.

Maternal deaths. Please note that "Other maternal deaths" should not be included in the "Total".

Obstetric complications. Please note that "Other direct obstetric complications" should not be included in the Total".

Overall "case fatality rate due to major obstetric causes" should **not** include women in the "other maternal deaths" or "other obstetric complications" categories, as this may introduce bias. (See Principle 2, under “General Notes”, below.)

Annual case fatality rate. Remember not to include "other" deaths and complications in the overall case fatality rate. Finally, you may calculate annual case fatality rate due to "other direct causes".

Monthly data should be used wherever possible. If data has already been collapsed into quarters or years, and the original monthly figures are no longer available, it is probably not an efficient use of time to go back and try to re-allocate the data by month. Please provide what data you have, making clear how they have been grouped.

Missing data. Periods for which data are missing should not be recorded at "zeros". Instead, please clearly indicate that the data are missing or unavailable (e.g. "MISSING DATA", "NOT AVAIL.").

Variations in data quality. If there are periods for which you suspect that the data are incomplete in some way (e.g., there was a three- month gap between the departure of the maternity ward matron and her replacement by a new matron) please indicate this on the forms and describe on a separate sheet. If there was anything else that might affect the consistency of the data (e.g., a change in recordkeeping procedures), please clearly indicate when this happened on the forms and describe on a separate sheet.

General Notes on Collecting Data for Hospital Interventions

Please note: The two indicators discussed below -- utilization and case fatality rate -- were described, and methods for their collection discussed, in the PMM document "Minimum Essential Indicators for Evaluating PMM Network Programs", first circulated in 1993. These were also the topic of a PMM workshop in Kumasi in February, 1993. What is being suggested in this document is not anything new. This is simply a refresher memo about two important indicators that the Network has been using for years.

As you know from your work in the Network, there are 2 key questions we need to answer to evaluate improvements at hospital-level facilities: 1) How did the improvements affect utilization?; and 2) how did they affect case fatality rates?

Utilization is an important measure for any level facility; case fatality is only appropriate for referral facilities. For the Network summary paper, we will be including data from only one hospital per team.

utilization: the number of women admitted to the hospital with obstetric complications

case fatality rate: the proportion of women admitted to the hospital with obstetric complications who die.

So, the goal is to count the number of women with complications, and the number of deaths among these women. In collecting these data, we strongly suggest you use the hospital or maternity ward admissions register. Loose sheets (e.g., PMM forms), while good for other purposes, are especially vulnerable to getting lost, and therefore not the best source of information on total complications and deaths.

A few general principles:

1) Research is only as good as the data collected.

It is crucial that the numbers of women with complications and maternal deaths are counted in as accurate and complete a manner as possible. One person should be responsible for the data collection. This person should be very familiar with how the registers are kept and with the diagnoses used. Ideally, it should be a core team member, and she/he should be directly involved in the process. If we are not confident in our data collection, we cannot be confident in our findings.

Double-check the data collection. Have someone else pick a few months from the register at random and check to see that the numbers tally. If there are inaccuracies, they need to be corrected, and the other months reviewed as well.

2) Use a strict, consistent case definition.

For the purposes of operations research in the Network, a complicated case is a woman who is diagnosed as having any one of the following conditions:

- haemorrhage (antepartum and postpartum)
- prolonged/obstructed labor
- postpartum sepsis
- complications of induced abortion
- pre-eclampsia/eclampsia
- ectopic pregnancy
- ruptured uterus

If a woman has more than one of these complications, the one that is most immediately life-threatening should be selected.

"Other" categories. Other direct obstetric complications that may be life-threatening but do not fall into one of these categories should be counted under "other" (spontaneous, threatened, or inevitable abortion, for example). Complications during pregnancy that are not obstetric (for example, malaria, tuberculosis, etc.) or not seriously life-threatening (for example, anemia without hemorrhage) should not be counted.

Women with complications or deaths in the "other" category should not be included in calculating overall case fatality rate. Inclusion of "other" causes can bias the case fatality rate. For example, if the "other" category includes a large number of conditions which are not seriously life-threatening, this would result in an artificially low estimate of the case fatality rate.

Also, if a substantial proportion of deaths or women with complications fall under "other", this could affect the interpretation of your data. It may be worthwhile to investigate what these deaths or complications are, by examining records for a few months.

Complications of abortion. In many settings, complications of induced abortion are recorded under some other diagnosis (e.g., "spontaneous", "incomplete", "septic" abortion). The judgment of someone familiar with the record-keeping practices on the ward is important in deciding what should be counted. For example, if it is known that "incomplete abortion" is the diagnosis used for complications of induced abortion, these cases should be counted. True cases of spontaneous abortion without other complication should not be counted here.

3) Data from different time periods should be comparable.

If record-keeping procedures changed at some point in time, data from before and after that point they may not be comparable. For example, it may be that recent registers are more complete, so that complications and deaths in earlier period are likely to be undercounted. It is important that the extent of undercounting be estimated, if possible, so that something can be said about what proportion of an apparent increase in utilization was due to improved record-keeping and what proportion was real.

How to estimate undercounting: Specifically, what is needed is some other source of information on number of obstetric admissions from the pre-intervention period. This source should be as complete as possible, but need only cover a few (2 or 3) months. (One possibility in many hospitals is the book that the ward nurses use to record observations on their patients as they sign off from their shift each day.) If, from this other source, you are able to count the number of admissions to the maternity ward for a two or three month period, this number can be compared to the number taken from the admissions register for the same period. The percent of total obstetric admissions undercounted would then be assumed to be equal to the percent undercounted during this few month period. Further, the percent undercounting over these few months would be assumed to apply to the entire pre-intervention period.

Having completed this, it is then possible to say, for example, that in the pre-intervention period, the number of women with complications is likely to be under-estimated by X %, and that therefore the case fatality rate is likely to be overestimated by Y%. This kind of information will help you make conclusive statements about the effect of the hospital interventions.

4) It is always easier to combine data than to separate data.

When in doubt, group data in smaller categories, rather than larger. For example, even though you may be planning to present your data by quarter or year, collect it by month. When collecting data on complications by cause, make the causes specific (e.g., keep figures on APH and PPH separate) rather than general (e.g., a single figure for all categories of haemorrhage). Data can always be grouped later in the analysis, but it would be impossible to plot utilization by month, for example, if it was collected by year.

A.4 Supervision Visit Checklist for Hospital

	Quantity (& units)	**Comments** (e.g., reasons for non-availability)
Trained personnel		
Doctors/obstetrician		
Nurse/midwives		
Anaesthetist		
Theatre attendant		
Key drugs		
Oxytocics		
Anticonvulsants		
Procaine penicillin		
Crystalline penicillin		
Gentamycin		
Metronidazole		
Ampicillin		
Local anaesthetics		
General anaesthetics		
Oxygen		
Labor room		
Vacuum extractor		
IV infusion sets		
IV fluids		
Ovum forceps		
Vaginal speculum		
Artery forceps		
Needles		
Sutures		

	Quantity (& units)	**Comments** (e.g., reasons for non-availability)
Syringes		
Sterilizer		
Scissors		
Curette		
Sphygmomanometer		
Laboratory equipment		
Microscope		
Test tubes		
Slides		
Blood bank		
Blood bags		
Anti-sera		
Storage capability		
Operating theatre		
C-section set		
Laparotomy set		
Neonatal intubation set		
Evaluation sets		

Recommendations for action:

Action	Person responsible	By when	Comments

Form Filled Out By: _____ **Date:** _____

A.5 Supervision Checklist for Health Center

	Quantity (& units)	Comments (e.g., reasons for non-availability)
Trained personnel		
Trained health worker		
Nurse/midwives		
Key drugs		
Oxytocics		
Anticonvulsants		
Penicillin		
Gentamycin		
Metronidazole		
Ampicillin		
Labor room		
IV infusion sets		
IV fluids		
Ovum forceps		
Vaginal speculum		
Artery forceps		
Needles		
Sutures		
Syringes		
Sterilizer		
Scissors		
Curette		
Sphygmomanometer		
Laboratory equipment		
Test tubes		
Slides		

Recommendations for action:

Action	Person responsible	By when	Comments

Form Filled Out By: _____ **Date:** _____

A.6 Health Facility Staff Interview Guide

Purpose

The identification of barriers to prompt and effective treatment of obstetric complications at health facilities.

Objectives

To identify problems at the facilities which affect the availability, quality and utilization of services.

To obtain information on service providers' perceptions of the barriers to care.

Analysis of the Problem

What obstetric complications do you see at this facility?

Probes: Are these common? In what condition do women arrive?

What are some of the reasons women may come in poor condition?

What distances do women have to travel? How long does it take?

What happens when a woman needs to be referred?

Probes: (select those appropriate for the level of care)
Who takes care of transport? What role do the service providers play in transporting/accompanying her?

Barriers at the Facilities

What actions can be taken at this facility to treat women who come in with an emergency obstetric complication?

What are some of the problems you face in providing care?

What are some of the reasons a woman may have to wait for treatment?

Probes: (select those appropriate for the level of care):
Are staff on call on a 24-hour basis? What happens when a woman with a complication comes in? Are drugs for treating emergency obstetric complications available? Do the staff on duty have 24-hour access to them? Is blood available on a 24-hour basis? Is anesthesia (and someone to administer it) available on a 24-hour basis?

Suggestions for Addressing Barriers to Care

[Moderator summarizes some of the problems the service providers have identified.]

You have mentioned that __(e.g. drugs and supplies, blood supply, etc.)__ is a problem when a woman needs emergency obstetric care. What are some of the low-cost ways in which this problem could be addressed?

Probe: What could be done at the community level? What could be done at the facilities? What could the government do?

Who at the facilities should actively work to do something about addressing these problems?

A.7 Health Facility Questionnaire for Case Studies of Women with Obstetric Complications

This questionnaire is a guide to the type of information desired when conducting case studies of women with obstetric complications. It can easily be coded and the information entered into a computer (e.g. each piece of information is numbered and responses have been coded). This would be useful if large numbers of cases were being reviewed and results are being tabulated. In most situations, however, cases will be reviewed individually. If results are not being entered into a computer, the multiple-response format may be changed to open-ended questions to allow for more varied responses.

1. ID Number (assigned by research team): _____

A. Information on complication

2. Principal reason for admission to facility:
   1. Obstructed labor
   2. Postpartum haemorrhage
   3. Antepartum haemorrhage
   4. H.D.P./Eclampsia
   5. Sepsis (related to abortion)
   6. Puerperal sepsis
   7. Shock (related to abortion)
   8. Bleeding (in early pregnancy)
   9. Other (specify) _____

   99. Unknown

3. Main complication woman experienced (if different from reason for admission):
   0. Not applicable/ same as above
   1. Obstructed labor
   2. Postpartum haemorrhage
   3. Antepartum haemorrhage
   4. H.D.P./Eclampsia
   5. Sepsis (related to abortion)
   6. Puerperal sepsis
   7. Shock (related to abortion)
   8. Bleeding (in early pregnancy)
   9. Ruptured uterus
   10. Ectopic pregnancy
   11. Other (specify) _____

4. Was this complication due to an unsafe abortion?
   1. Yes
   2. No

	Date	Approximate time	am/pm
Onset of labor	5.	6.	7.
Onset of main complication	8.	9.	10.

B. Condition on admission

11. Dead on arrival:
    1. Yes (Skip to #38)
    2. No
12. B/P:
13. Temperature: _____
14. Pulse: _____
15. Respiration: _____

C. Information on management of case

Event	Time	Date	Type of Treatment
Admission to hospital	16.	17.	
Treatment 1	18.	19.	20.
Treatment 2	21.	22.	23.
Treatment 3	24.	25.	26.
Treatment 4	27.	28.	29.
Treatment 5	30.	31.	32.
Referral	33.	34.	35.Where to:

36. List any treatment prescribed and not given. Give reason for not giving it.

_____

_____

D. Referral information

37. Referred from: _____
(Name of health facility)

38. Type of facility referred from (circle one):
    1. Government hospital
    2. Private hospital
    3. Health centre
    4. Health post
    5. Maternity post
    6. Not Applicable -- Self-referral (directly from home)
    7. Other (specify) _____

    9. Unknown

39. Referred by:
    1. Self-referral (directly from home)
    2. Doctor
    3. Paramedical staff
    4. Nurse/midwife
    5. Non-nurse midwife, MCH aide, etc.
    6. TBA
    7. Other (specify) _____

    9. Unknown

40. Mode of transportation to the health institution (NOTE: here you should circle all types of transport used from the home to the institution):
    1. Private vehicle
    2. Government vehicle
    3. Ambulance
    4. Transport workers' union vehicle
    5. Walked
    6. Carried
    7. Other (specify) _____

    9. Unknown

41. Cost of transportation (NOTE: this should be the total cost of transportation from their home to the facility): _____

E. Delivery information

42. Where did delivery occur?
    0. Not applicable (No delivery)
    1. At this facility
    2. At another facility (specify) _____
    3. En route
    4. Home
    5. Other (specify) _____
    9. Unknown

43. Type of delivery:
    0. Not applicable (No delivery)
    1. Normal
    2. Forceps
    3. Vacuum extraction
    4. Cesarean section
    9. Unknown

44. Delivery attendant:
    0. Not applicable (No delivery)
    1. Doctor
    2. Nurse/Midwife
    3. Trained TBA
    4. Untrained TBA
    5. TBA (training status unknown)
    6. Family member
    7. Other (specify) _____
    9. Unknown

45. Maternal outcome:
    1. Referred (specify place) _____
    2. Discharged
    3. Discharged against advice
    4. Absconded
    5. Died (in hospital)
    9. Unknown

46. Fetal outcome:
    0. Not applicable
    1. Survived
    2. Died
    9. Unknown

F. Cost and cost-recovery information

ITEM	CHARGE TO PATIENT	AMOUNT RECEIVED FROM PATIENT
Blood transfusion	47.	48.
Drugs and supplies	49.	50.
Service fees	51.	52.
Physician's fee	53.	54.
Other (specify)	55.	56.
Other (specify)	57.	58.
TOTAL	59.	60.

