41

Maternal Mortality: A Global Perspective

Gwyneth Lewis, Chelsea Morroni, Eric R.M. Jauniaux

OUTLINE

KEY ABBREVIATIONS

Acquired immune deficiency syndrome	AIDS
Emergency obstetric care	EmOC
Female genital mutilation/cutting	FGM/FGC
International Federation of Obstetricians and Gynecologists	FIGO
Global Library of Women's Medicine	GLOWM
Gross national income	GNI
Human immunodeficiency virus	HIV
International Conference on Population and Development	ICPD
Intrauterine device	IUD
Long-acting reversible contraception	LARC
Low-income country	LIC
Millennium Development Goals	MDGs
Middle-income country	MIC
Maternal mortality ratio	MMR
Postpartum hemorrhage	PPH
Traditional birth attendant	TBA
Tuberculosis	TB
World Health Organization	WHO
United Nations	UN

This chapter can only touch the surface of the complex issues relating to the continuing, yet generally avoidable, tragedy of maternal deaths worldwide—a scandal of epic proportions in a 21st century world. For those readers for whom it provides the fire and impetus for more in-depth study, many key documents and papers are contained within its references. We offer a brief description of the main clinical, health system, and wider social causes of maternal death and obstetric complications, particularly in resource-poor countries, and the key actions to prevent or treat these. This includes a summary of the crucial steps that need to be taken at an individual, professional, facility, and health system level, both nationally and internationally. We describe the clinical challenges of preventing, identifying, and managing the main obstetric complications of pregnancy, applicable to low- and middle-income countries but also relevant in developed settings.

MATERNAL HEALTH AND THE BURDEN OF DEATH AND DISABILITY

"Many Births Mean Many Burials"

—Kenyan Proverb

Every year worldwide, it is estimated that more than 300,000 mothers die from preventable causes during pregnancy, birth, and the postnatal period—approximately 830 women every day.[1,2] Despite ongoing efforts by the global health community, the death rate has dropped by only 44% overall since 1975, far less than the 75% decline anticipated after the introduction of the United Nation (UN) Millennium Development Goals (MDGs) in 1990.[3] Despite recent initiatives, which in some resource-poor countries have resulted in quite significant declines over the past few years, too little has happened too late. The irrefutable fact is that the main preventive or remediable interventions to reduce maternal deaths have been well known for many years, and nearly all of these tragedies could be avoided at little or no extra cost. Lives would be saved in those countries which carry a significant burden of maternal and newborn deaths if there was stronger political will to improve the lives of women by placing women's health and reproductive rights far higher up the agenda rather than at the tail end of services, as so often happens. As the father of the Safe Motherhood movement, Professor Mahmoud Fathalla famously said **"women are not dying of diseases we cannot treat…they are dying because societies have yet to decide that their lives are worth saving."**[4]

Downloaded for kate bresnahan (k.bresnahan@elsevier.com) at Elsevier - Demonstration Account from ClinicalKey.com by Elsevier on January 19, 2023. For personal use only. No other uses without permission. Copyright ©2023. Elsevier Inc. All rights reserved.

Abstract

This chapter can only touch the surface of the complex issues relating to the continuing, yet generally avoidable, tragedy of maternal deaths worldwide—a scandal of epic proportions in a 21st century world. For those readers for whom it provides the fire and impetus for more in-depth study, many key documents and papers are contained within its references. We offer a brief description of the main clinical, health system, and wider social causes of maternal death and obstetric complications, particularly in resource-poor countries, and the key actions to prevent or treat these. This includes a summary of the crucial steps that need to be taken at an individual, professional, facility, and health system level, both nationally and internationally. We describe the clinical challenges of preventing, identifying, and managing the main obstetric complications of pregnancy, applicable to low- and middle-income countries but also relevant in developed settings.

Key Words

maternal death
global maternal health
maternity care in resource-poor settings
family planning
sustainable development goals
working overseas

Downloaded for kate bresnahan (k.bresnahan@elsevier.com) at Elsevier - Demonstration Account from ClinicalKey.com by Elsevier on January 19, 2023. For personal use only. No other uses without permission. Copyright ©2023. Elsevier Inc. All rights reserved.

Maternal deaths and disabilities are eminently avoidable if women have a choice about becoming pregnant and, once pregnant, if they have access to essential health services that provide evidence-based, technologically appropriate, and affordable interventions even in the poorest countries of the world. For example, a UN report estimated that if all women who wanted to space or avoid pregnancy were able to access and use an effective modern method of contraception, the global number of unintended pregnancies would drop by 70% and the number of unsafe, potentially fatal abortions would drop by 74%. In addition, if all pregnant women and their newborn babies received only the basic standards of maternity care recommended by the World Health Organization (WHO), the number of women dying would fall by two-thirds and those of their babies would decrease by more than three-quarters.[5]

Deaths are merely the tip of the iceberg. Globally it is estimated that more than 300 million women are living with short- or long-term pregnancy-related complications, with approximately 20 million new cases occurring each year.[6,7] In addition, these figures generally do not include the poorly recognized or accepted burden of mental health. In most countries, postnatal depression, suicide from puerperal psychosis, and other mental health issues are not even acknowledged as pregnancy-related problems, and the stories of legions of women dying or suffering from these debilitating conditions remain untold.

Since maternal and newborn health are a dyad, babies are also affected by their mother's health in pregnancy and birth. It is estimated that 2.7 million newborns die, and another 2.6 million babies are stillborn annually,[8,9] and many more millions are left motherless and far less able to thrive. The risk of death for preexisting children younger than age 5 is doubled if their mother dies in childbirth and is even more challenging for girls.[10] Every maternal death or long-term complication is not only a tragedy for the mother, her partner, and her surviving children but is also an economic loss to her family, community, and society.

In Chichewa, the national language of Malawi, the word *pakati* refers to pregnancy. Its literal translation means "*in the middle between life and death.*" In other African countries, it is common to hear women in labor using euphemisms such as "*I am going to the river to fetch water; I may not come back,*" or childbirth is described as "*slipping on a banana skin at the edge of a cliff with no safety net.*" These concerns are all too real for many women, and "*a place between life and death*" is an accurate description of the 9 months of anxiety and fear that accompany pregnancy and delivery.

The World Bank classifies every economy as low, middle, or high income; as an indicator it uses gross national income (GNI) per capita because it is considered to be the single best gauge of economic capacity and progress. For the 11 million mothers who give birth each year in high-income countries, access to quality antenatal, intrapartum, and postnatal care for both mothers and babies is readily available and health outcomes are generally good. Another 34 million women deliver in middle-income countries (MICs), where hospital facilities with variable quality of care or resources such as staff, blood, drugs, or high-dependency units tend to be available. However, for the 90 million mothers in low-income countries (LICs), the situation is usually very different, with little or no access to even basic healthcare, which places the both mother and baby at significantly higher risk, and, of these mothers, approximately 830 will die and 16,000 will suffer severe and long-lasting complications from pregnancy, birth, or postnatal complications every day.[1,2] In addition, every day, nearly 8000 babies will die around the time of birth, and another 7000 will be stillborn.[12] **Overall, this burden of maternal and neonatal mortality, including stillbirths, accounts for approximately 15,800 deaths each day, or 10 lives lost every minute**. Most of these will be from preventable or treatable causes of maternal ill health. The film "Why Did Mrs. X Die: Retold" is available online in several languages (vimeo.com/50848172), and it provides a simple introduction.

