REVIEW ARTICLE

# Some Solutions to Reduce Maternal Mortality

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## Abstract

**Background:** Maternal mortality and morbidity remain an important public health priority and are key indicators of women's health worldwide. Data from the World Health Organization (WHO) show that about 295,000 women died during and following pregnancy and childbirth in 2017. About 13% of maternal deaths worldwide is due to unsafe abortions. The vast majority of these deaths (94%) occurred in low- and middle-income countries, and most could have been prevented. Severe maternal morbidity is nearly 100 times more common than maternal mortality and includes unexpected outcomes of labor and delivery that result in significant short- or long-term consequences to a woman's health. Improving maternal health is one of the key priorities of WHO. Action to improve women's health includes safe obstetric access, skilled attendance at childbirth, adequate antenatal, postpartum and postabortion care in order to reduce maternal deaths, and severe pregnancy complications.

**Causes of maternal mortality and morbidity:** The five most important direct causes of maternal mortality in developing countries that account for nearly 75% of all maternal deaths are severe bleeding, infections, unsafe abortion, high blood pressure during pregnancy, and complications from delivery. Some other factors also impact the poor maternal health outcomes such as the distance to facilities and, in some cases, inadequate and poor quality prenatal and maternity care services. Poor women in remote areas are the least likely to receive adequate healthcare. On the other side, adolescent girls face a higher risk of complications and death as a result of pregnancy than other complications.

**How can we reduce maternal mortality ratio?** Delivery by skilled birth attendants is strongly recommended to reduce maternal and neonatal mortality. Skilled care before, during, and after childbirth can make the difference between life and death for the mother as well as for the baby. A good essential obstetric care should be accessible to address complications of childbirth. An adequate antenatal and postpartum care can significantly reduce maternal mortality and morbidity. To avoid maternal deaths, it is also very important to prevent unwanted pregnancies. Family planning is also very important for primary prevention of maternal mortality.

**Conclusion:** Efforts to improve maternal outcomes could be done through programs of antenatal and postpartum care focused on the prevention and recognition of complications of pregnancy and childbirth. Substantial reduction in maternal mortality and morbidity will require long-term investment in community education and family planning and, ultimately, the empowerment of women. It is important to implement initiatives to understand the burden of severe maternal mortality and morbidity and to implement review processes for assessing potential preventability.

**Keywords:** Antenatal care, Maternal morbidity, Maternal mortality, Skilled birth attendant, Unsafe abortion.

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## Background

According to the International Classification of Diseases (ICD)-10 definition, maternal death is: "the death of a woman while pregnant or within 42 days of termination of pregnancy, irrespective of the duration and site of the pregnancy, from any cause related to or aggravated by the pregnancy or its management but not from accidental or incidental causes" (World Health Organization, 1999).[1]

Maternal mortality and morbidity remains an important public health priority and are key indicators of women's health worldwide. Maternal mortality ratio (MMR) is the number of maternal deaths in a population that occur during a given year per 100,000 live births and unfortunately it is unacceptably high. Data from WHO show that about 295,000 women died during and following pregnancy and childbirth in 2017. It means that every day, approximately 810 women died from preventable causes related to pregnancy and childbirth. The vast majority of these deaths (94%) occurred in low-resource settings, and most could have been prevented.[2] Sub-Saharan Africa and Southern Asia accounted for approximately 86% (254,000) of the estimated global maternal deaths in 2017. Sub-Saharan Africa alone accounted for roughly two thirds (196,000) of maternal deaths, while Southern Asia accounted for nearly one fifth (58,000). The high number of maternal deaths in some areas of the world reflects inequalities in access to quality health services and highlights the gap between rich and poor. The global MMR is estimated at 216 per 100,000 live births but enormous variations are observed between regions and countries. Maternal mortality ratio in low-income countries in 2017 is 462 per 100,000 live births vs 11 per 100,000 live births in high-income countries.