G. Comments

61. List factors that contributed to delays in treatment (e.g. lack of transport, anesthetist not on site, etc.). Please do not blame the patient.

Factors contributing to delay
62.
63.
64.
65.
66.

H. Health facility information

67. Name of this facility: _____

68. Type of health facility (circle one):
    1. Government hospital
    2. Private hospital
    3. Health centre
    4. Health post
    5. Maternity post
    6. Other (specify) _____

69. Sources of information used to fill out this form (circle all that apply):

    1. Admission logbook
    2. Ward record book
    3. Death register
    4. Bookkeeping records
    5. Transport logs
    6. Referral logs
    7. Discharge book
    8. Patient's records
    9. Other facility records (specify) _____
    10. Interviews with service providers
    11. Interviews with patient
    12. Interviews with patient's family/friends
    13. Other interviews (specify) _____

    99. Don't know

70. Date form filled out: Month ___ Day ___ Year ___

71. Other Comments or Observations:

_____

_____

_____

_____

72. Person filling out form:

_____

A.8 Patient/Family Interview Guide for Case Studies of Women with Complications

The following guide provides an example of questions which could be asked to collect information on women with obstetric complications who are taken to a health facility for treatment. It may be used in conjunction with the **Health Facility Questionnaire** to get additional information from the woman and/or her family members while she is in the hospital.

Purpose

The purpose of the case studies are to evaluate the interventions put into place by the PMM project from the patients' perspective, as well as to obtain information concerning areas which still need improvement.

Objectives

To assess patients' perceptions of the PMM interventions.

To identify barriers to emergency obstetric care which have not yet been addressed by the project.

ID Number (assigned by researchers) _____

Facility information:

The following information should be obtained from the health facility where the woman received definitive treatment for the obstetric complication.

F1. Facility name: _____

F2. Main complication woman experienced:

1. Prolonged/Obstructed labor
2. Postpartum hemorrhage
3. Antepartum hemorrhage
4. H.D.P./Eclampsia
5. Sepsis (related to abortion)
6. Puerperal sepsis
7. Shock (related to abortion)
8. Bleeding (in early pregnancy)
9. Ruptured uterus
10. Ectopic pregnancy
11. Other (specify) _____

F3. Was this complication due to an unsafe abortion?

1. Yes
2. No

F4. Name of interviewer: _____

F5. Date of interview: _____

[NOTE: The following questions are worded as if the woman herself is being interviewed. Where possible the woman should be interviewed. If she is dead or not available, then the family member(s) who accompanied her to the hospital should be interviewed.

Person being interviewed

0. Woman who experienced complication only
1. Husband of woman who experienced complication
2. Other family member
3. Woman who experienced complication and husband
4. Woman who experienced complication and other family member
5. Other _____
   (specify)

Getting to the Hospital

Q1. For what reason(s) were you brought to the hospital?

Q2. At what point did you realize that you might be having a problem?

Q3. How long after that was it decided that you should go to the hospital?

Q4. Did you go to any other health facility or traditional healer prior to going to the hospital? Probe: What happened there?

Q5. Who made the decision that you should go to the hospital?

Probe: Who was this decision discussed with?
Did anyone have to give consent/permission?

Q6. Before you came, how did you feel about going to the hospital? Probe: Were there reasons you preferred to stay at home?

Q7. Now how do you feel about having come to the hospital? Probe: What are the reasons you feel that way?

Q8. How did you get to the hospital?

Probe: Did you have difficulties in obtaining transportation? What were they? How were these overcome?

Q9. Who accompanied you to the hospital?

Q10. How long did it take to get to the hospital?

Q11. How much did it cost to get to the hospital?

Q12. Did you have money to pay this cost or did you have to borrow it?

At the Hospital

Now, I am going to ask you some questions about the care you received at the hospital. Please let me know both the good and bad things about the care here. Your comments will not be told to the staff (nurses and doctors here). What you say will not affect the care you receive here at all. We are only going to use this information to try to provide better services in the future.

Q13. How would you describe the attention you received when you first arrived at the hospital?

Probe: What happened? How did the staff receive you?

Q14. How long did you wait before being examined by anyone?

Probe: How did you feel during the wait?

Q15. Did you experience any problems in getting the treatment you needed?

Probes: What were they? Supplies? / Drugs? Staff? Costs?

Q16. How did you feel about the way in which the person who first greeted you and filled out the forms talked to you?

Probe: Courteous? Helpful?

Q17. How did you feel about the way in which the nurses and or midwives talked with you?

Probe: Courteous? Helpful?

Q18. How did you feel about the way in which the doctor or doctors talked with you?

Probe: Courteous? Helpful?

Q19. Have people told you what your treatment/stay here will cost?

Probes: Do you think the cost is fair?
Are you able to pay or will you have to borrow the money?

Q20. Is there anything else you can tell us about your experience at the hospital? Remember, I am interested in both good and bad things which you have found here.

Q21. Overall, do you think that you got good care or bad care at the hospital?

Probes: What makes you say that it was (good or bad)?

A.9 Community Focus Group Discussion Guide

The sample focus group guide below is the prototype of a guide for use with members of the community. It provides questions for the assessment of factors which may cause delay in obtaining life-saving emergency obstetric care. The guide should be tailored to meet local needs.

The questions on the discussion guide are designed to provide starting points for discussions. The moderators should be encouraged to follow each question up with additional probing questions. In many cases, they will need to develop the probes as the discussion evolves. Some of the potential probing questions have been included in order to provide guidance for the moderator.

Purpose

To identify barriers to prompt and effective treatment of obstetric complications in order to develop appropriate strategies to address these problems.

Objectives

To obtain information on community's understanding of obstetric complications.

To explore the factors affecting the decision-making process concerning obstetric complications.

To obtain community input concerning potential strategies for improving the utilization of emergency obstetric care.

Discussion Topics

Recognizing Obstetric Complications

What are some of the things that can go wrong when a woman gives birth?

Probes: Are these problems dangerous to the woman?

How does one know when the problem has become serious? [Repeat for each of the complications mentioned].

Obtaining Care for Obstetric Complications

What can be done if a woman experiences one of these problems?

Probes: What would be the best thing to do if a woman experiences one of these problems?

Who can help her? (in the community?)
Where would she be taken first?

What are the problems involved in taking her to seek care?

Probes: How would she be transported? Where would she get the money?

What have you heard about this place (where woman is taken for care)?

Probes: What do people say about the staff at this place?
Is this place equipped to handle emergencies?

What are some of the difficulties that might be experienced at the place where she seeks care?

What are the costs involved in seeking care?

Probe: How would the family obtain the money for this?
What would be done if they cannot get the money?

Decision-Making Concerning Obstetric Care

Who makes the decision to seek help for a woman if she experiences a problem in childbirth?

Probes: Alternative decision-makers (e.g. if husband is not home?)

Who is consulted about such a decision?

What considerations are taken into account in making the decision? (e.g. financial, distance, etc.)

Suggestions for Addressing Barriers to Care

[Moderator summarizes some of the problems the community has identified.]

You have mentioned that __(e.g. transport, money, supply shortages, etc.)__ is a problem when a woman needs emergency obstetric care. What are some of the ways in which this problem could be addressed?

Probe: What could be done here at the community?
What could the government do?

Who in the community should actively work to do something about addressing these problems?

Summary Form for Costs of Hospital Improvements

PMM Network, 1996

Team: _____ Hospital: _____

Today's Date: _____

Instructions: This form is for collecting data on costs of activities to upgrade hospital emergency obstetric care (EmOC). Please note that it is for improvements at the hospital level only. The form requests information on costs associated with improvements in a number of areas:

- Operating Theatre
- Availability of Blood
- Maternity Ward
- Availability of Drugs and Supplies
- Hospital Infrastructure
- Other Human Resource Improvements
- Other Improvements

There are also sections for information on:

- Overall Costs
- General Comments

Please look over all parts of the form before completing it. If your team has not undertaken improvements in a given area, please write "NONE". If your team has undertaken activities that do not fall under one of the specific headings, please record them in one of the "other" sections. If an activity falls under more than one heading, you may list it more than once. **However, please do not double-count expenditures when completing the section on "Overall Costs".**

The form asks for two types of information under each of the specific categories above: 1) A description of the activities undertaken to achieve the improvement; and 2) A summary of the costs associated with each of the activities described.

In the cost tables, it is requested that you provide the amount contributed by each source (PMM, government, community, and other sources). Enter "zero" where appropriate. The four "Contribution by Source" columns should add up to the figure in the "Total cost" column. If cost data are not available for a particular improvement, please write "NOT AVAILABLE".

Please attach copies of worksheets you use in calculating costs. Also, please attach extra sheets wherever necessary.

Please Note: All costs should be given in U.S. dollars, calculated using the exchange rate current at the time of the expenditure.

Description of OPERATING THEATRE Improvements

1. Renovation of physical facility: What specific improvements were made to renovate the physical structure of the operating theatre?

2. Equipment/instruments: a) What specific equipment/instruments were repaired for the operating theatre?

b) What specific equipment/instruments were purchased for the operating theatre?

3. Consumable supplies: What specific consumable supplies were purchased for the operating theatre?

4. Other: Was there anything else done to bring the operating theatre to working order? Please describe.

5. Staff: Were any staff hired, transferred or reassigned to the operating theatre to upgrade emergency obstetric surgery? Please list and describe the functions of these staff.

6. Training: Were any staff trained to improve emergency obstetric surgery in the hospital? Please list staff and describe the training received.

Costs of OPERATING THEATRE Improvements

1-4. Material Costs

	Total Cost ($US)	Contributions by Source ($US)			
		PMM	Gov't	Comm	Other
1. Renovation of physical facility					
2. Equipment/instruments (repairs + purchases)					
3. Consumable supplies					
4. Other					
Total					

5. Staff Costs

Note: The number of staff in this table should be the same as the number in Question 5 on the facing page.

	Number	Annual salary per person ($US)	Contributions by source ($US)			
			PMM	Gov't	Comm	Other
Physician						
Midwife/Nurse						
Anesthetist						
Other						
Total						

6. Training Costs

Note: The number of staff in this table should be the same as the number in Question 6 on the facing page.

	Number trained	Cost per person ($US)	Contributions by source ($US)			
			PMM	Gov't	Comm	Other
Physician						
Midwife/Nurse						
Anesthetist						
Other						
Total						

Description of AVAILABILITY OF BLOOD Improvements

1. Renovation of physical facility: What specific improvements were made to renovate the physical structure of the blood bank?

2. Equipment/instruments: a) What specific equipment/instruments were repaired to improve availability of blood?

b) What specific equipment/instruments were purchased to improve availability of blood?

3. Consumable supplies: What specific consumable supplies were purchased to improve availability of blood?

4. Other: Was there anything else done to improve availability of blood for emergency obstetric care (EmOC) in the hospital? Please describe.

5. Staff: Were any staff hired, transferred or reassigned to improve availability of blood for EmOC in the hospital? Please list and describe the functions of these staff.

6. Training: Were any staff trained to improve availability of blood for EmOC in the hospital? Please list staff and describe the training received.

Costs of AVAILABILITY OF BLOOD Improvements

1-4. Material Costs

	Total Cost ($US)	Contributions by Source ($US)			
		PMM	Gov't	Comm	Other
1. Renovation of physical facility					
2. Equipment/instruments (repairs + purchases)					
3. Consumable supplies					
4. Other					
Total					

5. Staff Costs

Note: The number of staff in this table should be the same as the number in Question 5 on the facing page.

	Number	Annual salary per person ($US)	Contributions by source ($US)			
			PMM	Gov't	Comm	Other
Lab technician						
Lab assistant						
Other						
Total						

6. Training Costs

Note: The number of staff in this table should be the same as the number in Question 6 on the facing page.

	Number trained	Cost per person ($US)	Contributions by source ($US)			
			PMM	Gov't	Comm	Other
Lab technician						
Lab assistant						
Other						
Total						

Description of MATERNITY WARD Improvements

1. Renovation of physical facility: What specific improvements were made to renovate the physical structure of the maternity ward?

2. Equipment/instruments: a) What specific equipment/instruments were repaired for the maternity ward?

b) What specific equipment/instruments were purchased for the maternity ward?

3. Consumable supplies: What specific consumable supplies were purchased for the maternity ward?

4. Other: Was there anything else done to bring the maternity ward to working order? Please describe.

5. Staff: Were any staff hired, transferred or reassigned to improve services on the maternity ward? Please list and describe the functions of these staff.

6. Training: Were any staff trained to improve services on the maternity ward? Please list staff and describe the training received.

Costs of MATERNITY WARD Improvements

1-4. Material Costs

	Total Cost ($US)	Contributions by Source ($US)			
		PMM	Gov't	Comm	Other
1. Renovation of physical facility					
2. Equipment/instruments (repairs + purchases)					
3. Consumable supplies					
4. Other					
Total					

5. Staff Costs

Note: The number of staff in this table should be the same as the number in Question 5 on the facing page.

	Number	Annual salary per person ($US)	Contributions by source ($US)			
			PMM	Gov't	Comm	Other
Physician						
Midwife/Nurse						
Auxiliary Midwife/Nurse						
Other						
Total						

6. Training Costs

Note: The number of staff in this table should be the same as the number in Question 6 on the facing page.

	Number trained	Cost per person ($US)	Contributions by source ($US)			
			PMM	Gov't	Comm	Other
Physician						
Midwife/Nurse						
Auxiliary Midwife/Nurse						
Other						
Total						

Description of AVAILABILITY OF DRUGS AND SUPPLIES Improvements

1. Renovation of physical facility: What specific physical renovations were made to improve availability of drugs and supplies?

2. Equipment/furniture: a) What specific equipment/furniture were repaired to improve availability of drugs and supplies?

b) What specific equipment/furniture were purchased to improve availability of drugs and supplies?

3. Purchase of initial stock: If an initial stock of drugs and supplies was purchased, where were they purchased from?

4. Other: Please describe what was done to improve availability of drugs and supplies for emergency obstetric care (EmOC) in the hospital in addition to the above. Please specify whether the improved drug and supply system was available to the entire hospital or just to the maternity ward.