Where Mothers Die

Ninety-nine percent of maternal and newborn deaths occur in LICs and MICs. Their burden is described by the WHO *maternal mortality ratio* (MMR), which is the number of direct and indirect maternal deaths per 100,000 live births during pregnancy or up to and including 42 days after the end of pregnancy.[2] **The UN estimated an overall global MMR of 216 deaths per 100,000 live births, with a higher figure, 239, for developing countries compared with an average of 12 for the most developed in 2015.** The highest regional MMR is 536 for sub-Saharan Africa, followed by rates between 175 to 187 per 100,000 live births for Southern Asia, the Caribbean, and Oceania. However, these figures hide wide intercountry and intracountry variations. Overall, Sierra Leone is estimated to have the highest MMR (1360), followed by the Central African Republic (882), Chad (856), Nigeria (814), and South Sudan (780). All 19 African countries have MMRs higher than 500 per 100,000 live births. Due to the sheer weight of their population, Nigeria and India have the largest number of maternal deaths each year at 58,000 (19%) and 45,000 (15%), respectively. However, India has made significant progress in reducing poor maternal health outcomes over recent years with a concerted effort at national, state, and local levels. The Indian MMR fell from 600 in 1990 to 174 in 2015, a 69% reduction. The equivalent figures for Nigeria show an MMR of 1350 in 1990 falling to 814 in 2015; a 40% decline.[2]

Adolescent Girls

Apart from taking away their childhood, pregnant adolescent girls and their babies are far more likely to die and are at greater risk of complications than their older sisters.[10-13] Indeed, maternal death is currently the leading cause of mortality for young girls in developing countries.[13] Compared with mothers age 20 to 24 years, girls between 10 and 19 years have higher risks of obstructed labor, eclampsia, puerperal sepsis, systemic infection, and preterm delivery, and their babies also fare worse.[13,14]

Lifetime Risk of Maternal Death

Global

Women in developing countries tend to start their pregnancies at a younger age and have more children, not necessarily a position they wish to be in but one that is determined by numerous, intertwined factors such as societal pressures and norms, lack of education, little access to effective contraception, and a lack of human or reproductive human rights. For many, their fate in all things is decided by their husbands, elders (grandmothers are particularly powerful), or male family members. **In developing countries, on average, a 15-year-old girl faces a 1:180 per-pregnancy risk of dying from a pregnancy-related complication during her lifetime, rising to an average lifetime risk of 1:36 for those living in sub-Saharan Africa and 1:54 for those in fragile states due to war or health service breakdown.**[2] **By contrast, the average risk in the most developed countries is 1:4900.** In the very worst countries to be born, such as Sierra Leone, Chad, Niger, and Nigeria, the lifetime risk is between 1:17 and 1:23 despite the fact that these figures have actually been halved over the past 10 years.[2]

United States of America

The WHO estimated the overall MMR for the USA to be 14 per 100,000 live births in 2015, greater than Western Europe and Australasia.[2,15] Enhanced surveillance of maternal deaths through the Centers for Disease Control and Prevention Pregnancy Mortality Surveillance System found a pregnancy-related mortality ratio of 17 per 100,000 births for the

Downloaded for kate bresnahan (k.bresnahan@elsevier.com) at Elsevier - Demonstration Account from ClinicalKey.com by Elsevier on January 19, 2023. For personal use only. No other uses without permission. Copyright ©2023. Elsevier Inc. All rights reserved.

TABLE 41.1 Estimated Numbers and Incidence of the Major Global Causes of *Direct* Maternal Deaths and Severe Morbidity, 2000

Cause	Incidence of Complication (% of Live Births)	Number of Cases	Case Fatality Rate (%)	Maternal Deaths	% of All *Direct* Deaths
Hemorrhage	10.5	13,795,000	1.0	132,000	28
Sepsis	4.4	5,768,00	1.3	79,000	16
Preeclampsia, Eclampsia	3.2	4,152,000	1.7	63,000	13
Obstructed labor	4.6	6,038,000	0.7	42,000	9
Abortion	14.8	19,340,000	0.3	69,000	15

Modified from AbouZahr C. Global burden of maternal death. In: British Medical Bulletin. *Pregnancy: Reducing Maternal Death and Disability*. British Council. Oxford University Press; 2003:1–13.

2011–2013 epoch.[16] Although these figures are estimates, **there is no doubt that the USA is one of the few countries whose MMR has increased rather than decreased in recent years. In addition, the risk of death during and shortly after pregnancy is higher in the USA than in many other developed nations, and there is a persistent disparity in risk between African American women and their white counterparts.**[17] Moreover, indicators of severe pregnancy complications that place women at risk of critical illness and death are increasing.[18] Although there is a critical need for better data to provide a more accurate accounting and a more nuanced explanation for causes and trends, there are indications that the majority of maternal deaths are preventable by addressing factors related to providers, patients, and systems of care.[19,20] Recent patient safety research demonstrates that placing an emphasis on continuous quality improvement, implementing consistent protocols for diagnosis, management (i.e., patient safety bundles), and providing for consultation or referral of complicated cases are all opportunities to improve maternal outcomes.

In the United States, as in many Western countries, deaths from chronic conditions, such as cardiac disease, which are aggravated by pregnancy but not directly due to pregnancy-only–related conditions such as hemorrhage, eclampsia, or sepsis, the so-called indirect deaths, are the leading cause of mortality.[21] A major challenge is to identify those women with underlying conditions who need specialist care at an early stage, without eliminating the category of lower risk cases. To address this complex problem, a multidisciplinary group of senior healthcare and birth facility leaders has been convened as the US National Partnership for Maternal Safety under the guidance of the Council on Patient Safety in Women's Health Care to review and amend current recommendations and plan a national approach to implement strategies to address these issues.[22]

Mothers Who Survive: Severe Maternal Morbidity

Although global maternal deaths may have been neglected until relatively recently, women suffering from severe maternal morbidity (SMM) and its long-term sequelae have fared even worse and such conditions are far more common. **It is estimated that 1.1 million of the 136 million births each year are complicated by an SMM, a "near-miss" event where the mother survived either by chance or due to good medical care.** A further 9.5 million women suffer slightly less-immediate life-threatening complications which are still severe, and 20 million mothers suffer long-term complications each year.[6] Recent estimates put the burden of SMM in sub-Saharan Africa to be as high as 198 cases per 1000 births,[23] compared with 12 in the United Kingdom.[24]

But whatever the death to SMM ratio, as with maternal deaths, the numbers of women suffering from severe obstetric complications are far too high and the underlying causes disturbingly similar. Hence reducing the risk factors for death will also help to decrease the number of significant obstetric complications and their long-term sequelae. Estimates of the overall numbers and case fatality rates for the five major global direct obstetric complications of pregnancy and the overall numbers of women affected are shown in Table 41.1.[25] These conditions are discussed later.