On the other side, severe maternal morbidity is nearly 100 times more common than maternal mortality and includes unexpected outcomes of labor and delivery that result in significant short- or long-term consequences to a woman's health. In 2014, more than 50,000 US women were affected by severe maternal morbidity.[3]

The good news is that between 2000 and 2017, the MMR dropped by about 38% worldwide. At the same time, Southern Asia achieved the greatest overall reduction in MMR, a decline of nearly 60% (from 384 down to 157). Despite its very high MMR in 2017, sub-Saharan Africa as a subregion also achieved a substantial

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reduction in MMR of nearly 40% since 2000. Additionally, four other subregions roughly halved their MMRs during this period: Central Asia, Eastern Asia, Europe, and Northern Africa. Overall, the MMR in less developed countries declined by just under 50%.[4]

Improving maternal health is one of the key priorities of WHO. In the context of the WHO development goals, countries have united behind a new target to accelerate the decline in maternal mortality by 2030: "Reducing the global MMR to less than 70 per 100,000 births, with no country having a maternal mortality rate of more than twice the global average."[5]

## Causes of Maternal Mortality and Morbidity

Adolescent girls of 10–19 years of age face a higher risk of complications and death as a result of pregnancy compared to other women. A young woman's lifetime risk of maternal death is the probability that a 15-year-old woman will eventually die from a maternal cause. Women in less developed countries have, on average, much more pregnancies in adolescents than women in developed countries, and their lifetime risk of death due to pregnancy is higher. In high-income countries, this is 1 in 5,400 vs 1 in 45 in low-income countries.[6]

About 13% of maternal deaths worldwide are due to unsafe abortions, i.e., 67,900 maternal deaths annually. Safety is closely bound to the legality and accessibility of abortion. Research from 2014 found that in countries where abortion is illegal or limited to women whose physical or mental health is at jeopardy, only one quarter of abortions were deemed safe. In countries where the practice is legal, the figure jumps to 87%.[7]

The risk of experiencing maternal mortality and morbidity are magnified for specific populations, including women of advanced maternal age and those residing in medically underserved areas. Significant racial and ethnic disparities also exist. African women are three to four times more likely than white women to die from pregnancy complications.[8]

The five most important direct causes of maternal mortality in developing countries that account for nearly 75% of all maternal deaths are:

- Severe bleeding (mostly bleeding after childbirth),
- Infections (usually after childbirth),
- Unsafe abortion,
- High blood pressure during pregnancy (preeclampsia and eclampsia),
- Complications from delivery (obstructed labor, etc.).

The remainder are caused by or associated with infections such as malaria or related to chronic conditions such as cardiac diseases, viral hepatitis, or diabetes. Figure 1 shows the causes of maternal death in Africa.[9]

There are certain reasons as to why women do not get the care they need. Poor women in remote areas are the least likely to receive adequate healthcare. This is especially true for regions with low numbers of skilled health workers, such as sub-Saharan Africa and South Asia. The latest available data suggest that in most high-income and upper-middle-income countries, more than 90% of all births benefits from the presence of a trained midwife, doctor, or nurse. However, fewer than half of all births in several low-income and lower-middle-income countries are assisted by such skilled health personnel.[10]

Some other factors can also impact the poor maternal health outcomes:

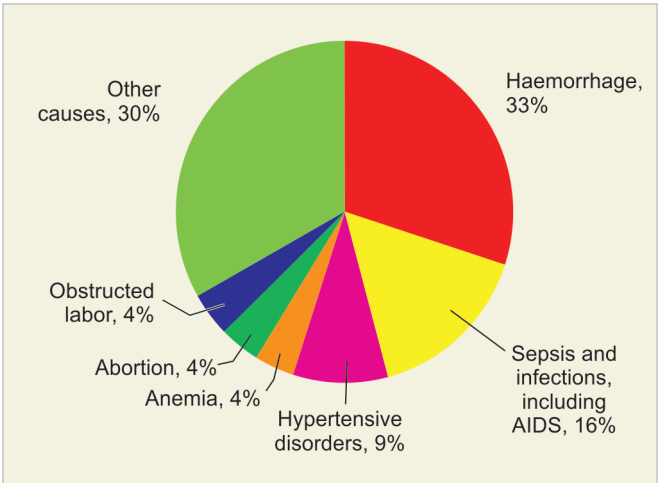


**Fig. 1:** Causes of maternal mortality in Africa

- One major factor is the distance to facilities and, in some cases, inadequate and poor quality prenatal and maternity care services. This lack of access may mean life or death if a woman experiences complications, such as hemorrhage or hypertension after returning home from delivery. Unfortunately, not all maternity care services are prepared to manage obstetric emergencies and may not have immediate access to vital equipment, medications, and supplies for a rapid response.
- Because obstetric emergencies are an infrequent occurrence in many inpatient and outpatient facilities, providers and staff may not be routinely educated or trained on recognizing and responding to the early warning signs of emergencies. This lack of experience in dealing with obstetric emergencies may result in denial and delay of care when warning signs are present.
- Pregnant and postpartum women and their family may also lack knowledge about the early warning signs of obstetric emergencies, during both the pregnancy and postpartum periods.

## What can We do to Reduce Maternal Mortality and Morbidity?

Most maternal deaths are preventable, as the healthcare solutions to prevent or manage complications are well known. Maternal health and newborn health are closely linked. To improve maternal health, barriers that limit access to quality maternal health services must be identified and addressed at both health system and family and society levels. Some policies that can reduce maternal mortality and morbidity are the following.

### Skilled Attendance at Childbirth

Two important challenges to achieving a significant reduction in maternal mortality are obtaining skillful services from the birth attendant at labor and delivery and access to higher level of obstetric care in the event of complications.[11,12] Meeting these challenges requires competent health professionals as well as an environment in which they can perform effectively.[13] There are major differences worldwide and among developing countries in the proportion of deliveries with skilled attendance, the quality of that attendance, the proportion of deliveries that take place in health facilities, and the quality of services in these facilities. There are also important differences in the risks of maternal and

neonatal mortality in different settings. In some urban areas of the developing countries and in all developed countries, most childbirths take place in a hospital attended by a physician or midwife. In rural areas of the developing world, most childbirths take place at home, generally without skilled birth attendance and often with poor access to medical care.

### *What is the Evidence that Skilled Attendance at Childbirth Reduces Mortality?*

For an issue as important as the role of skilled attendance, it might be assumed that randomized controlled trials (RCTs) would have been undertaken in a range of low- and middle-income settings, but unfortunately such rigorous trials are not easy to be done. The appropriate outcomes of maternal mortality are to be measured, but since maternal mortality is a relatively rare event, obtaining an accurate estimate of the effectiveness of skilled attendance at childbirth on reducing maternal mortality would require a very large population study. The individual follow-up of each pregnancy adds an additional complication to a very large trial. Such a trial may also have ethical issues involving the withholding of skilled birth attendance from a population of women who are serving as controls in the trial.

In a systematic review in 2014, Berhan et al. report that according to the national data of the included African countries, skilled delivery attendance was associated with significant reduction in maternal, fetal, and neonatal mortality.[14] In another paper of 2018, Kibria et al. compared two groups with highest and lowest skilled delivery attendance in Bangladesh and they found that the group of skilled attendance was associated with lower rates of maternal mortality and morbidity.[15]

Obviously, rigorous and large studies, possibly RCTs during the period of childbirth will address measurements of maternal, neonatal, and fetal mortality, and these assessments will include the impact of skilled attendance. In fact, it's not easy because there are serious difficulties to be addressed, such as how to randomize women whose deliveries are done by trained and untrained attendants. Although rigorous cause and effect data are not available, in the meeting "The Challenge in the Developing World" of the Institute of Medicine of the National Academies in 2003, the committee on improving birth outcomes has reviewed the wide range of less rigorous data that were currently available in order to address this important issue. In the committee's judgment, skilled birth attendance has the best evidence so far for reducing maternal and neonatal mortality.[16]

Every delivery, including those that take place at home, should be assisted by a skilled midwife, physician, or nurse who has been trained to proficiency in basic techniques for a clean and safe delivery, with the recognition and management of prolonged labor, infection, and hemorrhage. Where necessary, the birth attendant should also be prepared to stabilize and swiftly refer the mother to a facility providing essential obstetric care. Doctors, midwives, or nurses must be routinely educated or trained on recognizing and responding to the early warning signs of emergencies. Skilled care before, during, and after childbirth can make the difference between life and death for the mother as well as for the baby. Figure 2 demonstrates a schematic framework for skilled attendance at delivery.[17]