5. Staff: Were any staff hired, transferred or reassigned to improve availability of drugs and supplies for EmOC in the hospital? Please list and describe the functions of these staff.

6. Training: Were any staff trained to improve availability of drugs and supplies for EmOC in the hospital? Please list staff and describe the training received.

Costs of AVAILABILITY OF DRUGS AND SUPPLIES Improvements

1-4. Material Costs

	Total Cost ($US)	Contributions by Source ($US)			
		PMM	Gov't	Comm	Other
1. Renovation of physical facility					
2. Equipment/furniture (repairs + purchases)					
3. Purchase of initial stock[1]					
4. Other					
Total					

5. Staff Costs

Note: The number of staff in this table should be the same as the number in Question 5 on the facing page.

	Number	Annual salary per person ($US)	Contributions by source ($US)			
			PMM	Gov't	Comm	Other
Pharmacist						
Other						
Other						
Total						

6. Training Costs

Note: The number of staff in this table should be the same as the number in Question 6 on the facing page.

	Number trained	Cost per person ($US)	Contributions by source ($US)			
			PMM	Gov't	Comm	Other
Pharmacist						
Other						
Other						
Total						

[1] This figure should reflect the full purchase cost of the initial stock of drugs and supplies, including any customs and ıties or shipping charges paid.

Description of HOSPITAL INFRASTRUCTURE Improvements

1. Electricity: Were any improvements made to the electricity system as part of upgrading hospital emergency obstetric care (EmOC)? Please describe.

2. Water supply system: Were any improvements made to the water supply system as part of upgrading hospital EmOC? Please describe.

3. Other: Were any other improvements made to the hospital infrastructure as part of upgrading EmOC? Please describe.

Costs of HOSPITAL INFRASTRUCTURE Improvements

1-3. Material Costs

	Total Cost ($US)	Contributions by Source ($US)			
		PMM	Gov't	Comm	Other
1. Improvements to electricity system					
2. Improvements to water supply system					
3. Other					
Total					

Description of OTHER HUMAN RESOURCE* Improvements

not listed in previous sections of this form

1. Were any additional staff *not listed in previous section of this form* hired, transferred or reassigned to the hospital to upgrade emergency obstetric care (EmOC)? Please give staff levels (e.g., recordkeeping personnel, administration, etc.) and numbers.

2. Were any other forms of training *not listed in previous sections of this form* conducted to improve EmOC at the hospital? Please specify staff levels, type(s) of training program, number and duration of sessions.

3. Were any other changes in staffing made in order to improve EmOC in the hospital? (For example, were general physicians replaced with obstetricians? Were nurses replaced with midwives?) Please describe.

4. Were any financial or other incentives provided to hospital staff in addition to normal salaries? If so, please give staff level, type of incentive, amount (in $US), frequency and duration.

Costs of OTHER HUMAN RESOURCE* Improvements

not listed in previous sections of this form

1. Other Staff Costs

Note: The number of staff in this table should be the same as the number in Question 1 on the facing page.

(Please list each separately)	Number	Annual salary per person ($US)	Contributions by source ($US)			
			PMM	Gov't	Comm	Other
Total						

2. Other Training Costs

Note: The number of staff in this table should be the same as the number in Question 2 on the facing page.

(Please list each separately)	Number trained	Cost per person ($US)	Contributions by source ($US)			
			PMM	Gov't	Comm	Other
Total						

Description of OTHER IMPROVEMENTS* to Upgrade EmOC in the Hospital

not listed in previous sections of this form

1. Were any other activities not listed in previous section of this form undertaken at the hospital to upgrade emergency obstetric care (EmOC)? Please describe in this space and give costs in the table below.

Costs of OTHER IMPROVEMENTS* to Upgrade EmOC in the Hospital

not listed in previous sections of this form

(Please list each improvement separately)	Total Cost ($US)	Contributions by Source ($US)			
		PMM	Gov't	Comm	Other
Total					

OVERALL COSTS of Upgrading EmOC in the Hospital

In previous sections of this form, you have provided data on the costs of particular interventions to improve emergency obstetric care (EmOC) in the hospital. It would also be of interest to provide data on the overall costs of a package of interventions to improve EmOC in the hospital.

In the boxes below, please provide the overall material, staff, and training costs of upgrading EmOC in the hospital. These figures should reflect the total costs of improvements in all of the areas covered in this form: operating theatre, availability of blood, maternity ward, availability of drugs and supplies, hospital infrastructure, other human resource improvements, and other improvements to upgrade EmOC.

You may have listed some activities under more than one of these headings. **Do not simply add the figures from previous sections of the form, as this might be double-counting.** For example, if you listed surgical gloves and sutures under both the "Operating Theatre" and the "Availability of Drugs and Supplies" sections, be sure these items are counted **only once** in the totals below.

Similarly, if you listed training of nurses and midwives under both the "Maternity Ward" and "Operating Theatre" sections, make sure the costs of this training are counted **only once** below.

1. **Total Material Costs** of Upgrading EmOC in the Hospital = _____ $U.S.

2. **Total Staff Costs*** of Upgrading EmOC in the Hospital = _____ $U.S.

* This figure should include only staff hired, reassigned or transferred. Pre-existing staff should not be counted.

3. **Total Training Costs** of Upgrading EmOC in the Hospital = _____ $U.S.

OVERALL COSTS of Upgrading EmOC in the Hospital = _____ $U.S.
(Sum of Boxes 1, 2 & 3)

General Comments on Costs to Upgrade EmOC in the Hospital

Your comments: Research on costs of upgrading facilities to provide emergency obstetric care (EmOC) is a new area. Please provide any comments you have on the process of assembling these data and completing this form. Which areas were particularly problematic? Which areas did you find most straightforward?

Given your experience in completing this form, how much confidence do you have in the accuracy of the data? In which areas do you feel cost estimates are most reliable? Please explain.

In which areas do you feel cost estimates are least reliable? Please explain.

Please use the space below to provide any other ideas or thoughts you have on doing research on cost of health interventions in general, or on PMM cost research in particular.

A.11 Sample Implementation Plan

Intervention	Person responsible	Time			
		Year 0	Year 1	Year 2	Year 3
District/Health Center Level					
Availability of drugs and supplies			----------		
Functioning of operating facilities			----------		
Improve blood transfusion capabilities			----------		
Improve recordkeeping and supervision		-----	-----		
Establish ambulance and radio links			----------		
Training of physicians, midwives and other hospital staff			----	----------	
Community Level					
Educate community on warning signs and referral				---------->	
Mobilize community support for emergency loan fund, emergency transport system,				---------->	
Train TBAs in warning signs and referral				----------	
Monitoring and Evaluation					
Upgrade recordkeeping		----			
Data collection		------- --	---------->		
Analysis of data; preparation of reports			-- -- -- -- -- >		

A.12 Sample Monitoring and Evaluation Plan

Intervention	Evaluation Indicators	Monitoring and Evaluation Activities	Data Sources	Timing
Improving skills of hospital staff in management of emergency obstetric complications	Number of staff trained	Records review	Training participant list	Annually
	Improved staff knowledge	Pre- and post-training exams	Exam results	2 months post- training
	Improved staff attitudes	Observation and case reviews	Staff interviews	2 months post- training
	Number of patients treated and referred, by complication	Hospital records review	Hospital register	Monthly
	Improved management of emergency obstetric cases	Observation Case reviews	Maternity ward Patient charts	Monthly
	Improved patients' perception of care	Case reviews	In-depth interviews	Post-training and 6 months later
	Case fatality rates	Hospital records review	Hospital register	Monthly
Improving blood transfusion capabilities	Availability of blood	Blood bank inventory review	Blood bank inventory	Monthly
	Availability of transfusion supplies	Supply inventory review	Supply inventory	Monthly
	Proportion of cases requiring blood transfusion that receive transfusion	Hospital record reviews	Maternity register	Quarterly
Improving communication and transport between facilities	Availability and condition of vehicle(s)	Observation Regularly scheduled checks	Vehicle log	Monthly
	Availability and functioning of radios	Observation Ambulance log reviews	Transportation vehicle Ambulance log	Monthly Quarterly
	Number of cases transported	Case reviews	Ambulance log	Quarterly
	Time from referral decision to arrival at facility			

Intervention	Evaluation Indicators	Monitoring and Evaluation Activities	Data Sources	Timing
Improving community awareness and knowledge of early warning signs and referral	Number of health educators trained	Records review	Project records	Annually
	Number and attendance of community education sessions	Records review	Project records Attendance lists	Semi-annually
	Increase in knowledge of warning signs and referral	Mini-survey	Community	6 months post-activity
	Decrease in time from onset of complication to arrival at EmOC facility	Records review	Facilities' registers	Quarterly

Conference Presentation Guidelines

Note: The Internet version of this paper may not translate fonts properly. Rely on the name given, not the appearance.

February 1996

Conference Presentation Guidelines

How many times have you been at a conference and looked forward to a presentation only to be shown slides of tables or graphs that you could not read? Or presented with transparencies with print so small, you had to squint in order to see them?

Now it's your turn. You're giving a presentation in front of colleagues and strangers. You're excited and nervous. Your work deserves to be presented well and the audience deserves a good, clear presentation.

Using good visual aids during an oral presentation serves several purposes. They illustrate the points made in the talk. They help the audience follow the presentation. They provide a visual complement to the spoken words. They help the presenter keep on track. They hold the audience's interest.

Poorly designed visual aids confuse the audience. As they peer at the slides, they miss what the speaker is saying. They miss the main points of the talk.

Note: There are two aspects to presenting a paper at a meeting or conference: content and presentation. The presenter must pay ample attention to both. If you have nothing interesting to say, the best visual aids won't help. By the same token, the importance of significant project findings can be lost in a confusing or unappealing presentation.

How can you ensure that your visual aids will enhance and clarify your presentation?

These Guidelines offer suggestions on creating effective slides and transparencies as visual aids.

Elements of Good Slides and Transparencies

▶ Color

Slides the key is **light** letters or figures on a **dark** background

- ▶ Use white or yellow on blue or black.
- ▶ Avoid dark red, blue or green on a blue or black background. These colors do not provide enough contrast and make the text or graphics difficult to read.

Transparencies the key is **dark** letters or figures on a **light (clear)** background

- ▶ Printing transparencies on a laser or inkjet printer (or photocopying laser or inkjet printed sheets onto transparencies) are simple ways to produce very nice visual aids. Good dot matrix printers can also be used.
- ▶ Any dark colors -- for example, dark red, blue, green if you have access to a color printer or color photocopier -- also show up very nicely on a transparency.
- ▶ Avoid handwritten transparencies for formal presentations.

- **Font** refers to the appearance (typeface) of the letters. All computer software offer font options. Note that different software and printers have different fonts accessible to them. *The names also vary, so go by general appearance.*

  - Choose simple, clear fonts rather than fonts with curly or elaborate lettering.

  - Best choices for both slides and transparencies are

    Univers which looks like this.

    CG Omega which looks like this.

    Antique Olive which looks like this.

    Helvetica which looks like this.

  - Acceptable choices include

    CG Times which looks like this.

    Albertus which looks like this.

    Times New Roman which looks like this.

  - Poor choices include

    Coronet Italic which looks like this.

    Brush which looks like this.

    Blackletter which looks like this.

    Onyx which looks like this.

- **Size of the print.** Print size is measured in points. The larger the point size, the larger the print.

  - Most standard documents (such as this one) are printed in 12 point print. This is far too small for transparencies. *Do not just make a transparency from a regular typed page of print.*

  - Absolute minimum size for a transparency is 24 point. 30 point and larger are better.

    This is Univers 12 point.

    This is Univers 18 point.

    This is Univers 24 point.

    This is Univers 30 point.

    This is Univers 36 pt.

  - Using **bold**, underline, double underline or *italics* can make a word stand out even if it is the same point size as the other words on the transparency.

    This is Univers 30 pt. bold.

    Underlining can emphasize a word.

  - The same point size in different fonts can be different actual sizes, so make sure the actual size is large enough.

    This is Univers 24 point.

    This is Coronet Italic 24 point.

- **Composition** refers to the words, graphs, tables or other images that are put on the slide or transparency.

  If you are tempted to say to the audience, "I don't know if you can see this clearly, ..." then the print is too small or the slide is too busy. *Do not use the slide!!* Why show it if the audience can't read it?

Text

- Present the points you want to make in a few words on the slide or transparency. The slide is a guide for the audience and an outline for you. Your spoken comments explain and elaborate on the points on the slide.

- Use a maximum of 4 points (one line each) per slide or transparency.

- The slide is not a script. You do not need complete sentences and you should not read to the audience what is written on the slide. If the slides are that detailed, they can read them for themselves. They don't need you.

- Bullets, indenting and space between lines can make slides easier to follow. (This document uses these techniques.)

Graphs

- Usually, each graph should illustrate one result. Use a series of slides on different slides to show multiple results.

- If you want to compare data on the graph, limit the information to two or, at most, three lines or bars.

- Use the graph to make a sharp visual point. For presentation purposes, a graph does not need to be as detailed as it should be in an article or report. A presentation graph should have a clear title and clear legend (labels for the bars or lines.) It may not need detailed scales on the axes or each point on the line labeled. This would make it too busy. So, for example, rather than labeling each time period on the x-axis ("Jan-Mar 1993, April-June 1993, July-Sept 1993," etc, as you would do in a report), it might just be labeled "Time, 1993-1995." Similarly, rather than labeling every observation on a line, just the first and last points might be identified.

Tables

- Tables are difficult to present clearly on a transparency or slide because even simple tables contain substantial information. For example, in examining a simple 2x2 table, the audience has to absorb what the table is about, the row and column meanings, the four table entries and they also have to assimilate the relationship among the numbers. This requires a lot of processing. While they are doing that, they are not listening to you.

- If you are discussing only a few cells of a table, highlight those by shading them or circling them by hand to draw the audience's attention where you want it.