Babies Who Die

As stated earlier, **approximately 2.7 million babies die in the first week of life, half on the day of their birth. In addition, another 2.6 million babies are stillborn. Approximately 80% of these newborn deaths are due to complications from prematurity, complications during labor and delivery, or infection, with similar complications especially during labor and delivery for those who are stillborn.**[26] **Half of all babies who are stillborn are alive at the onset of labor.**[26] Most newborn deaths could be prevented if skilled health workers were available and performed effective interventions at birth and during the first week of life.[27] However, not only are more skilled health professional workers required, but also deliveries should take place in a clean and well-equipped units with working transport links to more comprehensive facilities capable of managing emergency complications for both mother and baby.

Why Mothers Die

Clinical Causes

A recent WHO analysis of the global causes of maternal death, 99% of which take place in developing countries, estimated 73% were due to direct obstetric causes due only to the mother being pregnant. The remaining 27% were due to preexisting medical or psychiatric conditions aggravated or exacerbated by the pregnant state and are defined as indirect deaths. Globally, of all direct and indirect deaths combined, 27% are due to hemorrhage, 14% to preeclampsia, 11% to puerperal sepsis, 8% from unsafe abortion, 3% from embolism, 3% from obstructed labor, and 7% from other direct causes combined.[28] Virtually all of these deaths could be avoided if the maternal and reproductive health services taken for granted in developed countries were available.

Human immunodeficiency virus (HIV)- and acquired immune deficiency syndrome (AIDS)-related illnesses, regarded as indirect deaths, make a major contribution to maternal mortality globally and, in some sub-Saharan countries, cause more than half of all indirect deaths. In four non-African countries, Ukraine, Bahamas, Thailand, and the Russian Federation, more than 20% of indirect deaths are due to HIV, with the majority being linked to intravenous drug use.[29] The same survey predicted that 12% of all deaths during pregnancy and up to 1 year after delivery will result from a positive HIV pregnancy prevalence rate of 2%, and that the MMR will increase to 50% in areas with an HIV in pregnancy prevalence rate of 15%.

Downloaded for kate bresnahan (k.bresnahan@elsevier.com) at Elsevier - Demonstration Account from ClinicalKey.com by Elsevier on January 19, 2023. For personal use only. No other uses without permission. Copyright ©2023. Elsevier Inc. All rights reserved.

In developed countries, indirect deaths predominate. The latest UK confidential enquiry into maternal deaths also reported that two-thirds of the maternal deaths between the years 2013 and 2015 were due to indirect causes.[30] The risk of a maternal death in the UK has significantly fallen over the past 10 years, from already small numbers. The comparative UK MMR, calculated using WHO methods, is currently 5.35 deaths per 10,000 live births.[30] The majority of the reported indirect deaths were due to severe medical and mental health problems becoming complicated by pregnancy, such as preexisting cardiac disease, epilepsy, autoimmune disease, and suicide. These causes are currently being bolstered by conditions adversely affected by poorer lifestyles such as acquired cardiac disease, hypertension, type II diabetes, liver disease, alcohol and drug dependency, and other disorders associated with obesity.

Health System Factors

A lack of health system resources is one of the largest contributors to the continuing pandemic of maternal ill health and mortality. Many women receive no antenatal care at all, and the WHO estimates that only 38% of mothers in LICs receive the minimum four antenatal visits they recommend.[31] Less than 50% of all women give birth accompanied by a skilled attendant, such as a midwife or doctor,[1] and many lack access to facilities with staff and resources capable of providing basic emergency obstetric or newborn care or to higher level services capable of dealing with serious complications or emergencies such as life-saving cesarean delivery (CD) for mother or child.[32]

A recent WHO study showed 54 countries had CD rates lower than 10%, the minimum standard for safe motherhood services, and 69 had rates higher than 15%, all unacceptably high. In 2008 the conservative estimate overall CD rate for Brazil was 45.9% and 30.3% for the United States, compared with 0.7 for Burkina Faso.[33] The study also estimated that in 2008, 3.18 million additional CDs were needed, all in countries with no facilities, and 6.20 million unnecessary operations were performed in higher-income countries worldwide. The cost of the global "excess" CD was estimated to amount to approximately 2.32 billion US dollars, while the cost of the global "needed" CD was approximately $432 million.

There is a critical lack of skilled staff such as midwives and doctors. It is estimated that the world needs another 350,000 midwives,[34] and doctors are also extremely scarce, especially in the unattractive, remote, and poorer areas of already resource-poor countries. To help address these shortages, task-shifting, the transferring of skills and competencies to other trained individuals, is becoming increasingly common. In countries such as Mozambique, cadres of ancillary staff have been trained as clinical officers, nonphysician clinicians, to perform basic life-saving skills and procedures including CD, and the results are impressive.[35]

An emerging issue is that of quality of care. To date, much of the global effort to reduce maternal mortality has focused on increasing access to care; however, the focus is currently shifting towards improving and standardizing the highly variable quality of care that women receive from the health services they have been encouraged to attend. Clinical guidelines and protocols have been developed by WHO and professional associations, and the use of maternal mortality reviews to learn lessons to improve care is also having a positive effect.[36]

Vulnerability and Underlying Social Determinants

The underlying causes of maternal mortality are complex and multifactorial. For example, although a mother in a resource-poor country may technically be described as dying from a postpartum hemorrhage (PPH), the true underlying causes may be very different. She may have died because she had no care or because she was unable to read the information leaflets about the warning signs and when or where to seek help. Care may have been available but beyond reach physically or financially. Access to any form of transport in emergency situations is frequently problematic, especially at night. Furthermore, her husband or family members may have prevented her from attending care or lacked the money to pay the necessary bribes to secure her treatment. She may have refused to seek help because she has heard she would be slapped, shouted at, or treated disrespectfully in the health facility.[37] Or she may have overcome all of these obstacles to reach a healthcare facility only to find no or poorly trained staff, no medicines, blood products, or equipment, and no one capable of performing her life-saving operation. Added to which, she will probably have been in poor physical condition and suffering from anemia and other chronic health disorders. Thus the stated clinical factors surrounding a maternal death provide little or no indication of the underlying causes as to why women really die. Without understanding the wider "causes of the causes," the barriers to safe maternity care cannot be identified and overcome. To help quantify these, it is common for those who work in the field of international women's health to use the "three delays" model as a checklist to help identify the barriers pregnant women face.[38,39] These may be financial, physical, social, cultural, or medical and be present in the family, the community, or the healthcare system. They are inextricably interlinked, and some examples are given in Table 41.2.