## Essential Obstetric Care should be Accessible

Essential obstetric care should be accessible to address complications of childbirth and this requires a network of good quality essential care facilities that provide basic essential obstetric care: administration of antibiotic, oxytocic, and anticonvulsant drugs; manual removal of the placenta; removal of retained products of conception; and assisted vaginal delivery and also surgery and blood transfusion. Access for the majority of a population to the appropriate level of care also requires strong referral systems that include communication with, and transportation to, referral facilities. It is important to improve access to patient centered, comprehensive care for women before, during, and after pregnancy, especially in rural and underserved areas. All women need access to good quality care in pregnancy, delivery, and after childbirth.

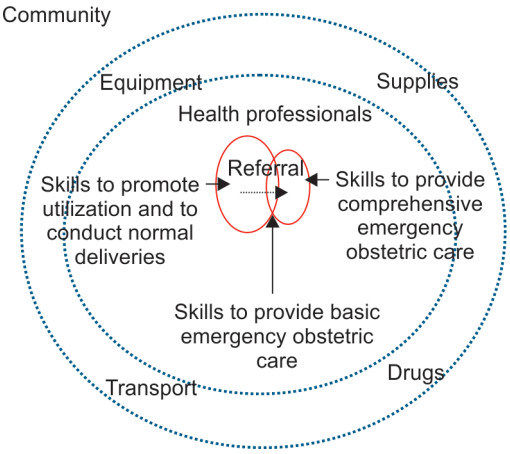


**Fig. 2:** Schematic framework for skilled attendance at delivery

## Service Quality Improvements

Service quality improvements through efforts such as the utilization of safety protocols in all birthing facilities and provide continuity of care before, during, and after pregnancies. In relation to maternal deaths, the gathering of information on death with a view to finding why death occurs, and what can be done to prevent them, is the keystone of quality assurance strategies. This can take the form of verbal autopsies in the community, facility-based maternal death reviews, confidential enquiries, reviewing cases of severe maternal morbidity, and criterion-based clinical audit of life-threatening complications. These methodologies are strongly supported by expert opinion and have received a recent endorsement from the WHO.[18] Many evaluations of audit have been conducted, showing some benefit but absolute scientific worthwhile proof is not available. A Cochrane review of RCTs of audit and feedback showed them to have a better effect on healthcare practices and outcomes than other strategies though the effect size could be modest.[19] Despite this, in a review of the evidence for the role of audits to improve the quality of obstetric care, it was concluded that enquiry into the quality of obstetric care is important and that this may be particularly so for facilities in developing countries where there is evidence that the services fall short of acceptable standards.[20]

## An Adequate Antenatal Care

An adequate antenatal care (ANC) offers many benefits not only to the fetus and neonate, but through certain preconceptional and antenatal interventions that can significantly reduce maternal mortality and morbidity. The rationale for the widespread introduction of ANC has been the belief that early signs of, or risk factors for, morbidity and mortality can be detected and that effective interventions are possible.[21] The antenatal visits can help us in the detection and treatment of pregnancy-related complications. Although there is a lack of strong evidence on the effectiveness of the content, frequency, and timing of visits in ANC

programs, ANC offers an opportunity for alerting the woman to the risks associated with the pregnancy and for discussing and planning her options for professional care during delivery. Women seeking ANC may be more likely to seek professional care during delivery.[22] Therefore, ANC still has importance as a potentially effective instrument to ensure better use of obstetric services.

Where adequate medical care is available, however, certain antenatal interventions appear to be effective in reducing adverse maternal outcomes.[23,24] These include the recognition and treatment of hypertensive disease of pregnancy, gestational diabetes, anemia, early treatment of malaria, detection and treatment of asymptomatic bacteriuria, and external cephalic version at term (to prevent obstructed labor). In addition to the potential for reducing specific causes of maternal morbidity and mortality, ANC can also encourage birth preparedness and the use of skilled assistance in labor and delivery.