- If possible, make the point in a graph or in a simple comparison of figures rather than in a table.

- If you do use tables, the recommendations regarding clear titles and labels listed under *Graphs* also apply.

Photos/Slides

- Photos only apply to slide presentations, as they do not reproduce well on transparencies.

- Adding a few photos can enliven a presentation. They give a strong visual image of the project site. They can illustrate geography (terrain and roads), state of health facilities, project activities (e.g., survey field work, training.)

- Do not turn the presentation into a travelogue. If you include photos, only use those that help make a point that is relevant to the presentation.

▶ Other suggestions

- ***One advantage of transparencies over slides is that last-minute changes can be made.*** Since they are produced with pretty common office equipment, transparencies can be revised or created quickly, even in the days right before the presentation. Since slides are made by a studio, there is nothing you can do about last-minute changes you would like to make.

We strongly recommend transparencies for the 1996 PMM Final Conference. We will have equipment on site to produce them, so last-minute changes can be accommodated.

- ***In preparing your presentation, pare down your results, findings, implications, conclusions and recommendations to a maximum of three concise statements you want the audience to remember when they leave.*** This is your conclusion, which should be presented as brief statements on a transparency. So, for example, though you may have explained that your project reduced hospital CFR by 25% between 1991 and 1995 through improved infrastructure, training, blood bank, and drug supply, the audience will never remember all that information. The important conclusion, or 'take-home message,' might be that 'Hospital CFR can be reduced.' As they leave, you want them to think, "That project showed that hospital CFR can be reduced. I'll have to find out more about how they did that."

- ***Practice your presentation with the slides or transparencies.*** Make sure you know when to switch to the next slide. Mark the changes in your notes. If someone is helping you with your transparencies, make sure they practice with you.

- ***Practice to make sure the presentation will be completed within the time allotted.*** If you are cut off before your conclusions, the power of your presentation is lost. You have 10 minutes for each presentation at the 1996 PMM Final Conference. Create a presentation that can be completed in 10 minutes and practice so that you stay within that time.

- ***Make sure you know how to operate all of the equipment you will need.*** If someone will help you with the presentation, make sure he or she knows too.

- ***If possible, practice in the actual room where the presentation will be made.*** Know where the slide projector or overhead machine should be placed for clearest projection.

- ***Verify the sequence of your transparencies or slides well before your presentation.*** Transparencies are simple to check. With slides, you must run through all the slides to make sure they are in sequence and placed correctly in the slide tray, so they do not appear upside down or backwards (as too frequently occurs at conferences.)

- ***Number the slides and transparencies so that when (not if!) they fall on the ground, they can be quickly re-ordered.***

- ***When preparing transparencies, use only the top _ or 2/3 of the page.*** Anything written on the bottom of the transparency can not be seen by audience members beyond the first row, even if it appears in the projector window.

- ***For future reference: Remember that slides are usually prepared by a professional studio. Make sure you give them the information in the exact format they request.*** They may want hard copies in portrait or landscape orientation, a disk copy, or both.

- ***If slides are used, it is a good idea to make a backup of the presentation on transparencies.***

Most people are nervous when they stand up in front of a conference audience to present a paper. If a problem arises, it's hard to think on your feet. Your best chance for success is to prevent an awkward situation by ensuring that no problems arise: make sure your visual aids are well-designed, ready and tested so that the presentation can proceed smoothly.

Examples of Good and Poor Transparencies and Slides

The Three Delays

- Delay in deciding to seek care
- Delay in reaching facility
- Delay in receiving treatment at facility

Comments This would make a good slide or transparency. Why?

PMM Project Interventions
State PMM Team
My State, My Country

- Hospital interventions
    - Repaired opertaing theatre
    - New equipment
    - 24-hour blood and drug supply
- Health center interventions
    - New equipment
    - Life-saving skills training for midwives
    - Two-way radios
- Community interventions
    - Loan scheme
    - Transport scheme
    - Resource persons
    - Education campaign

Comments — This would make a poor slide or transparency. Why?

Suggestions — Present the information in three separate slides.
Use bigger print.
Shorten the title.
Always check spelling carefully.

Appendix B National and Subnational Monitoring

The contents of this appendix have been excerpted from the following publication, forthcoming in 1997 from UNICEF and the World Health Organization:

Deborah Maine, Tessa M. Wardlaw, Victoria M. Ward, James McCarthy, Amanda Birnbaum, Murat Z. Akalin and Jennifer E. Brown. Guidelines for Monitoring the Availability and Use of Obstetric Services. Second Edition. New York: UNICEF and WHO, 1997 (forthcoming).

B.1 Indicators of Process for Use at the National and Subnational Levels

The indicators presented in the first part of this manual were developed specifically for monitoring and evaluation at the local or project level. Using the same approach, however, it is possible to derive related indicators for monitoring larger areas. Like the process indicators for local monitoring, these are grounded in the causal pathways to maternal death, yield useful information, and are feasible to calculate.

This appendix presents a series of process indicators with which national and subnational (e.g., provincial) progress in the prevention of maternal deaths can be monitored. The order in which the indicators are discussed reflects a rough order of priority. If women are to receive prompt, adequate treatment for complications, then facilities for providing emergency obstetric care (EmOC) must:

- exist;
- be distributed in a useful fashion;
- be used by women; and
- be used by women who really need them.

All of these issues can be subsumed under the heading of coverage. Adequate coverage *does not* mean that all births should take place in health facilities. It does mean that all pregnant women have access to functioning EmOC facilities, in case they need them.

Once *coverage* is established, then questions of *performance* must be addressed. After all, many women die in hospitals. Some women die because they were not admitted until their condition was critical. Many others, however, die because they did not receive timely treatment or because the treatment they received was inadequate.

Figure B.1 presents a series of process indicators that address issues of EmOC coverage and performance. Beside each indicator there is a "minimum acceptable level." (The indicator using data on cesarean sections has both a minimum and a maximum.) These acceptable levels are, of necessity, approximate. They are based on the best data, estimates, and assumptions currently available.

Figure B.1. Indicators and minimum acceptable levels	
Indicator	**Minimum Acceptable Level**
Amount of EmOC: **Basic** EmOC facilities **Comprehensive** EmOC facilities	For every **500,000 population**, there should be: **At least 4 Basic** EmOC facilities. **At least 1 Comprehensive** EmOC facility.
Geographic distribution of EmOC facilities	Minimum level for amount of EmOC services is met in subnational areas.
Proportion of all births in Basic and Comprehensive EmOC facilities	**At least 15%** of all births in the population take place in either Basic or Comprehensive EmOC facilities.
Met need for EmOC: Proportion of women estimated to have complications who are treated in EmOC facilities	**100%** of women estimated to have obstetric complications are treated in EmOC facilities.
Cesarean sections as a percentage of all births	As a proportion of all births in the population, cesarean sections account for **not less than 5% nor more than 15%.**
Case fatality rate	The case fatality rate among women with obstetric complications in EmOC facilities is **less than 1%.**

Emergency Obstetric Care (EmOC) Coverage

Indicator #1: Amount of EmOC services

The first in this series of process measures is the existence of sufficient emergency obstetric care services. Two levels of facilities — Basic and Comprehensive EmOC — are specified. Both provide life-saving obstetric care, but only Comprehensive EmOC facilities perform surgery.

A health center that provides Basic EmOC can prevent many maternal deaths. For some conditions (e.g., some cases of postpartum hemorrhage), these services may

be sufficient. For other complications (e.g., obstructed labor), more complicated treatment is required. Even then, however, first aid can save lives because the condition of the woman can be stabilized before she is referred.

In order to assess the level of care a facility is actually providing, it is helpful to select a few important EmOC functions to identify Basic and Comprehensive EmOC. This is not intended as a complete list of services that should be provided. Rather, it is a short list of clearly defined "signal functions" designed for monitoring purposes.*

Figure B.2. Signal functions to identify Basic and Comprehensive EmOC facilities

Basic EmOC Services	Comprehensive EmOC Services
(1) Administer parenteral antibiotics*	(1-6) All of those included in Basic EmOC
(2) administer parenteral oxytocic drugs	(7) perform surgery (cesarean section)
(3) administer parenteral anticonvulsants for preeclampsia and eclampsia	(8) perform blood transfusion
(4) perform manual removal of placenta	
(5) perform removal of retained products (e.g., manual vacuum aspiration)	
(6) perform assisted vaginal delivery	

A Basic EmOC facility is one that is performing *all* of functions 1-6.
A Comprehensive EmOC facility is one that is performing *all* of functions 1-8.

*Parenteral administration of drugs means by injection or intravenous infusion.

There are, of course, many health facilities that perform some, but not all, of the Basic EmOC functions listed above. These facilities are undoubtedly useful, and may well avert some maternal deaths. Such facilities should definitely be included in, for example, an in-depth study of a district. For national monitoring, however, it is not feasible or useful to have fine distinctions and many categories. Consequently, for the

* A 1993 Technical Working Group convened by the WHO endorsed a similar list; however, that list distinguishes between health centers and hospitals rather than between Basic and Comprehensive EmOC facilities. As noted earlier, for monitoring purposes, we emphasize the actual — not potential or theoretical — levels of functioning of facilities.

present purposes, only facilities currently providing all the signal functions in either the Basic or Comprehensive EmOC lists are included.

Minimum acceptable levels:

For every 500,000 population, there should be:

1 facility providing Comprehensive EmOC; and

4 facilities providing Basic EmOC.

Indicator #2: Geographic distribution of EmOC facilities

If enough EmOC facilities exist, then the next step is to see if they are appropriately located, i.e., near the women who need them. The distribution of services is too important to ignore. It is not uncommon to find an excess of services clustered around the main cities, while large parts of the population are virtually without services.

Therefore, the minimum acceptable level for *distribution* of EmOC services is the same as that for the *amount* of EmOC services, but applied to smaller geographic areas.

Indicator #3: Proportion of all births in Basic and Comprehensive EmOC facilities

The next question is, are women using the EmOC facilities? The idea here is not to recommend that all women deliver in hospitals. In many developing countries the health system could not cope with the additional patients. Furthermore, if a woman is having a normal delivery she may well be better off at home. The issue is what happens when she develops a complication.

The proportion of all births that take place in an EmOC facility serves as a crude indicator of utilization of EmOC facilities. A number of authors have estimated the proportion of pregnant women who develop serious complications to be at least 15 percent.[1,2] Furthermore, a Technical Working Group assembled by the WHO agreed to use 15 percent as the minimum proportion of pregnant women who require medical care in order to avoid death or disability.[3] Thus, if the number of women receiving care in an EmOC facility is not equal to at least 15 percent of *all* women giving birth in the population, then it is certain that some obstetric complications are going untreated.

Minimum acceptable level:

At least 15 percent of all births in the population take place in an EmOC facility (including both Basic and Comprehensive EmOC facilities).

Indicator #4: Met need for EmOC: Proportion of all women with complications who are treated in EmOC facilities

Of course, just because 15 percent of births take place in EmOC facilities does not mean that women with complications are receiving care. It might be that most of the births in the EmOC facilities are normal deliveries. In that case, the women with complications would still be outside the EmOC facilities and not receiving treatment. This indicator, therefore, is a more refined measure of the utilization of EmOC services because it takes into account the type of activities occurring in the EmOC facilities. (Unmet need, another useful indicator, may be calculated simply as: 100 - [met need].)

Minimum acceptable level:

The proportion of all women with obstetric complications that are treated in Basic or Comprehensive EmOC facilities is at least 100 percent.

For the purposes of monitoring, a "complicated case" is defined as a woman that has any of the diagnoses presented in Figure B.3 below.

Figure B.3. Working definition of a complicated case

- Hemorrhage: antepartum or postpartum
- Prolonged/obstructed labor
- Postpartum sepsis
- Complications of abortion
- Preeclampsia/eclampsia
- Ectopic pregnancy
- Ruptured uterus

In some places (chiefly in developed countries) the proportion of women with complications managed in EmOC facilities may be greater than 15 percent of births — i.e., more than 100 percent of the estimated need is met.

One reason that this could happen is that more than 15 percent of pregnant women in the population may develop these obstetric complications. Studies in several countries have found this to be the case.[4] This is especially likely where the incidence of unsafe abortion is very high, because that would substantially increase the proportion of women in that population who develop a complication.

Indicator #5: Cesarean sections as a proportion of all births

An indicator of whether EmOC facilities are, in fact, providing life-saving obstetric services is cesarean sections as a proportion of all births. The use of this indicator is somewhat controversial because this procedure is sometimes overused. While this operation can be convenient and lucrative for physicians, it is dangerous and expensive for their patients. Of the countries where excessive use of cesarean sections has been documented, most are industrialized countries — but not all.[5]

A reasonable (even conservative) estimate of the minimum proportion of pregnant women who will require a cesarean section is five percent.[6] Since we are assuming that about 15 percent of pregnant women will develop serious complications, then we can estimate that one-third (5/15 = .33) of women with complications will require treatment in a Comprehensive EmOC facility.[b]

In setting acceptable levels for cesarean sections, it seems appropriate to have both a minimum and a maximum. Five percent of all births in the population is a relatively conservative lower limit. For the upper limit, 15 percent seems reasonable. It is slightly higher than the level in most developed countries, but less than the level in those countries known to have problems with excessive use of this procedure. These minimum and maximum levels have been adopted for global use by the Technical Working Group assembled by the WHO.[7]

Minimum and maximum acceptable levels:

As a proportion of all births in the population, cesarean sections should account for not less than five nor more than 15 percent.

---

[b] The 1993 WHO Technical Working Group also adopted these estimates.

Performance of EmOC Facilities

The previous indicators have focused on coverage of the population by EmOC services. If a country meets all of these criteria, then one can say that (1) a reasonable number of EmOC facilities exist; (2) they are reasonably well distributed within the country; (3) they are serving a reasonable proportion of women; (4) they are serving the kinds of women who need them most (i.e., women with obstetric complications); and (5) they are actually providing life-saving obstetric services such as cesarean sections.