Causes of the Causes

A recent report into inequalities in health outcomes in England, "Fair Society, Healthy Lives" (http://www.instituteofhealthequity.org/projects/fair-society-healthy-lives-the-marmot-review) states that the "causes of the causes" are the circumstances and societies in which people are

TABLE 41.2 Three Delays: Examples of Barriers to Safe, Effective Maternal Care

	Examples of Key Barriers
1. Delay in seeking care	• Traditional beliefs and practices, use of traditional birth attendants • Lack of education and understanding of need for care or warning signs • Mother is not decision maker • Mother has no money herself and no control over decisions affecting her life • Religious custom and practice
2. Delay in arriving at a place of care	• No transport • No money • Unofficial bribes • Services patchy or too far away • Concerns about physical abuse by staff in labor • Poor reputation of facilities; "places where women and babies die"
3. Delay in providing appropriate high-quality care	• Facilities not equipped to provide basic and/or emergency obstetric care • Lack of suitably trained staff • Poor clinical practice • Little or no use of evidence-based protocols and guidelines • Physical and verbal abuse of women in labor • Lack of blood, medicines, essential equipment, and operating theaters • Frankly harmful care • Intermittent electricity, water, etc.

Modified from Thaddeus S, Maine D. Too far to walk: maternal mortality in context. *Soc Sci Med.* 1994:1091–1110.

Downloaded for kate bresnahan (k.bresnahan@elsevier.com) at Elsevier - Demonstration Account from ClinicalKey.com by Elsevier on January 19, 2023. For personal use only. No other uses without permission. Copyright ©2023. Elsevier Inc. All rights reserved.

born, grow, live, work, and age. Social position, wealth, and education help to determine each person's health outcomes and life expectancy.[40] **It estimates that healthcare services contribute only one-third to improvements in life expectancy and that improving life chances and removing inequalities contribute the remaining two-thirds**. If this is the case in a developed country, then the ratio of inequality in resource-poor countries must be far higher. Indeed, whether a pregnant woman lives or dies is a lottery, dependent virtually entirely on where she was born and lives and in what circumstances. Mothers who die are generally the least visible, most vulnerable, and poorest of the poor. Although urban poverty is an increasing problem, most maternal casualties tend to live in rural areas and lack both transport and access to skilled care in health facilities. They are more likely to be illiterate or poorly educated, undertake hard manual work, and find themselves almost permanently pregnant. In societies where social and economic deprivation is rife, the absence of laws to protect human rights and promote gender equality places those women with the lowest educational achievements at greatest risk.[41]

The lowly status of girls and women frequently means that they receive the last and least of the family food. Many will become child brides, fall pregnant, and forced to give up any form of education. Female genital mutilation or cutting (FGM/FGC) is common and associated with a higher incidence of obstructed labor, emergency CD, fetal distress, obstetric fistula, and permanent perineal damage.[42] All of these factors lead to complex pregnancies and higher rates of stillbirth and neonatal deaths.

Advocacy for women is an obligation for everyone engaged in reproductive healthcare. This means that all healthcare professionals need to know how to embed human rights principles into every aspect of their delivery of care. The International Federation of Obstetricians and Gynecologists (FIGO) women's sexual and reproductive rights committee have developed a comprehensive teaching syllabus that can be adapted for use by a wide range of professionals. The clinical knowledge and practical skills required to deliver high-quality reproductive healthcare have been built around a core checklist of 10 health-related human rights. The teaching materials can be freely accessed and downloaded from the Global Library of Women's Medicine (GLOWM).[43] Experience from the teaching workshops with both lay and professional audiences confirms that this approach shifts the teaching of human rights and women's reproductive health from a marginal to a mainstream position in the learning process for all healthcare professionals.

ACCESS TO SEXUAL AND REPRODUCTIVE HEALTH

The lack of universal access to basic sexual and reproductive health services is one of the most significant barriers to improving maternal morbidity and mortality globally. **If women's contraceptive needs were met, the number of maternal deaths would fall by two-thirds and newborn deaths by more than three-quarters.**[6] The transmission of HIV from mothers to newborns would also be virtually eliminated.[6] It was estimated that contraceptive use averted 272,040 maternal deaths in 2008 and that meeting unmet need for contraception could prevent an additional 104,000 deaths per year, thus preventing a further 29% of maternal mortality.[44] This further reduction by approximately one-third if unmet need for contraception were fulfilled is similar to estimates reported by others and underscores the critical role that access to effective contraception plays in preventing maternal mortality and morbidity.

Sexual and reproductive health was formally defined at the 1994 International Conference on Population and Development (ICPD). At its core is the promotion of healthy, voluntary, and safe sexual and reproductive choices for individuals and couples, including decisions about if, when, and with whom to have children. Its full attainment depends on the protection of human and reproductive rights. The conference also adopted the goal of ensuring universal access to sexual and reproductive health as part of its framework for a broad set of development objectives, and the MDGs in 2000 followed by their Sustainable Development Goals in 2015 set very similar objectives.

From 2010 to 2014, the global unintended pregnancy rate was 62 per 1000 women ages 15 to 44 per year, with the highest rates in the Caribbean (116), Eastern Africa (112), and Middle Africa (108), and the lowest in Northern (27) and Western Europe (28).[45] According to a recent report by the Guttmacher Institute, between 2010 and 2014, there were almost 400 million unintended pregnancies; 56% of these ended in abortion, and 45% of those were unsafe.[46] **Four out of five pregnancies in the developing world occur among women with no access to modern effective contraception, but even in settings where contraceptive use is comparatively high, unintended pregnancies occur because women do not have access to available methods, because available contraceptive methods fail, or because of challenges with method adherence and continued use.**

Family Planning

Access to contraception, especially highly effective contraceptive methods, is crucial to directly improving health outcomes and positively associated with improvements in educational and economic status. The health benefits include sizable reductions in maternal, newborn, and child morbidity and mortality, as well as deaths and complications arising from unsafe abortion.[47-49] At household level, improved access to family planning services leads to substantial improvements in women's earnings and children's education. Nationally, higher levels of uptake correlate with lower fertility rates, which enhance economic growth.[49] Conversely, high levels of unwanted fertility correlate with poverty and inequality.[50]

Barriers to contraceptive use can also be categorized according to the "three delays" model and can occur at the client, healthcare provider, and health systems level. The most frequently cited reasons for nonuse among women are poor understanding of their risk for pregnancy, concerns about possible side effects, infrequent sexual activity, service fees, or opposition. The latter is where a male partner, family, or religious or cultural reasons are cited. Married women may have little control over contraceptive decision making, which is particularly important when partners differ in their childbearing preferences. Unmarried women frequently have to face strong stigma from judgmental providers if sexually active, which in turn reduces these women's ability to obtain needed services. At the provider level, barriers include lack of knowledge, skills, motivation, and bias for or against certain methods, such as intrauterine devices (IUDs). Limiting the provision by certain provider types also blocks uptake. Access may also be limited through geographic constraints and lack of equipment and supplies. Stockouts/shortages are very common, especially in rural areas. In addition to overcoming provider bias, lack of competency, and health systems issues, most low-resource settings are still in need of educational interventions to increase awareness and understanding for the community as a whole, thereby reducing many of the existing barriers to effective contraceptive use.