An essential package of interventions for care during labor and delivery should include the monitoring of progress of labor using a partograph, using aseptic practices, avoiding medical episiotomy unless specifically indicated, and preventing postpartum hemorrhage through active management of the third stage of labor.[16]

### Postpartum Care

Postpartum care is critical during the first hours after birth and important throughout the first month. More than 60% of maternal deaths occur in the postnatal period and a survey of women delivering in rural homes identified a 43% of postpartum morbidity.[25,26] Most postpartum deaths occur the first day after birth and their management falls within the skilled attendance or emergency care strategies. For the mother, such care should emphasize the prevention, timely recognition, and treatment of infection; postpartum hemorrhage; and complications of hypertensive disorders of pregnancy. The postpartum visit offers an opportunity to address any health concerns postdelivery. Evidence shows close monitoring and follow-up care throughout the postpartum period are crucial.

### Make Abortion Safe

To avoid maternal deaths, it is also vital to prevent unwanted pregnancies. The introduction of postabortion care as a strategy has depended to a large extent on the work of the postabortion consortium comprising several agencies that work to inform the reproductive health community about possible complications related to miscarriage and incomplete abortion. Essentially the strategy consists of scaling up of good quality postabortion care including the use of manual vacuum aspiration instead of dilatation and curettage. The scientific evidence for its effectiveness does not extend to its effect on maternal mortality but evaluations have shown that scaling up leads to better patient care, shorter hospital stays, lower costs, increased contraceptive use, and the adoption of local anesthesia instead of general anesthesia.[27] All women, including adolescents, need access to contraception, safe abortion services to the full extent of the law, and quality postabortion care. The paucity of death from abortion in countries where this standard of care is the norm is an evidence of its value. Legal, regulated, and accessible contraception and abortion services, combined with robust aftercare, could save tens of thousands of lives.

### Family Planning

Primary prevention of maternal mortality is exemplified in the consideration of family planning as a strategy. During the 1980s, family planning was presented as one of the key strategies for maternal mortality reduction in the developing countries.[28,29] If accepted by a large proportion of the population, and if used continuously for prolonged periods, contraceptive methods should, at least in theory, contribute to lowering the high levels of maternal mortality. Family planning may prevent unwanted pregnancy (and illegal abortion), redistribute births from high- to low-risk categories, reduce the total numbers of births, and have direct benefits from the contraceptive methods themselves.[30] Yet various reports examining the potential impact of family planning on the reduction in maternal mortality have suggested disappointing effects.[30,31] There is no doubt that widespread use of contraceptives will reduce the total numbers of maternal deaths, which lower the maternal mortality rate, as fewer women will be exposed to the risks of pregnancy. However, the effects on the MMR, that is the risk of death once a woman is pregnant, are not so clear.[30,32,33] The vastly lower mortality ratios in the developed world when compared with developing countries cannot be attributed to the changes in the demographic distribution of births.[30] A study in Bangladesh has also convincingly shown that while increased use of contraceptives was associated with a steady decline in the maternal mortality rate, no such effects were observed for the MMR.[34,35]

### Community Mobilization

Interest in community-based strategies has been boosted by evidence pointing toward the effectiveness of community-based participatory interventions in Nepal.[36] In this cluster RCT, a female facilitator (nonhealth professional) convened women's group meetings monthly to raise awareness about childbirth. Although the study was not designed to measure maternal mortality, intervention clusters showed an MMR 80% lower than control clusters and reduced neonatal mortality by 30%.

## Conclusion

As global efforts are united to address maternal mortality, action is needed to prevent further loss of life and serious short- and long-term health complications due to pregnancy-related complications.

The wide gap between MMRs in the developed and developing countries, where the vast majority of maternal deaths occur, suggests that much can be done to improve maternal survival. Some central, interdependent elements of any strategy to improve maternal health are the provision of skilled assistance for every delivery, an adequate antenatal and postpartum care and access to essential obstetric care for complicated cases.

Efforts to improve maternal outcomes could be greatly strengthened through programs of antenatal and postpartum care focused on the prevention and recognition of complications of pregnancy and childbirth. Substantial reduction in maternal mortality and morbidity will require long-term investment in community education and family planning and, ultimately, the empowerment of women.

Many measures that can be taken to improve maternal health—from specific medical interventions, to research, to the strengthening of women's socioeconomic status—are likely to benefit the fetus and neonate as well.

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