The next issue is the quality of the services provided. Quality of care is the subject of a growing and complex literature. In the present context, we will use a relatively crude indicator of performance. Of course, it would be valuable to the national program to supplement this information with other kinds, such as information gained from in-depth analyses (e.g., case reviews of deaths) and from qualitative studies.

Case fatality rates

The case fatality rate (CFR) is the number of deaths from the condition of interest, divided by the number of people with that condition. In this context, the term is used to mean the number of maternal deaths among women with obstetric complications in the health facility being studied. Ideally, one would calculate a separate cause-specific CFR for each of the major causes of maternal death. However, the number of maternal deaths in a given facility is usually too small to allow a stable CFR to be determined for each complication. Therefore, in most facilities only one CFR will be calculated.

This indicator of performance has not been frequently used, even though it is relatively easy to calculate. The case fatality rate among women with complications in West African hospitals in the late 1980s ranged from a low of 1.2 percent in Kumasi, Ghana, to a high of 8.0 percent in Ota, Nigeria.[8] In contrast, a study of 654 U.S. hospitals showed a case fatality rate of 0.05 percent of complicated deliveries even in 1970. By 1978, the U.S. rate had declined even further, to 0.03 percent.[9] Given these data, it seems that one percent is a reasonable maximum acceptable level. It falls in the gap between the rates from Africa and those from the United States.

Maximum acceptable level:

The case fatality rate among women with obstetric complications in EmOC facilities should not exceed one percent.

The case fatality rate can be calculated for any facility that meets three conditions: women with obstetric complications are treated there; maternal deaths may take place there; and there are adequate records on both of these kinds of events. Case fatality rates for Basic EmOC facilities would be difficult to interpret because women at risk of death may be referred to Comprehensive EmOC facilities. Therefore, for monitoring purposes, case fatality rates should be calculated only for Comprehensive EmOC facilities.

As we gain experience in gathering and interpreting case fatality information from a variety of settings in developing countries, we will see whether certain limitations should be suggested when comparing CFRs from different institutions or settings. For example, it may not be valid to compare CFRs from district and teaching hospitals, since women with the most serious complications may be referred to the teaching hospital at the last moment, where they die. This would lower the CFR at the district hospital and raise it at the teaching hospital.

One simple way to expose such patterns is to analyze data from various kinds of facilities (or from different areas) separately before combining them. Also, in addition to calculating averages, it can be very informative to put CFR data on bar charts or "scattergrams."

It is true, however, that the CFR can be high even when the facility is functioning well — e.g., when many women in need of EmOC arrive in very poor condition. One way to disentangle the factors influencing the CFR is to gather information on other indicators of quality of care. For example, the time interval from admission-to-treatment can be analyzed (either for all complications or for a subset, such as prolonged/obstructed labor). Although there is only a little experience with this statistic, data from West Africa show that, in general, facilities with long waiting periods for emergency treatment also have relatively high CFRs.[10]

A somewhat more complicated, but very informative, exercise is to gather information about the condition of the women on admission (e.g., pulse, blood pressure, and temperature). This would also help disentangle the effect of patients' condition on arrival from that of the quality of care.

Of course, CFRs do not take into account deaths outside the health system. This does not affect the validity of this indicator, because we are using it only to give us a sense of the performance of the EmOC facility. If the coverage indicators show that EmOC services are well distributed and well utilized, and CFRs are low, then it is safe to say that the maternity care system in the country is working fairly well.

B.2 Collecting Data for Process and Output Indicators

In order to construct the process and output indicators proposed here, three kinds of data are needed: population data, data on birthrates, and health facility data. Figure B.4 shows which process indicators require which kinds of data.

Figure B.4. Types of data used to construct process indicators

Type of data	Indicator 1 Number of EmOC facilities	Indicator 2 Geographic distribution of EmOC facilities	Indicator 3 Proportion of all births in EmOC facilities	Indicator 4 Met need for EmOC	Indicator 5 Cesarean sections	Indicator 6 Case fatality rate
Population size	X	X	X	X	X	
Birthrate			X	X	X	
Health facility data						
EmOC "signal functions"	X	X				
Number of births			X			
Number of complicated cases				X		X
Number of cesarean sections					X	
Number of maternal deaths						X

Note: EmOC = Emergency Obstetric Care

Information on population and on birthrates is available in most countries. Gathering information on health facilities, however, will be more difficult in some situations. Fortunately, the task is simplified by the fact that only facilities providing emergency obstetric care need to be counted for the present purposes. The names used to refer to such facilities will vary from place to place. In some countries, "health centers" might provide services that would qualify as Basic EmOC. In other countries, "maternities" might be more likely to perform Basic EmOC functions.

There will, of course, be variation within countries as well. For example, health centers may be better staffed and equipped in some areas than in others. The emphasis here is on the EmOC services that a facility is *actually providing,* not on what it is supposed to be able to provide. Recently, several checklists have been developed that can be helpful in assessing the type and level of care that can be

provided by different health facilities.[11,12] However, while a checklist contains information on whether the facility is (theoretically) capable of providing certain services, it cannot gather information on whether the services are actually being provided.

Preparation for data collection

Most of the data for calculating these indicators will be collected in facilities. In a relatively small country, visiting every hospital should not be too difficult, but in a large country it might not be possible. Visiting every health center would be difficult even in some small countries. Therefore, in most countries, a subset of EmOC facilities will need to be selected for review.

We hope that in a few years the kinds of information required for these process indicators will be routinely reported to ministries of health, in which case the data from all facilities would be already compiled and available.

The steps described in this appendix will help you to identify a set of facilities that gives a reasonably accurate picture of the situation, while at the same time not requiring an unreasonable amount of work. Ensuring that the facilities selected for review provide a fairly accurate picture of the situation depends largely on avoiding two major pitfalls: systematic bias and the effects of chance variation.

Systematic bias can occur when conscious or unconscious factors affect selection of facilities for study. For example, the people selecting the facilities might want to present the situation in the most favorable light possible, or they might select facilities that are easily accessible (e.g., on a paved road or near a large town). In either case, the data collected might give an overly favorable impression. The effects of chance are, of course, unpredictable, but they do tend to diminish as the number of facilities studied increases.

The selection process will be done in two stages: selecting areas of the country for study and then selecting facilities within these areas. Selecting *areas* for study will be done at the national level, while selecting *facilities* within those areas will be done at the area level. Guidelines for each stage are presented below.

Selecting areas for study

Consider a level smaller than "national." The term for this administrative level will vary by country — e.g., state, province — and will be referred to here as an "area." The following guidelines should be used to determine whether or not to study all areas of a country:

If a country has 100 or fewer hospitals (public and private), study all areas.

If a country has more than 100 hospitals (public and private), a subset of areas may be selected for study. Select as many areas as possible, but the number selected should be **at least 30 percent of the total number** of areas in the country.[c]

If selecting a subset of areas, the aim should be to study as many areas as possible, without compromising the quality of the data collected.

For example, if there are 21 areas in Country W, 10 might be selected for study. Fewer may be studied if resources are scarce, but the proportion selected should not be less than 30 percent, or a minimum of seven areas.

Random selection of areas

In order to avoid bias, the basis for selection of areas within each type must be *random*. Random is not the same as haphazard. The procedure for random selection is outlined below.

Step 1. Make a list of all areas in the country. The list should be in alphabetical order, to minimize the possibility of bias.

Step 2. Assign each area a consecutive number, starting with the number 1 for the first area on the list.

Step 3. Calculate the "sampling interval". The sampling interval will tell you to select every *nth* area, once the first area has been selected at random. Use the following formula:

$$\text{sampling interval} = \frac{\text{total number of areas in country}}{\text{number of areas selected}}$$

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[c] In a few countries where the administrative units of "province" or "state" are exceptionally large, it may be necessary to select sub-areas for study. Again, as a rough guideline, if an area has more than 100 hospitals (public and private), sub-areas may be selected, and the number of sub-areas studied should represent at least 30 percent of the total. For the purposes of the forms, each sub-area should be considered an "area." Professional help from a statistician should be sought in obtaining national estimates in countries where sub-areas are selected.

In country W there are a total of 21 areas, of which ten are to be selected for study, giving a sampling interval of 2 (21/10 = 2.1).

Note: Sampling intervals should be rounded to the nearest whole number.

Step 4. Identify the first area to be included in the sample by generating a random number that is less than or equal to the sampling interval but greater than zero. This can be done using a random number table (in section B.4). To use the table, look away from the page and touch it with the point of a pencil. The digit closest to where the pencil touches the page is the random number selected. If the digit is less than or equal to the sampling interval and greater than zero, use it; if not, read from left to right until a digit that satisfies this condition is reached. This number will be the first area selected.

For Country W, the sampling interval is 2. Using the random number table, our pencil point falls on the digit 7, at row 21, column 33. This is larger than our sampling interval, so we read left to right, passing the digits 0, 4, and 6, until we come to 2. Thus, area #2 on the list will be the first area selected.

Step 5. Identify all other areas to be included in the sample by adding the sampling interval to the number that located the first area and continue to select areas until the desired number has been reached.

Since the first selected area is #2 on the list of areas, the next one would be 2 plus 2, or #4, and the next #6, and so on, until ten areas have been selected.

Determine the nationally uniform 12-month period to be studied

The 12-month period selected should be a recent one, to help ensure that the data will still be available. For comparability of data, it is important that all data be from the *same 12-month period.* The decision about which period to use should be made at the national level, and should then be entered at the top of Form 2 *before* the form is duplicated for use. This will ensure that data collection at all facilities will focus on the same time period. The 12-month period may be either a calendar year (e.g., January 1–December 31) or any other 12-month period.

Once areas for study have been selected, Forms 1–4, including all worksheets, should be duplicated and a complete set sent to the person coordinating the research in each area.

Form 1: List all possible EmOC facilities in study area

The first step in gathering the required health facility data is to make a list of all the facilities within the study area that *may be* providing EmOC services — either Basic or Comprehensive — as defined by the signal functions (Figure B.2). A facility that may be providing EmOC services is one that is either:

(1) on the Ministry of Health's list of hospitals or facilities that *should* be providing at least Basic EmOC;
(2) on a list of private hospitals or facilities that might be providing at least Basic EmOC; or
(3) known to the area Medical Officer as possibly providing at least Basic EmOC.

This list should be as complete as possible so that no likely provider of EmOC is overlooked. Worksheets 1a-b can be used for this purpose. Since each worksheet has enough space to list 17 facilities, it is likely that copies of each worksheet will have to be made and the lists of each type of facility will be several pages long. Form 1 summarizes the numbers of facilities listed on Worksheets 1a-b.

Selecting EmOC facilities for study

In a relatively small area, visiting every hospital may be feasible, while in larger areas it will not. Even in small areas, it will often be difficult to visit every lower level facility that might be providing Basic EmOC. Thus, within most areas, a subset of EmOC facilities must be selected for review. In order to avoid bias, this second stage of selection should also be done randomly. The number of facilities selected should be as large as possible while still allowing for careful data collection at each facility. The criteria below can be used in deciding whether to study all facilities or to select a subset for review:

Possible Comprehensive EmOC Facilities: If there are 25 or fewer, study all of them. If there are more than 25, a subset may be selected for study. Select as many as possible, but the number should represent at least 30 percent, and should be at least 20.
Possible Basic EmOC facilities: If there are 100 or fewer, study all of them. If there are more than 100, a subset may be selected for study. Select as many as possible, but the number should represent at least 30 percent.

In Area X, there are not too many possible Comprehensive EmOC facilities — 48. Although the number is greater than 25, it is decided that it is feasible to visit all of them.

However, there are 390 possible Basic EmOC facilities, and it would be too difficult and costly to visit all of them, so a subset of these facilities must be selected for review. It is decided that 40 percent will be selected. Thus, 156 (.4 x 390) possible Basic EmOC facilities will be reviewed.

Random selection of facilities

If all possible Comprehensive and all possible Basic EmOC facilities will be visited, this step will not be necessary. If a subset of both types of facilities will be selected, the random selection procedure should be carried out separately for each. The procedure is outlined below.

The random selection will be done using all copies of Worksheets 1a and/or 1b that have been filled out for the geographic area in question.

Step 1. Assign each facility a consecutive number. (*Note:* In order to minimize the possibility of bias, it is best to have facilities listed in alphabetical order before numbering them.)

Step 2. Calculate the sampling interval. The sampling interval will tell you to select every *nth* facility, once the first facility has been selected at random. Use the following formula:

sampling interval =	number of facilities in area *divided by* number of facilities to be selected

In Area X there are a total of 390 possible Basic EmOC facilities, of which 156 are to be selected for study, giving a sampling interval of about 3 (390/156 = 2.5).

Note: Sampling intervals are rounded to the nearest whole number.

Step 3. Identify the first facility to be included in the sample by generating a random number that is less than or equal to the sampling interval but greater than zero. This can be done using a random number table (in section B.4). To use the table, look away from the page and touch it with the point of a pencil. The digit closest to where the pencil touches the page is the random number. If the digit is less than or equal to the sampling interval and greater than zero, use it; if not, read from left to right until a digit that satisfies this condition is reached. This number will be the first facility selected.

For possible Basic EmOC facilities of Area X, the sampling interval is 3. Using the random number table, our pencil point falls on the digit 4, at row 15, column 22. This is larger than our sampling interval, so we read left to right, passing the digits 0, 7, and 5, until we come to 1. Thus, facility #1 on the list of possible Basic EmOC facilities will be the first area selected.

Step 4. Identify all other facilities to be studied by adding the sampling interval to the number that located the first facility. Continue to select facilities until the desired number has been reached. If you come to the end of a list in the selection process, continue on back to the beginning of the list, but do not count those facilities that have already been selected.

Since the first selected facility is #1 on the list, the next one would be 1 plus 3, or #4, and the next #7, and so on. Facility #388 will be the 129th facility selected, and facility #3 will be the 130th (since #1 has already been selected and should not be counted in the second pass through). Every third facility will continue to be selected in this way until all 156 have been selected.

Once the facilities to be reviewed have been selected, site visits to gather data at each of these facilities can begin.