The unmet need for contraception is unacceptably high. Globally, 222 million women who wish to, and are trying to limit or space their pregnancies, are not using contraception.[51] Approximately three-quarters of these women live in the world's poorest countries, and high unmet need remains in sub-Saharan Africa (60%) and West and South Asia (50% and 34%, respectively), with disproportionately high levels among illiterate, poor, adolescent, and rural women.[47]

The postpartum period is crucially important for family planning because rapid repeat pregnancies are associated with poor maternal and infant outcomes. An analysis of data from 27 countries found that

Downloaded for kate bresnahan (k.bresnahan@elsevier.com) at Elsevier - Demonstration Account from ClinicalKey.com by Elsevier on January 19, 2023. For personal use only. No other uses without permission. Copyright ©2023. Elsevier Inc. All rights reserved.

95% of women who were 12 or fewer months postpartum did not want another birth within 2 years, yet 65% of them were not using contraception.[52] Similarly, although most women being treated for complications of induced or spontaneous abortion also need effective contraception, data from 14 low-resource countries show that only one in four of these women were discharged from care with a method in place.[52a]

Unsafe Abortion

Even though deaths from unsafe abortion worldwide dropped from 69,000 in 1990 to 47,000 in 2008, the consequences of unsafe abortion remain one of the five leading causes of maternal mortality.[53] Although the actual numbers may have declined, the proportion of women dying from unsafe abortion has remained stubbornly unchanged at approximately 9% to 13% of maternal deaths.[28,54] Their deaths can be largely prevented by the provision of safe services offered by trained staff working within an enabling legal framework. Where the in-country laws prevent offering this service, many lives can still be saved by introducing accessible, nonjudgmental, and prompt care for the identification and management of the complications of clandestine unsafe abortions. Only 40% of the world's women have access to safe and legal abortion services within set gestational limits.[54a]

Globally each year, approximately 44 million procedures take place, of which approximately half are unsafe, the vast majority of which are due to unintended pregnancies.[55] Unsafe abortions include those undertaken by unskilled providers under unhygienic conditions, those that are self-induced by the woman inserting a foreign object into her uterus or consuming toxic products, and those instigated by physical trauma to a woman's abdomen. Nearly all of them (98%) and the deaths arising as a consequence (99.8%) occur in developing countires.[53] Approximately two-thirds of abortion-related deaths occur in sub-Saharan Africa and one-third in Asia. **In high-resource regions of the world offering safe and legal services, deaths are extremely rare,** with fewer than 60 deaths in total in Europe and North America combined.[53]

Deaths and disability from unsafe abortion continue to occur, despite major advances in the availability of safe and effective technologies for medically induced abortion, which additionally reduce operative interventions.[56] Complications and causes of death from unsafe abortion include hemorrhage, sepsis, peritonitis, and trauma to the cervix, vagina, uterus, and abdominal organs.[57] Apart from the risk of death, one in four women undergoing an unsafe procedure (an estimated 5 million each year) are likely to develop temporary or life-long disability requiring medical care, including secondary infertility.[53,57]

IMPROVING MATERNAL AND REPRODUCTIVE HEALTH FOR ALL WOMEN IN FUTURE

Despite efforts at many levels, improving the accessibly and quality of care for all of the world's mothers and babies remains a herculean task. Progress has been made in that globally maternal death rates have fallen 45% between 1990 and 2013, but in many pockets of the world they still continue to stagnate or rise, including the USA.[16] The international spotlight shone brightly on the problem when the MDGs 5, agreed on by all UN member states in 1990, challenged LICs and MICs to reduce their maternal mortality by 75% by 2015, but that target, perhaps too ambitious, was unmet. More recently, the UN proposed that by 2030 the overall global MMR should be reduced to less than 70 per 100,000 live births and preventable neonatal deaths should be eliminated.[58] These are hugely challenging targets which will not be met unless renewed action at all levels, and in all sectors, is taken to implement the necessary and fundamental changes that have been described in this chapter.

BOX 41.1 Twelve Propositions for Safe Motherhood for All Women

1. A woman's life is worth saving.
2. Girls should have equal access to food, education, healthcare, and life opportunities as their brothers.
3. Young girls should not be subject to violence, including rape, FGM, and child marriage, and women should not suffer violence in any form.
4. Women should have an equal say in decisions that affect their own and their children's health and well-being.
5. All women must have the basic human right to control their own fertility and reproductive health, and plan and space their pregnancies.
6. Pregnancy must be a voluntary choice.
7. Maternity is special, and every society has an obligation to make it safe. Safe motherhood is a basic human right enshrined in UN statutes.
8. All pregnant women must have access to antenatal/prenatal, birth, and postnatal care as described by WHO and other organizations.
9. All deliveries must be assisted by skilled birth attendants.
10. All women must have access to high-quality, life-saving, comprehensive emergency obstetric care if needed.
11. Care must be free or affordable. There should be no "bribes" or "unofficial" fees.
12. All women should be treated with dignity, respect, and compassion.

FGM, Female genital mutilation; *UN*, United Nations; *WHO*, World Health Organization.

Modified from Fathalla M. Ten propositions for safe motherhood for all women. From the Hubert de Watteville Memorial Lecture. Imagine a world where motherhood is safe for all women—you can help make it happen. *Int J Gynaecol Obstet*. 2011;72(3):207–213.

National and local professional associations and individual healthcare workers themselves can improve the quality of care they provide through the use of evidence-based practice and the development of appropriate clinical guidelines and technologies. They can also ensure continual professional updating and training. Until such time as there are enough midwives and doctors, intermediate-level healthcare workers trained to undertake tasks traditionally performed by doctors play an invaluable role. A functioning health system also requires an efficient system of communication, referral, and transport. Underpinning and facilitating all of this work should be a supportive national legal and ethical framework, including policies that strive for equality in women's rights. This is not universal. Professor Mahmoud Fathalla once proposed 10 steps for safe motherhood, which have been updated and adapted for this chapter (Box 41.1).[59]

LIFE-THREATENING OBSTETRIC COMPLICATIONS

The major complications of pregnancy are similar throughout the world. However, the outcome for individual women depends upon the care received and the capacity of the local health systems to respond to their needs. But clearly women in resource-poor settings fare far worse than those living in developed countries with functioning healthcare systems. Between 2003 and 2009, hemorrhage, hypertensive disorders, and sepsis were responsible for more than half of maternal deaths worldwide,[28] and where facilities for CD are lacking, deaths or complications mainly arise from prolonged obstructed labor, systemic infections/sepsis, and life-threatening hemorrhage. These maternal complications are also associated with a high incidence of intrauterine fetal or early neonatal death, and early identification and management of women with complications improve both maternal and neonatal outcomes.[60]

Downloaded for kate bresnahan (k.bresnahan@elsevier.com) at Elsevier - Demonstration Account from ClinicalKey.com by Elsevier on January 19, 2023. For personal use only. No other uses without permission. Copyright ©2023. Elsevier Inc. All rights reserved.