Form 2: Conduct site visits to assess EmOC actually being provided

A copy of Form 2 and Worksheets 2a and 2b should be used at each facility to record the type and amount of services provided. The information compiled on the form will enable research staff to determine whether a given facility is actually providing EmOC services and, if it is, whether these are Basic or Comprehensive. The same forms also elicit information needed to assess EmOC coverage and performance. Except for data on population size and birthrate, all the information needed to construct the process indicators is contained in Form 2 and Worksheets 2a and 2b.

Note: There has been some discussion of the fact that the minimum acceptable level for cesarean sections might be somewhat lower than 5 percent if it included only operations performed for maternal indications. Unfortunately, it is often impossible to get information on indications from records in developing countries.

Notes on data collection using Form 2 (Worksheets 2a and 2b)

▸ Collecting data on complicated cases

Worksheet 2a should be used in conjunction with Form 2 for recording complications. Depending on the size of each facility and the quality of its records, it may be too difficult to collect the necessary information for the whole year. Therefore, the worksheet presents two other plans, to be used when necessary.

- *Plan 1* should be followed whenever possible. This entails completing the grid on Worksheet 2a to record the number of each type of complication at the facility during each of the 12 months being studied.

- *Plan 2* can be followed if the facility's patient volume is so large that gathering this information for all 12 months would be too time-consuming (e.g., if there are more than 100 admissions to the obstetric ward per month). This plan uses a sample of four months distributed throughout the year, and then multiplies by three to estimate the total number of complications for the year.

- *Plan 3* should be followed *only* if the records at the facility do not contain the information needed to follow Plan 1 or 2. Plan 3 entails using commonly available information — the total number of deliveries in the facility and the number of "normal" deliveries. The number of "normal" deliveries in the study period is subtracted from the number of total deliveries, which yields the number of "non-normal" deliveries. This number is then multiplied by a correction factor (1.25), and the resulting number is a proxy for the number of women with obstetric complications.

The correction factor is applied because the number of non-normal deliveries is likely to underestimate the number of women with major obstetric complications admitted to the facility. The number of non-normal deliveries will fail to include women admitted for at least three of the major obstetric complications: postpartum and antepartum hemorrhage, postpartum sepsis, and complications of induced abortion. On the other hand, non-normal deliveries will include a certain number of complications that are not among those being used here to define a complicated case (e.g., non-obstetric illnesses occurring during pregnancy or postpartum). Depending on how hospital records are kept, non-normal deliveries may also include events such as multiple births or even deliveries done with episiotomy. Thus, using Plan 3 is a poor substitute for using Plan 1 or 2.

- Collecting data on maternal deaths

Worksheet 2b is used in conjunction with Form 2 for recording maternal deaths. To ensure that all maternal deaths that occurred in the facility during the 12-month period are recorded, all relevant sources of information should be investigated, including (but not limited to) maternity ward death registers, morgue record books, and emergency room records.

While only those maternal deaths due to the direct obstetric complications specified earlier will be used in calculating case fatality rates, other maternal deaths discovered in these investigations may still be informative to facility managers.

Form 3: Summarize findings for Basic and Comprehensive EmOC facilities

After copies of Form 2 have been used to gather data from EmOC facilities, the forms should be collected and sorted into three groups, based on the findings in Box B ("Facility's Actual EmOC Status") at the top of the first page:

- facilities actually providing Comprehensive EmOC;
- facilities actually providing Basic EmOC; and
- facilities not providing EmOC.

The next step should be to summarize these findings for the area. Form 3 is used for this purpose. The form has two parts. Part A — a straightforward summary of the data collected from facilities — should be used only if *all* possible Basic and Comprehensive facilities in the area were visited (that is, no selection of facilities was done). Worksheets 3a-b will help in creating this summary.

Part B of Form 3 should be used if not all facilities were visited. Because it uses data from areas where a subset of all facilities were selected for study, an intermediate step is necessary to convert the data collected into estimates for all facilities in the

area. Worksheet 3c (in addition to Worksheets 3a–b) should be used for this intermediate step.

Thus, for each area included in the study, one copy of Form 3 will be filled out, using *either* Part A *or* Part B.

Form 4: Calculate indicators for the area

Once the findings from site visits have been summarized, Form 4 can be used to calculate the indicators for the area. This form lays out the steps for using the information summarized in Form 3. A summary checklist for whether each indicator meets or does not meet acceptable levels is part of this form.

While, ultimately, data from facilities will be aggregated to calculate the indicators for the whole country, the area-level indicators provide important information. First, they provide useful information for setting program priorities at the area level. A complete set of completed Forms 1–4 should be maintained at the area level for this purpose. Second, these indicators will allow for comparisons across study areas at the national level. Using the information obtained for each study area, national-level researchers can examine the differences in EmOC coverage, utilization, and performance in different areas of the country. This, in turn, may have important implications for policy and programming priorities.

Form 5: Calculate indicators for the country

In order to calculate the process indicators for the country as a whole, the national-level researchers will need to collect copies of all Forms 1–4 (including worksheets) from each of the study areas. All the information needed for this final step — calculating the indicators for the country — is summarized on Form 5 and Worksheets 5a–c.

Worksheets 5a–c are designed to organize the data needed to calculate the indicators for the country. Worksheet 5a summarizes information on the amount of EmOC facilities for all areas studied. Worksheet 5b does the same for deliveries, complications and cesarean sections. Worksheet 5c summarizes obstetric complications and deaths in Comprehensive EmOC facilities studies, for the calculation of CFR. Finally, the indicators for the country as a whole are determined on Form 5. As with Form 4 for the calculation of indicators at the area level, a summary checklist for whether each indicator meets or does not meet acceptable levels is provided.

All of the above steps are summarized in Figure B.5 — a "user's guide" to the data collection forms.

Figure B.5. User's guide to the data collection forms

Form #	Level of action	Actions required	Use
None	National	Select areas for study, if necessary.	Text B.2
	National	Determine nationally uniform 12-month period to be studied and enter on Form 2.	
	National	Duplicate Forms 1–4 (with worksheets) and distribute to areas selected.	
1	Area*	List all possible facilities providing EmOC in area.	Worksheets 1a–b
	Area	If necessary, select facilities to be visited.	Text B.2
2	Local	Conduct site visits to facilities.	Worksheets 2a–b Text B.2
3	Area	If a sample of facilities was visited, count: • Possible Basic EmOC facilities visited • Possible Comprehensive EmOC facilities visited	Forms 1 & 2 Worksheet 3c
	Area	Separate facilities into three groups: • Actual Comprehensive EmOC facilities • Actual Basic EmOC facilities • Not EmOC	Form 2
	Area	Summarize findings from Basic and Comprehensive EmOC facilities.	Worksheets 3a–c Text B.2
4	Area	Calculate indicators for area.	Form 3 & Worksheet 3b Text B.2
	Area	Interpret.	Text B.3
5	National	Collect completed Forms 1–4 (with worksheets) from all study areas.	
	National	Calculate indicators for entire country.	Forms 3 & 4, Worksheet 3b Text B.2
	National	Interpret.	Text B.3

* "Area" refers to the administrative level in the country being used for monitoring — e.g., state, province.

B.3 Interpreting the Findings

Having calculated the indicators, the next step is to interpret the findings. Some general interpretation issues, which are relevant to most of the process indicators, are discussed below. Additionally, a useful reference is "Emergency Obstetric Care: Measuring Availability and Monitoring Progress," which presents findings on the process indicators for several areas in India.[13] Although the process indicators have been revised somewhat since this study, the article provides a good example of how to present and interpret the findings.

"Minimum" versus "optimum" levels

One important distinction that applies to most of the indicators is the distinction between "minimum" and "optimum" levels. By necessity, the minimum acceptable levels proposed here are approximations. Therefore, if the *minimum* acceptable level is met for a particular indicator, this does not imply that the *optimum* level has been reached. For instance, one key assumption in setting the minimum acceptable levels is that approximately 15 percent of pregnant women will experience serious obstetric complications. If in fact this is an underestimate — as some studies suggest it may be — then the minimum acceptable levels proposed here may be underestimates as well.[14,15] However, since it would be extremely difficult and costly to collect national and local data on the incidence of obstetric complications, it is reasonable to assume (based on the evidence presented in section B.1) that a country meeting the minimum acceptable level for each indicator has a strong program for reducing maternal mortality.

In comparing the findings to the minimum acceptable levels, a good rule is that when the actual level meets or exceeds the minimum acceptable level, it is probable that, in the aggregate, the need for EmOC is being reasonably well met. Nevertheless, even if the minimum acceptable level for an indicator is met on the national level, there may be problems in particular areas. On the other hand, when the level falls below the minimum acceptable level, one can conclude that the need for EmOC is not being met in most areas of the country. The general principle here is that favorable findings, while reassuring, do not justify complacency. Unfavorable findings, on the other hand, clearly indicate the need for action.

Generalizability of results

In countries where subsets of areas and/or facilities are selected for study, another concern about interpreting data is generalizability of the findings. In section B.2, which discusses selection of facilities for study, the selection process had two steps — selection of areas for study, and, within these areas, selection of facilities for study.

If, however, information ends up not to be useful for generalization, it may nevertheless be useful for managing or evaluating health services in the area. For example, supposing that

the possible EmOC facilities selected for study were not randomly selected and were therefore much more likely to be located on a major road than a randomly selected group would have been. While it may not be possible to generalize from these data, they may show that some hospitals are not providing such life-saving services as cesarean sections, even though government standards indicate that they should. This information, by itself, can be used to direct efforts to reduce maternal deaths.

Furthermore, even if one knows that data are biased, they may still be useful if the direction of the bias is known. For instance, in the example given above, it may be possible to say with reasonable certainly that hospitals far from major roads are less likely (rather than more likely) than hospitals on the major roads to perform cesarean sections. Therefore, one could cautiously say that the estimate derived from the biased sample presents an unrealistically favorable picture and that the situation is probably worse than the data indicate.

Incomplete or poor data

The routine maternity record system in many countries does not make it easy to gather data on obstetric complications. Thus, it is likely that incomplete or poor records will be encountered when gathering data for these indicators — at least the first time. The question is, what to do when problems are encountered?

First of all, it is important to remember that poor records will bias the findings in one direction — undercounting of events taking place in facilities. Therefore, when interpreting the data one can discuss the possible effect of undercounting. In many situations, the level of EmOC being provided is so low that, even allowing for substantial undercounting (e.g., 100 percent), the meaning of the findings does not change very much. For example, if the records show that only six percent of the need for EmOC is met in an area, and one assumes that the true proportion is twice as high, that is still only 12 percent. This change does not alter the clear implications for programs.

There are two ways in which it would be possible to overestimate, rather than underestimate, the amount of EmOC being provided. The first is by underestimating the denominator — i.e., by underestimating live births. The second might arise if data on women with complications are unavailable in most facilities. In fact, as noted earlier, these are the data that are likely to be the most difficult to gather. If this is the case, and a proxy method is therefore used, it is likely to lead to an overestimate of women with complications. In such situations, if it is found that minimum met need for EmOC is not being satisfied, one can reasonably assume that the situation is probably even worse. If, on the other hand, it is found that met need exceeds 100 percent, the conclusion is indeterminate.

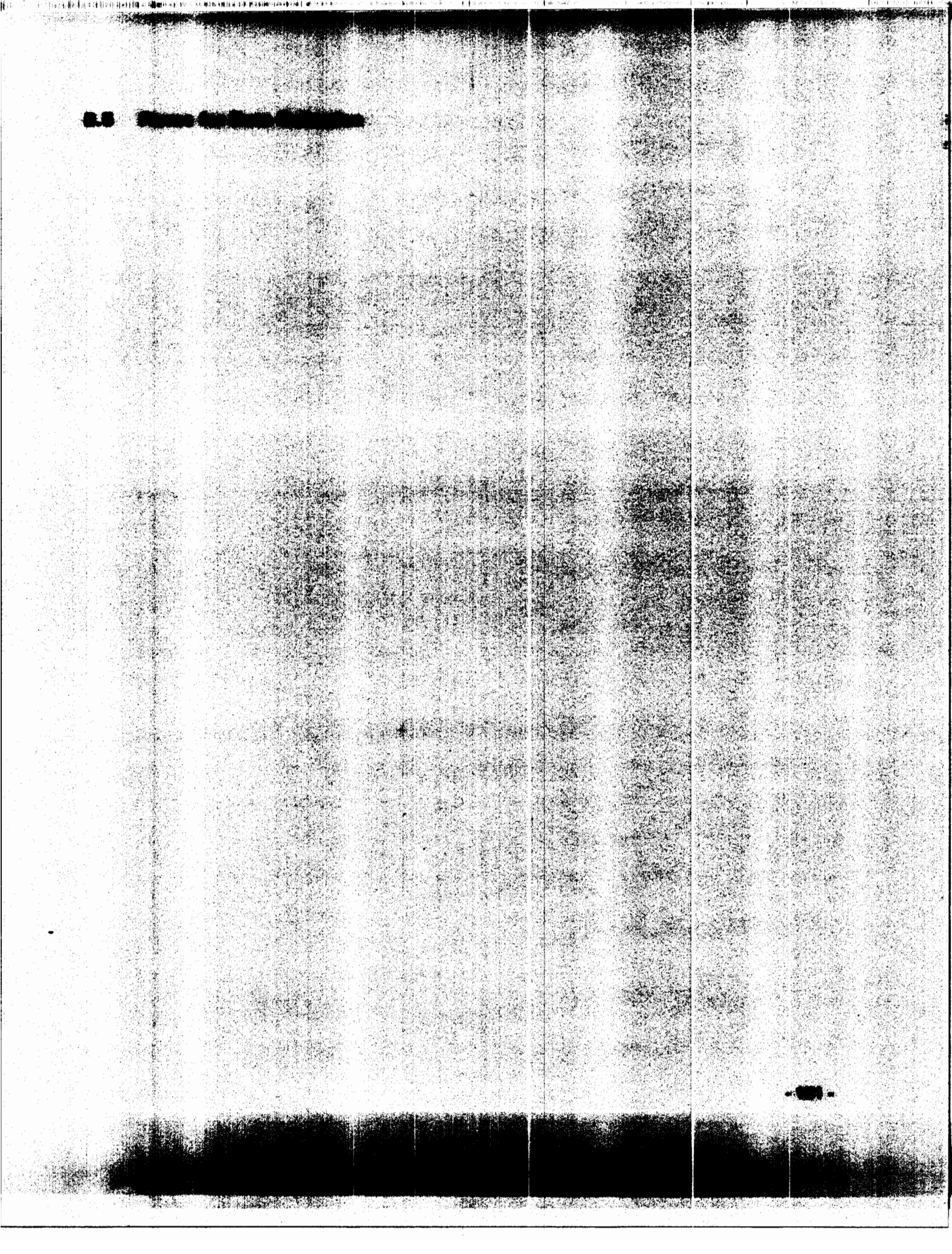
If the number of women with complications is *over*estimated, then the case fatality rate for these facilities is likely to be *under*estimated. The interpretation of CFRs from such facilities

follows a similar logic: If the CFR is found to be unacceptable, one can reasonably assume that the actual situation is even worse.

In the absence of information on women with complications, information on cesarean sections (Indicator 5 — cesarean sections as a percentage of births) may be used as a rough indication of the amount of EmOC being provided. (Surgery registers are usually fairly well kept.)

B.4 Random Number Table

	00000 12345	00001 67890	11111 12345	11112 67890	22222 12345	22223 67890	33333 12345	33334 67890	44444 12345	44445 67890
01	85967	73152	14511	85285	36009	95892	36962	67835	63314	50162
02	07483	51453	11649	86348	76431	81594	95848	36738	25014	15460
03	96283	01898	61414	83525	04231	13604	75339	11730	85423	60698
04	49174	12074	98551	37895	93547	24769	09404	76548	05393	96770
05	97366	39941	21225	93629	19574	71565	33413	56087	40875	13351
06	90474	41469	16812	81542	81652	45554	27931	93994	22375	00953
07	28599	64109	09497	76235	41383	31555	12639	00619	22909	29563
08	25254	16210	89717	65997	82667	74624	36348	44018	64732	93589
09	28785	02760	24359	99410	77319	73408	58993	61098	04393	48245
10	84725	86576	86944	93296	10081	82454	76810	52975	10324	15457
11	41059	66456	47679	66810	15941	84602	14493	65515	19251	41642
12	67434	41045	82830	47617	36932	46728	71183	36345	41404	81110
13	72766	68816	37643	19959	57550	49620	98480	25640	67257	18671
14	92079	46784	66125	94932	64451	29275	57669	66658	30818	58353
15	29187	40350	62533	73603	34075	16451	42885	03448	37390	96328
16	74220	17612	65522	80607	19184	64164	66962	82310	18163	63495
17	03786	02407	06098	92917	40434	60602	82175	04470	78754	90775
18	75085	55558	15520	27038	25471	76107	90832	10819	56797	33751
19	09161	33015	19155	11715	00551	24909	31894	37774	37953	78837
20	75707	48992	64998	87080	39333	00767	45637	12538	67439	94914
21	21333	48660	31288	00086	79889	75532	28704	62844	92337	99695
22	65626	50061	42539	14812	48895	11196	34335	60492	70650	51108
23	84380	07389	87891	76255	89604	41372	10837	66992	93183	56920
24	46479	32072	80083	63868	70930	89654	05359	47196	12452	38234
25	59847	97197	55147	76639	76971	55928	36441	95141	42333	67483
26	31416	11231	27904	57383	31852	69137	96667	14315	01007	31929
27	82066	83436	67914	21465	99605	83114	97885	74440	99622	87912
28	01850	42782	39202	18582	46214	99228	79541	78298	75404	63648
29	32315	89276	89582	87138	16165	15984	21466	63830	30475	74729
30	59388	42703	55198	80380	67067	97155	34160	85019	03527	78140
31	58089	27632	50987	91373	07736	20436	96130	73483	85332	24384
32	61705	57285	30392	23660	75841	21931	04295	00876	09114	32101
33	18914	98982	60199	99275	41967	35208	30357	76772	92656	62318
34	11965	94089	34803	48941	69709	16784	44642	89761	66864	62803
35	85251	48111	80936	81781	93248	67877	16498	31924	51315	79921
36	66121	96986	84844	93873	46352	92183	51152	85878	30490	15974
37	53972	96642	24199	58080	35450	03482	66953	49521	63719	57615
38	14509	16594	78883	43222	23093	58645	60257	89250	63266	90858
39	37700	07688	65533	72126	23611	93993	01848	03910	38552	17472
40	85466	59392	72722	15473	73295	49759	56157	60477	83284	56367
41	52969	55863	42312	67842	05673	91878	82738	36563	79540	61935
42	42744	68315	17514	02878	97291	74851	42725	57894	81434	62041
43	26140	13336	67726	61876	29971	99294	96664	52817	90039	53211
44	95589	56319	14563	24071	06916	59555	18195	32280	79357	04224
45	39113	13217	59999	49952	83021	47709	53105	19295	88318	41626
46	41392	17622	18994	98283	07249	52289	24209	91139	30715	06604
47	54684	53645	79246	70183	87731	19185	08541	33519	07223	97413
48	89442	61001	36658	57444	95388	36682	38052	46719	09428	94012
49	36751	16778	54888	15357	68003	43564	90976	58904	40512	07725
50	98159	02564	21416	74944	53049	88749	02865	25772	89853	88714



FORM 1
LIST OF POSSIBLE EMERGENCY OBSTETRIC CARE (EmOC) FACILITIES

1. Name of area: _____

2. Population size of area: _____

3. Sources of information:
(list additional sources on separate sheet) _____

4. Form completed by: Name: Title: _____

5. Form completed on: Date: / / _____

You will need to complete Worksheets 1a–b BEFORE filling in the totals below.

1. **Total number of possible BASIC EmOC facilities** =
(Add sheet totals from all copies of Worksheet 1a.)

2. **Total number of possible COMPREHENSIVE EmOC facilities** =
(Add sheet totals from all copies of Worksheet 1b.)

Basic EmOC includes the following procedures: parenteral administration of medications (antibiotics, oxytocics, sedatives); manual removal of placenta; removal of retained products; and assisted vaginal delivery (vacuum extraction, forceps).

Comprehensive EmOC includes all of the procedures of Basic EmOC plus surgery (cesarean section, curettage, hysterectomy) and blood transfusion.

WORKSHEET 1a

LIST OF FACILITIES WHERE BASIC EmOC MIGHT BE PERFORMED

Area: _____

This worksheet should be used to list all facilities in the area that might be providing Basic EmOC.
Possible Comprehensive EmOC facilities should be listed on Worksheet 1b. Do not list any facility twice.

Basic EmOC includes the following procedures: parenteral administration of medications (antibiotics, oxytocics, sedatives); manual removal of placenta; removal of retained products; and assisted vaginal delivery (vacuum extraction, forceps).

Facility Name	Location	Government/Private

Sheet total of facilities where Basic EmOC might be performed = [ ]

WORKSHEET 1b

LIST OF FACILITIES WHERE COMPREHENSIVE EmOC MIGHT BE PERFORMED

Area: _____

This worksheet should be used to list all facilities in the area that might be providing Comprehensive EmOC. Possible Basic EmOC facilities should be listed on Worksheet 1a. Do not list any facility twice.

Comprehensive EmOC includes all of the procedures of Basic EmOC plus surgery (cesarean section, curettage, hysterectomy) and blood transfusion.

Facility Name	Location	Government/Private

Sheet total of facilities where Comprehensive EmOC might be performed = ☐

FORM 2

EMERGENCY OBSTETRIC CARE (EmOC) FACILITY REVIEW

▸ *12-month Period Under Review:* _____ *through* _____ ◂

Box A: Facility's Possible EmOC Status

To be done at area level before completion of this form.

Circle ONE (Use W.S. 1a-b)

Comprehensive EmOC
Basic EmOC

Box B: Facility's Actual EmOC Status

To be done at facility level after completion of this form.

Circle ONE (Use Q11 Box)

Comprehensive EmOC
Basic EmOC
Not EmOC

1. Name of facility: _____

2. Location of facility: _____

3. Contact information: _____

_____

• If no data at all are available at this facility, check here: _____ *(Skip to last page and sign.)*

_____

4. Type of facility: (a) Hospital _____ (b) Maternity _____ (c) Health center _____ *(Check one)* (d) Clinic _____ (e) Other (specify) _____
5. Type of operating agency: (a) Government _____ (b) Private _____ *(Check one)*

6. Total deliveries during 12-month period	
7. Normal deliveries during 12-month period	
8. Cesarean sections during 12-month period	

Complete Worksheets 2a and 2b and enter a total for each of the following items

9. Complicated obstetric cases* during 12-month period (* fill in from Line 9b, Worksheet 2a)		*Check one (see Worksheet 2a)* __Plan 1 __Plan 2 __Plan 3
10. Direct obstetric deaths from selected causes** during 12-month period (** fill in from Line 8, TOTAL, Worksheet 2b)		

FORM 2
(continued)

Check Yes or No for <u>each</u> of the following items (a-h)		
11. Were the following services performed at least once during the last 3 months?	**Yes**	**No**
(a) Parenteral antibiotics		
(b) Parenteral oxytocics		
(c) Parenteral sedatives/anticonvulsants		
(d) Manual removal of placenta		
(e) Removal of retained products		
(f) Assisted vaginal delivery		
(g) Blood transfusion		
(h) Cesarean section		

Box: Determination of EmOC status
(Use Q11. Check only ONE.)

- **If ALL of 11a-h = Yes, check:**
  ____ COMPREHENSIVE EmOC
- **If ALL of 11a-f = Yes AND 11g OR 11h = No, check:**
  ____ BASIC EmOC
- **If ANY of 11a-f = No, check:**
  ____ **NOT** EmOC

12. What sources of data were used to complete this form?
(e.g., maternity ward register, delivery book, general admissions register, etc.)

_____

_____

_____

Quality of Information:

13. In your informed opinion (from talking to staff, seeing the record system, etc.) what proportion of the complications treated in this facility are recorded on this form? (check one)
None _____ Some _____ Most _____ All _____

14. Date of review: _____

15. Reviewed by: **Name:** _____

Title: _____

Facility: _____
Period: _____ to _____

WORKSHEET 2a
COMPLICATED OBSTETRIC CASES DURING 12-MONTH PERIOD

Indicate with a check which plan is being used (use only one):

___ **PLAN 1:** **TO BE FOLLOWED WHENEVER POSSIBLE**
- Enter the number of each type of complicated case treated each month during the 12-month period using the grid below.

___ **PLAN 2:** **TO BE FOLLOWED WHEN IT IS NOT FEASIBLE TO RECORD ALL COMPLICATIONS** (i.e., when this would be too much work)
- Enter the number of each type of complicated case treated during the four months underlined — i.e., months 1, 4, 7 & 10.

___ **PLAN 3:** **TO BE FOLLOWED ONLY WHEN DATA ON COMPLICATIONS ARE NOT AVAILABLE AT THE FACILITY**
- Enter the number of deliveries _____ and the number of "normal" deliveries _____ for the 12-month period and skip to Question 9 below.

Complication If more than one, use the most life-threatening.	Month (write in month above each number)											
	1	2	3	4	5	6	7	8	9	10	11	12
1. Hemorrhage (ante or postpartum)												
2. Prolonged/obstructed labor												
3. Postpartum sepsis												
4. Complications of abortion												
5. Preeclampsia/eclampsia												
6. Ectopic pregnancy												
7. Ruptured uterus												
8. Monthly totals												

9. TOTAL COMPLICATED OBSTETRIC CASES *(Complete only ONE of the boxes below.)*

PLAN 1	*PLAN 2*	*PLAN 3*
9b. Sum of monthly totals (Q8, columns 1-12) = _____	9a. Sum of monthly totals (Q8, columns 1,4,7,10) = _____ 9b. [Q9a] x 3 = _____	9a. (All deliveries) - ("Normal" deliveries) = _____ 9b. [Q9a] x 1.25* = _____ *Correction factor

Facility: _____
Period: _____ to _____

WORKSHEET 2b
MATERNAL DEATHS DURING 12-MONTH PERIOD

Use this worksheet to record maternal deaths, by cause, in this facility during the 12-month period covered. When transferring information to Form 2, be sure to use the total direct obstetric deaths from Line 8.

Cause of maternal death *If more than one, use the most life-threatening cause*	Month (write in month above each number)												
	1	2	3	4	5	6	7	8	9	10	11	12	Total
1. Hemorrhage (ante or postpartum)													
2. Prolonged/obstructed labor													
3. Postpartum sepsis													
4. Complications of abortion													
5. Preeclampsia/eclampsia													
6. Ectopic pregnancy													
7. Ruptured uterus													
8. Total direct obstetric deaths from selected causes (not including Other) **(Sum of Questions 1-7)**													*
9. Other (all other causes)													
10. Total maternal deaths													

*** Use this total in completing Form 2, Question 9.** The case fatality rate (CFR) will be calculated by dividing the number of deaths by the number of complicated cases. To keep the numerator and denominator of the CFR comparable, the deaths used in this calculation are restricted to only those due to the causes used to define a complicated case.

FORM 3

SUMMARY OF DATA FROM EmOC FACILITIES IN AREA

This form summarizes all the facilities' data that have been collected on all copies of Form 2 within the area. One copy of this form should be completed for each area.

1. Name of area: _____
2. Population in area: _____
3. Birthrate in area: _____
4. Estimated annual births in area (Q2 × Q3) _____

Complete either Part A or Part B below. The other part will be left blank.

If ALL facilities in area were visited, complete PART A ONLY.

If a SUBSET of facilities in area were selected, complete PART B ONLY.