These complications impose very high financial burdens on the families of the affected women and on the healthcare system in poor-resources countries. Maternal death or surviving serious illness of a mother results in lower household income and raises the risk of infant death during the first month of life.[61] A recent cross-sectional survey of 120 health facilities in Ghana has shown that 80% of health facilities do not meet the criteria for provision of emergency obstetric care (EmOC).[62] Challenges include inadequate skill mix of maternity health personnel, poor referral processes, a lack of reliable communication systems, and poor emergency transport systems. Comprehensive community-based antenatal, intrapartum, and postnatal interventions are necessary for reducing maternal and neonatal mortality around the world but particularly in sub-Saharan Africa and Southeast Asia.[63]

Postpartum Hemorrhage

The commonest cause of PPH is uterine atony (see Chapter 18). **In resource-poor settings, intrapartum and PPH continues to be the leading cause of maternal mortality, accounting for 27% of deaths.**[28] For many pregnant women already suffering from severe chronic anemia due to malnutrition, micronutrient deficiency, sickle cell disease, malaria, or helminthic infections, even a blood loss of 500 mL at delivery can compromise their already challenged hemodynamic state and can result more rapid hypovolemic shock. The prevention or early detection of bleeding and the aggressive use of methods to reduce blood loss are essential. However, blood products and storage facilities are often unavailable,[64] and in an emergency situation, when blood is usually obtained from family members or donors, it is rarely screened for infection and may be diluted with contaminated water.

Misoprostol, a synthetic prostaglandin E1 analogue, has been listed by the WHO as an essential medicine for its key role in the management of miscarriage and prevention of PPH.[65] Unlike oxytocin, it is low cost, stable at high temperatures, and not degraded by ultraviolet light and can be used orally or rectally, which makes it particularly useful in areas where skilled healthcare providers and resources are less available. Misoprostol distributed antenatally can be used accurately and reliably after delivery and should be more widely implemented in other countries with high home birth rates.[66,67] Using Misoprostol for PPH prevention appears acceptable to women, but community-based strategies will be needed to increase distribution rates.[68] A WHO-led multicenter study including 30,000 women from 10 countries comparing the effectiveness of a room temperature stable carbetocin versus oxytocin (administered intramuscularly) for preventing PPH in women having a vaginal birth is ongoing.

The double-blind, placebo-controlled WOMEN trial has shown that 1 g intravenous tranexamic acid reduces deaths from PPH by 20% and is not associated with higher adverse effects, including thromboembolic events, compared with placebo.[69] Early treatment of postpartum hemorrhage with tranexamic acid is highly cost-effective in Nigeria and Pakistan and is likely to be cost-effective in countries in sub-Saharan Africa and southern Asia, with a similar baseline risk of death due to bleeding.[70] Consequently, WHO PPH guidelines have already been updated to include tranexamic acid.[71]

In cases of persistent PPH, aggressive measures to minimize blood loss and secondary infection should be taken, but the availability of facilities and skilled staff to perform invasive procedures such as pelvic vessel ligation, arterial embolization, hysterectomy, and surgical compression sutures is often limited. In resource-rich countries, the use of intrauterine balloon tamponade in routine clinical practice has been associated with a significantly lower use of invasive procedures for hemorrhage control among women undergoing vaginal delivery.[72] In resource-poor settings, Burke et al. have recently shown that the use of an affordable (condom) uterine balloon tamponade (UBT) device arrests hemorrhage, prevents shock progression, and is associated with high survival rates (99.4%) among women with uncontrolled PPH from uterine atony.[73] Condom UBT is a highly cost-effective intervention for controlling severe PPH. Compared with standard care with no uterine packing, condom UBT may prevent hospital transfers, hysterectomies, and maternal deaths, and at $5 or $15 per UBT device, the incremental cost per disability-adjusted life year averted is $26 or $40, respectively.[74]

In facilities unable to provide emergency care, low-technology compression devices such as a nonpneumatic antishock garment (NASG) can also help to stabilize a hemorrhaging mother long enough for her to reach a hospital equipped to provide comprehensive emergency services.[75] The NASG is designed to reverse shock and decrease further bleeding, and the cost-effectiveness of early application of the NASG at the primary healthcare level compared with waiting until arrival at the referral hospital was $21.78 per disability-adjusted life year averted.[76] A recent qualitative study of the use of the NASG in Ethiopia, India, Nigeria, and Zimbabwe found that barriers to scaling up the NASG included limited health infrastructure, the relatively high upfront cost of the NASG, initial resistance by providers and policy makers, lack of in-country champions or policy makers advocating for NASG implementation, inadequate return and exchange programs, and lack of political will.[77]

Preeclampsia/Eclampsia

Hypertensive disorders of pregnancy (see Chapter 38) account for 14% of global maternal deaths[28] and are the leading cause of death in some urban areas in LICs.[78] Preeclampsia and eclampsia are more commonly associated with extremes of maternal age (younger than 17 and older than 35 years), nulliparity, multiple pregnancies, preexisting hypertension, preeclampsia in a previous pregnancy, poor socioeconomic circumstances, and illiteracy.[79,80] A multicountry, facility-based cross-sectional study of 276,388 mothers and their infants in 24 LICs and MICs from three regions and 373 health facilities found a prevalence of preeclampsia/eclampsia of 4%.[81] At the individual level, maternal age of 30 years or older and low educational attainment were significantly associated with higher risk of preeclampsia/eclampsia and a significant risk factor for maternal death, perinatal death, preterm birth, and low birthweight.

Limited access to antenatal care, little or no screening for high blood pressure and proteinuria, and the wide variations in access to antihypertensive drugs, coupled with poor maternal understanding of the signs and symptoms and the need to seek immediate care, all help to explain the higher mortality from eclampsia in many LICs to MICs. Severe morbidity increases eightfold in women with preeclampsia, and it increases 60-fold after an eclamptic seizure.[80] Magnesium sulfate is not available in many developing countries. A recent systematic review of the use of magnesium sulfate in LICs and MICs found that the majority of women receive less than optimal dosages, usually due to concerns about maternal safety and toxicity, cost, or available resources.[82]

Training healthcare and community workers and raising awareness in pregnant women about the signs and symptoms of preeclampsia are essential in low-resource settings. Evaluation of a clinical model and algorithm in LICs has shown a reasonable ability to identify women at increased risk of adverse maternal outcomes associated with hypertensive disorders.[80] Furthermore, a training intervention for healthcare providers to use an evidence-based protocol for the treatment of preeclampsia and eclampsia has been shown to be effective in reducing the associated case fatality rate.[83] Similarly, blood pressure and proteinuria measurement devices adapted to the need of low-resource setting are cost-effective, and a recent comparative study has found that the most cost-effective device combination was a semiautomatic blood pressure measurement device and visually read urine strip test.[84]

Downloaded for kate bresnahan (k.bresnahan@elsevier.com) at Elsevier - Demonstration Account from ClinicalKey.com by Elsevier on January 19, 2023. For personal use only. No other uses without permission. Copyright ©2023. Elsevier Inc. All rights reserved.

Sepsis

In the 19th and early 20th century, puerperal sepsis was the major cause of maternal death in industrialized countries, but improvements in hygiene and sanitation, together with the introduction of antibiotics after the Second World War, resulted in its rapid decline. **The WHO estimates the global incidence of puerperal infections at 4.4% among live births, representing more than 5.7 million cases a year.**[2] Important variations exist between regions, with a higher incidence in Asia (12%) and Africa (10%) compared with developed countries, where the estimated incidence is 1% to 2%. Despite a relatively low incidence overall and the availability of interventions for prevention and treatment, **maternal sepsis is one of the leading causes of maternal mortality, accounting for 10.7% of global maternal deaths.**[20] Poverty contributes significantly to these poor outcomes, with clear evidence of an association between poor sanitation, limited access to clean water, and maternal death in LICs to MICs.[85,86] Women face greater challenges than men in accessing water, sanitation, and hygiene to address their daily needs and may respond to these challenges by adopting unsafe practices that increase the risk of reproductive tract infections.[87] Analysis of water, sanitation, and hygiene practices in healthcare facilities in 54 LICs showed that 35% lacked water and soap for healthcare providers and patients to wash their hands.[88] In addition, ignorance of both the causes and need to prevent puerperal sepsis is widespread, and in some communities, people still believe illness is due to evil spirits. For the 50% of women globally who deliver at home attended only by a female relative or untrained traditional birth attendant (TBA), infection is an ever-present danger. Harmful practices are common, such as cutting the cord with broken glass and dressing the stump with cow dung, and despite immunization programs, neonatal tetanus is a frequent problem.[89] Once infected, mothers and babies often lack access to transport, and if they reach a care facility, they frequently find that essential resources such as antibiotics are unavailable.

The WHO guidelines on "the five cleans" needed during delivery (Clean delivery surface + Clean hands + Clean cord cut + Clean cord tie + Clean cord stump) have led to the introduction of clean birth kits that contain soap, plastic sheeting, gloves, sterile gauze, a razor, and cord ties for use at home births.[88] These simple kits have achieved a relative reduction in neonatal mortality, particularly in rural areas of developing countries.[90] However, wider interventions that included a skilled birth attendant in the intervention were associated with a greater and more significant reduction in neonatal mortality, omphalitis, and puerperal sepsis.[91,92] Therefore the best practice is to provide safe birth kits in the hands of skilled attendants.

Obstructed Labor and Obstetric Fistula

Worldwide, obstructed labor occurs in an estimated 5% of live births and accounts for 8% of maternal deaths.[93] In sub-Saharan Africa and parts of Asia, as many as 2 million young women are affected and 50,000 to 100,000 new cases occur every year.[94,95] Many occur in young girls, still in childhood, with underdeveloped pelvic floors. Obstructed labor or "failure to progress," with or without fetal distress, is the main indication for emergency CD worldwide.[96] The problem can also be prevented by encouraging all women to deliver with a skilled attendant, using a partogram routinely in labor and by resorting to early operative delivery when progress is slow. The partogram is a cheap, graphic record of cervical dilation against time in labor; this simple monitoring tool swiftly identifies when a labor is becoming prolonged, thereby avoiding the development of obstetric fistulae and death from a prolonged obstructed labor or a ruptured uterus.[97] Despite strong advocacy by the WHO and other healthcare agencies, the global use of partograms is extremely poor, and some senior clinicians wrongly assert that completing the monitoring paperwork is unrealistic for already overworked midwives and doctors.

In well-resourced countries, more than 83.2% of fistulae occurred following surgery, whereas in low-resourced countries, more than 95% are associated with childbirth.[98] Obstetric fistulae can occur at any age or parity but are most common in first births, particularly in young girls with a poorly developed pelvis. They are a direct consequence of prolonged obstructed labor where the pressure of the impacted fetus leads to the destruction of the vesicovaginal/rectovaginal septum with subsequent loss of urinary and/or fecal contro.[99] They can also be due to trauma at the time of pelvic surgery or as a result of rape, and in parts of Africa, some 15% of cases are caused by harmful FGM/FGC before or during labor by unskilled birth attendants.[100,101] The tragedy is that obstructed labor and obstetric fistulae are largely avoidable; a summary of the preventive measures, as described by the WHO, is shown in Table 41.3.

Obstetric fistulae are highly stigmatizing, and affected women who constantly leak urine and fecal matter frequently become social outcasts. Unlikely to have further children or find employment, they are regarded as worthless to their families and are frequently rejected. Specialist fistula repair centers and the training of local surgeons to perform simple repairs helps to restore function, fertility, and dignity to these women, but such services are still beyond the reach of most fistula sufferers. The successful treatment of obstetric fistula requires targeting several barriers, including depression, stigma and shame, lack of community-based referral mechanisms, financial cost of the procedure, transportation difficulties, gender power imbalances, the availability of facilities that offer fistula repair, community reintegration, and the competing priorities of political leadership. In addition, recurrence

TABLE 41.3 Prevention of Obstetric Fistulae

Type	When	What
Primary prevention	Before pregnancy	• Eliminate FGM, early marriage and childbearing • Pregnancies are planned
Secondary prevention	During pregnancy	• Skilled antenatal care and screening • During birth, awareness of signs and symptoms of impending fistula such as prolonged labor and the need to seek care • Manage prolonged labor (i.e., "do not let the sun set twice on a laboring woman") • Easy and early access to facilities equipped to manage essential obstetric care, including CS
Tertiary prevention	During and post delivery	• Monitor every labor using partograph to identify women at risk of or who develop obstructed labor and refer immediately if not able to conduct CS in current facility • Use of indwelling catheters to help enable spontaneous closure of small fistulae in mothers who have survived an obstructed labor • Encourage such women to seek skilled care during next pregnancy and delivery.

CS, Cesarean section; *FGM,* female genital mutilation.
Modified from Lewis G, de Bernis L. Obstetric fistula: guiding principles for clinical management and programme development. World Health Organization; 2006.

Downloaded for kate bresnahan (k.bresnahan@elsevier.com) at Elsevier - Demonstration Account from ClinicalKey.com by Elsevier on January 19, 2023. For personal use only. No other uses without permission. Copyright ©2023. Elsevier Inc. All rights reserved.

of female genital fistula and adverse pregnancy-related maternal and child health outcomes were frequent in women after fistula repair, and interventions are needed to safeguard the health of women after fistula repair.