PART A *Use Worksheets 3a–b to complete the table below.*

	Column 1 Basic EmOC facilities	Column 2 Comprehensive EmOC facilities	Column 3 Total (Col 1 + Col 2)
5. Number of facilities providing EmOC	(W.S. 3a, Q2)	(W.S. 3b, Q2)	
6. Number of deliveries in 12-month period	(W.S. 3a, Q1a)	(W.S. 3b, Q1a)	
7. Number of complicated cases treated in 12-month period	(W.S. 3a, Q1b)	(W.S. 3b, Q1b)	
8. Number of cesarean sections in 12-month period	(W.S. 3a, Q1c)	(W.S. 3b, Q1c)	

PART B *Complete Worksheets 3a–c. Then use Worksheet 3c to complete the table below.*

	Column 1 Basic EmOC facilities	Column 2 Comprehensive EmOC facilities	Column 3 Total (Col 1 + Col 2)
5. Number of facilities providing EmOC	(W.S. 3c, Q4)	(W.S. 3c, Q11)	
6. Number of deliveries in 12-month period	(W.S. 3c, Q5)	(W.S. 3c, Q12)	
7. Number of complicated cases treated in 12-month period	(W.S. 3c, Q6)	(W.S. 3c, Q13)	
8. Number of cesarean sections in 12-month period	(W.S. 3c, Q7)	(W.S. 3c, Q14)	

WORKSHEET 3a

SUMMARY OF BASIC EmOC FACILITY REVIEWS

Area: _____

This worksheet summarizes all **BASIC** EmOC facilities' data collected on all copies of Form 2.

Use Box B at top of Form 2 ("Facility's EmOC Status: Actual") to identify Basic EmOC facilities. Attach additional sheets if necessary.

Column 1	Column 2	Column 3	Column 4
Facility	Number of deliveries (Form 2, Q6)	Number of complicated cases (Form 2, Q9)	Number of cesarean sections (Form 2, Q8)
1. Column totals*	1a.	1b.	1c.

2. Total number* of **BASIC** EmOC facilities listed in Column 1 = ☐

*If more than one sheet was used, add sheet "totals" to get overall total.

WORKSHEET 3b

SUMMARY OF COMPREHENSIVE EmOC FACILITY REVIEWS

Area: _____

This worksheet summarizes all **COMPREHENSIVE** EmOC facilities' data collected on all copies of Form 2.

Use Box B at top of Form 2 ("Facility's EmOC Status: Actual") to identify Comprehensive EmOC facilities. Attach additional sheets if necessary.

Column 1	Column 2	Column 3	Column 4	Column 5	Column 6
Facility	Number of deliveries (Form 2, Q6)	Number of complicated cases (Form 2, Q9)	Number of cesarean sections (Form 2, Q8)	Number of direct obstetric deaths (from selected causes) (Form 2, Q10)	Facility case fatality rate (CFR) Direct obstetric deaths / Complicated cases x 100 (Column 5) ÷ (Column 3) x 100
1. Column totals*	1a.	1b.	1c.	1d.	

2. Total number* of **COMPREHENSIVE** EmOC facilities listed in Column 1 = ☐

*If more than one sheet was used, add sheet "totals" to get overall total.

Area: _____

WORKSHEET 3c
AREA-WIDE ESTIMATES OF EmOC

This worksheet converts the data from the subset of facilities that were selected for site visits into estimates for the entire area. If **all** possible Basic and Comprehensive EmOC facilities in the area were visited there is no need to complete this worksheet.

BASIC EmOC FACILITIES:

Use Forms 1 and 2 to complete the box below.

1. Number of possible Basic EmOC facilities visited (Use all copies of Form 2, Box A at top of p. 1.)	
2. Number of possible Basic EmOC facilities in area (Form 1, Q1)	
3. Proportion of facilities for which data were collected (Q1 ÷ Q2)	

*Use Worksheet 3a to calculate the following estimates for **Basic** EmOC facilities in the area.*

	Total from facilities visited	+	Proportion of Basic EmOC facilities visited (Q3 above)	=	Estimate for area
4. Estimated number of Basic EmOC facilities	(W.S. 3a, Q2)	+		=	
5. Estimated number of deliveries in 12-month period	(W.S. 3a, Q1a)	+		=	
6. Estimated number of complicated cases treated in 12-month period	(W.S. 3a, Q1b)	+		=	
7. Estimated number of cesarean sections in 12-month period	(W.S. 3a, Q1c)	+		=	

COMPREHENSIVE EmOC FACILITIES:

Use Forms 1 and 2 to complete the box below.

8. Number of possible Comprehensive EmOC facilities visited (Use all copies of Form 2, Box A at top of p. 1.)	
9. Number of possible Comprehensive EmOC facilities in area (Form 1, Q2)	
10. Proportion of facilities for which data were collected (Q1 ÷ Q2)	

*Use Worksheet 3b to calculate the following estimates for **Comprehensive** EmOC facilities in the area.*

	Total from facilities visited	+	Proportion of Comprehensive EmOC facilities visited (Q10 above)	=	Estimate for area
11. Estimated number of Comprehensive EmOC facilities	(W.S. 3b, Q2)	+		=	
12. Estimated number of deliveries in 12-month period	(W.S. 3b, Q1a)	+		=	
13. Estimated number of complicated cases treated in 12-month period	(W.S. 3b, Q1b)	+		=	
14. Estimated number of cesarean sections in 12-month period	(W.S. 3b, Q1c)	+		=	

Area: _____

FORM 4
CALCULATION OF INDICATORS FOR THE AREA

Use Form 3 to calculate the indicators below.

IS ACCEPTABLE LEVEL MET?

INDICATOR #1: AMOUNT OF EmOC SERVICES

(Total Basic EmOC facilities in area (Form 3, Q5, col. 1) ÷ Population in area (Form 3, Q2)) × 500,000 = **Indicator #1a** Number of Basic EmOC facilities per 500,000 population

Minimum acceptable level = 4 per 500,000 population

☐ Met ☐ Not met

(Total Comprehensive EmOC facilities in area (Form 3, Q5, col. 2) ÷ Population in area (Form 3, Q2)) × 500,000 = **Indicator #1b** Number of Comprehensive EmOC facilities per 500,000 population

Minimum acceptable level = 1 per 500,000 population

☐ Met ☐ Not met

INDICATOR #2: DISTRIBUTION OF EmOC FACILITIES

Note: This indicator is generally intended for use at the national level. In large areas (e.g. with millions of inhabitants), it is reasonable to calculate the distribution of EmOC facilities for sub-areas. This may be done by repeating the steps above (in Indicator #1), and then calculating the percentage of sub-areas meeting the minimum acceptable levels. The minimum acceptable level for this indicator is 100%.

INDICATOR #3: PROPORTION OF ALL BIRTHS IN BASIC AND COMPREHENSIVE EmOC FACILITIES

Total deliveries in all EmOC facilities in area (Form 3, Q6, col.3) ÷ Total annual births in area (Form 3, Q4) = **Indicator #3** Proportion of all births in Basic and Comprehensive EmOC facilities

_____ × 100 = _____ %

Minimum acceptable level = 15 %

☐ Met ☐ Not met

FORM 4
(continued)

IS ACCEPTABLE LEVEL MET?

INDICATOR #4: MET NEED FOR EmOC

Total complicated cases in all EmOC facilities (Form 3, Q7, col. 3)		Total annual births in area (Form 3, Q4)		.15*		Indicator #4: Proportion of women estimated to have complications who are treated in EmOC facilities
	+(		×	.15*	) =	_____ x 100 = _____ %

* Births are multiplied by .15 to estimate total complications in the population.

Minimum acceptable level = 100%

☐ Met ☐ Not met

INDICATOR #5: Cesarean SECTIONS AS A PROPORTION OF ALL BIRTHS

Total cesarean sections in all EmOC facilities (Form 3, Q8, col. 3)		Total annual births in area (Form 3, Q4)		Indicator #5: Cesarean sections as a proportion of all births
	÷		=	_____ x 100 = _____ %

Minimum acceptable level = 5%
Maximum acceptable level = 15 %

☐ Met ☐ Not met

INDICATOR #6: CASE FATALITY RATE

Total direct obstetric deaths (from selected causes) in all Comprehensive EmOC facilities *studied* (W.S. 3b, Q1d)		Total complicated cases in all Comprehensive EmOC facilities *studied* (W.S. 3b, Q1b)		Indicator #6: Case fatality rate
	÷		=	_____ x 100 = _____ %

Maximum acceptable level = 1 %

☐ Met ☐ Not met

CFR bar chart for area: *Create a bar chart for the area to show the CFRs for each Comprehensive EmOC facility studied. The horizontal axis should be labeled with the facility names and the vertical axis CFR (%). Use Worksheet 3b to obtain CFRs for each facility.*

FORM 5
CALCULATION OF INDICATORS FOR THE COUNTRY

Complete worksheets 5a-c before calculating the indicators below.

IS ACCEPTABLE LEVEL MET?

INDICATOR #1: AMOUNT OF EmOC SERVICES

(Total Basic EmOC facilities (W.S. 5a, Q1a) ÷ Total population (W.S. 5a, Q1c)) × 500,000 = **Indicator #1a** Number of Basic EmOC facilities per 500,000 population

Minimum acceptable level = 4 per 500,000 population

☐ Met ☐ Not met

(Total Comprehensive EmOC facilities (W.S. 5a, Q1b) ÷ Total population (W.S. 5a, Q1c)) × 500,000 = **Indicator #1b** Number of Comprehensive EmOC facilities per 500,000 population

Minimum acceptable level = 1 per 500,000 population

☐ Met ☐ Not met

INDICATOR #2: DISTRIBUTION OF EmOC FACILITIES

Number of areas meeting minimum levels for both Basic and Comprehensive EmOC (W.S. 5a, Q1d) ÷ Number of areas (W.S. 5a, Q2) = **Indicator #2** Proportion of areas with the minimum acceptable number of Basic and Comprehensive EmOC facilities: _____ × 100 = _____ %

Minimum acceptable level = 100% of areas have the minimum acceptable numbers of Basic and Comprehensive EmOC facilities

☐ Met ☐ Not met

INDICATOR #3: PROPORTION OF ALL BIRTHS IN BASIC AND COMPREHENSIVE EmOC FACILITIES

Total deliveries in all EmOC facilities (W.S. 5b, Q1a) ÷ Total annual births in all areas (W.S. 5b, Q1d) = **Indicator #3** Proportion of all births in Basic and Comprehensive EmOC facilities: _____ × 100 = _____ %

Minimum acceptable level = 15 %

☐ Met ☐ Not met

FORM 5
(continued)

IS ACCEPTABLE LEVEL MET?

INDICATOR #4: MET NEED EmOC

Total complicated cases in all EmOC facilities (W.S. 5b, Q1b)		Total annual births in all areas (W.S. 5 b, Q1d)		.15*		Indicator #4: Proportion of women estimated to have complications who are treated in EmOC facilities
	÷(		×	.15*	) =	_____ × 100 = _____ %

*Births are multiplied by .15 to estimate total complications in the population.

Minimum acceptable level = 100 %

☐ Met ☐ Not met

INDICATOR #5: Cesarean SECTIONS AS A PROPORTION OF ALL BIRTHS

Total cesarean section in all EmOC facilities (W.S. 5b, Q1c)		Total annual births in all areas (W.S. 5b, Q1d)		Indicator #5: Cesarean sections as a proportion of all births
	÷		=	_____ × 100 = _____ %

Minimum acceptable level = 5%
Maximum acceptable level = 15 %

☐ Met ☐ Not met

INDICATOR #6: CASE FATALITY RATE

Total direct obstetric deaths (from selected causes) in all Comprehensive EmOC facilities *studied* (W.S. 5c, Q1b)		Total complicated cases in all Comprehensive EmOC facilities *studied* (W.S. 5c, Q1a)		Indicator #6: Case fatality rate
	÷		=	_____ × 100 = _____ %

Maximum acceptable level = 1 %

☐ Met ☐ Not met

CFR Scattergram for country: *Create a scattergram for the country to show the CFRs in each Comprehensive EmOC facility studied, grouped by area. The horizontal axis should be labeled Area and the vertical axis CFR (%). Use all copies of Worksheet 3b to obtain CFRs. For each area, plot the CFR of all facilities and the aggregate CFR for that area.*

WORKSHEET 5a
AMOUNT OF EmOC SERVICES

Use copies of Form 3 and Form 4 for all areas studied to complete the following table. Attach additional sheets if necessary.

Name of area	Number of Basic EmOC facilities in area (Form 3, Q5, col. 1)	Number of Comprehensive EmOC facilities in area (Form 3, Q5, col. 2)	Population in area (Form 3, Q2)	Are minimum levels for both Basic and Comprehensive EmOC met? (If YES, place check in column.) (Form 4, Indicators #1a & #1b)
1. Column totals*	1a.	1b.	1c.	1d.

*If more than one sheet is used, add sheet "totals" to get overall column total.

2. Number of areas = [ ]

WORKSHEET 5b

DELIVERIES, COMPLICATIONS & C-SECTIONS

Use copies of Form 3 for all areas studied to complete the following table. Attach additional sheets if necessary.

Name of area	Total deliveries in all EmOC facilities in area (Form 3, Q6, col. 3)	Total complicated cases treated in all EmOC facilities in area (Form 3, Q7, col. 3)	Total cesarean sections in all EmOC facilities in area (Form 3, Q8, col. 3)	Total annual births in area (Form 3, Q4)
1. Column totals*	1a.	1b.	1c.	1d.

*If more than one sheet is used, add sheet "totals" to get overall column total.

WORKSHEET 5c

OBSTETRIC COMPLICATIONS AND DEATHS IN COMPREHENSIVE EmOC FACILITIES

Use all copies of Worksheet 3b to complete the following table. Attach additional sheets if necessary.

Name of area	Number of complicated obstetric cases in Comprehensive EmOC facilities *studied* (W.S. 3b, Q1b)	Number of direct obstetric deaths (due to selected causes) in Comprehensive EmOC facilities *studied* (W.S. 3b, Q1d)
1. Column totals*	1a.	1b.

*If more than one sheet is used, add sheet "totals" to get overall column total.

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