Human Immunodeficiency Virus and Malaria

Pregnant women infected with HIV and/or *Plasmodium falciparum* malaria suffer higher complication rates. The MMR for HIV-infected women increases 10-fold[102] because their immunodeficiency places them at greater risk of dying of pregnancy-related sepsis. **A review estimated the excess mortality attributable to HIV among pregnant and postpartum women to be 994 per 100,000 pregnant women.**[28]

The maternal immune response to malaria is also altered by pregnancy, and the most serious complications—including cerebral malaria, hypoglycemia, pulmonary edema, and severe hemolytic anemia—are more common. Approximately 40% of the world's pregnant women are exposed to malaria infection, and primigravidae are more likely to develop severe maternal anemia and to have low birthweight babies than multigravidae.[103] A recent systematic review and meta-analysis of 59 studies of 141,415 women with confirmed malaria found that *P. falciparum* malaria detected at delivery in peripheral or placental samples increased the odds of stillbirth (odds ratio 1.81 and 1.95, respectively; 95% confidence interval 1.42 to 2.30 and 1.48 to 2.57, respectively). *Plasmodium vivax* malaria increased the odds of stillbirth when detected at delivery (2.81 [0.77 to 10.22) but not when detected and treated during pregnancy.[104] Assuming all women with malaria are still parasitemic at delivery, an estimated 20% of the 1,059,700 stillbirths in malaria-endemic sub-Saharan Africa are attributed to *P. falciparum* malaria in pregnancy. Malaria infections among pregnant women are less common outside Africa but are more likely to cause severe disease, preterm births, and fetal loss. HIV increases the risk of malaria and its adverse effects, and women with both infections are at particular risk of adverse birth outcomes.[105]

Acknowledgments

The content on maternal health in the United States were prepared by William Callaghan, MD, MPH, Chief of Maternal and Infant Health Branch, Division of Reproductive Health, Center for Disease Control and Prevention, in collaboration with the American College of Obstetricians and Gynecologists. Professor Lesley Regan, St Mary's Hospital London, contributed to the first edition of the section on human rights, some of which remains relevant and is reproduced here.

KEY POINTS

- A woman's life is always worth saving.
- As a result of pregnancy or childbirth, 830 women a day die and a further 16,000 develop severe and long-lasting complications.
- Every day more than 7000 newborn babies die in the first 24 hours of life and another 7000 are stillborn, more than half the result of maternal causes.
- Adolescent pregnancies account for 11% of all births worldwide, and these young girls and their babies are at far higher risk of death and complications than other mothers.
- A total of 99% of all maternal and neonatal deaths take place in developing countries.
- The leading obstetric causes of maternal death in developing countries are hemorrhage, puerperal sepsis, preeclampsia, unsafe abortion, obstructed labor, and embolism. HIV causes a growing number of deaths in affected countries.
- If all pregnant women and their babies could access the maternity care recommended by the WHO, the annual number of maternal deaths would fall by two-thirds from 290,000 to 96,000, and newborn deaths by more than three-quarters to 660,000 each year.
- If all women had control over their fertility and access to effective contraception, then unintended pregnancies would drop by 70% and unsafe abortions by 74%.
- Apart from a lack of skilled healthcare and other resources, there is also wide variability in the quality of the care provided. The clinical guidelines and protocols already produced by WHO and professional organizations need to be urgently implemented and their uptake audited in developed as well as developing countries.
- Safe motherhood for all women is enshrined as a basic human right by the UN, yet many societies have yet to recognize and address this and fail to provide the necessary resources to provide adequate reproductive health, maternity, and newborn care or enact and enforce laws to support equality for women in all aspects of their lives, including the abolition of child marriage and harmful traditional practices.

REFERENCES

1. Assembly UNG. United Nations Millennium Declaration: Resolution adopted by the General Assembly. 55/2. 18 September 2000. New York: United Nations. 2000.
2. Trends in Maternal Mortality: 1990 to 2015. Estimates by WHO, UNICEF, UNFPA, World Bank Group and the United Nations Population Division. Geneva: World Health Organisation. 2015. http://www.who.int/reproductivehealth/publications/monitoring/maternal-mortality-2015/en/.
3. Assembly UNG. United Nations Millennium Declaration: Resolution adopted by the General Assembly. 55/2. 18 September 2000. New York: United Nations. 2000.
4. Fathalla M. Human rights aspects of safe motherhood. *Best Pract Res Clin Obstet Gynaecol*. 2006;20(3):409–419.
5. Singh S, Darroch JE, Ashford LS. Adding it up: costs and benefits of investing in sexual and reproductive health. In: *World Health Organisation. The World Health Report 2005*. New York: Guttmacher Institute and United Nations Population Fund; 2014.
6. Hardes K, Gay J, Blanc A. Maternal morbidity: neglected dimension of safe motherhood in the developing world. *Glob Public Health*. 2012;7(6):603–617.
7. World Health Organisation (WHO). The World Health Report 2005. Make every mother and child count. https://www.who.int/maternal_child_adolescent/documents/report_2005/en/.
8. Levels and Trends in Child Mortality. Report 2015. The Inter-agency Group for Child Mortality Estimation. UNICEF, WHO, The World Bank, United Nations Population Division. New York. USA, UNICEF, 2015.09X(15)00275-2.
9. Blencoe H, Cousens S, Jassir FB, et al. National, regional and worldwide estimates of stillbirth rates in 2015, with trends form 2000: a systematic analysis. *Lancet Glob Health*. 2016;4(2):e98–e108.
10. World Health Organisation media centre. Adolescent Pregnancy Fact sheet. Feb 2018. http://www.who.int/news-room/fact-sheets/detail/adolescent-pregnancy.
11. Patton GC, Coffey C, Sawyer SM, et al. Global patterns of mortality in young people: a systematic analysis of population health data. *Lancet*. 2009;374:881–892.

Downloaded for kate bresnahan (k.bresnahan@elsevier.com) at Elsevier - Demonstration Account from ClinicalKey.com by Elsevier on January 19, 2023. For personal use only. No other uses without permission. Copyright ©2023. Elsevier Inc. All rights reserved.

12. You D, Bastian P, Wu J, Wardlaw T. *Levels and Trends in Child Mortality. Estimates Developed by the UN Inter-Agency Group for Child Mortality Estimation. Report 2013*. New York: UNICEF, WHO, The World Bank and United Nations; 2013.
13. Ganchimeg T, Mori R, Ota E, et al. Maternal and perinatal outcomes among nulliparous adolescents in low- and middle-income countries: a multi-country study. *BJOG*. 2013;120:1622–1630.
14. Ganchimeg T, Ota E, Morisaki N, et al. WHO Multicountry Survey on Maternal Newborn Health Research Network. Pregnancy and childbirth outcomes among adolescent mothers: a World Health Organization Multicounty Study. *BJOG*. 2014;121(suppl 1):40–48.
15. GBD 2015 Maternal Mortality Collaborators. Global, regional, and national levels of maternal mortality, 1990–2015: a systematic analysis for the Global Burden of Disease Study 2015. *Lancet*. 2016;388.
16. Creanga AA, Syverson C, Seed K, Callaghan WM. Pregnancy-related mortality in the United States, 2011–2013. *Obstet Gynecol*. 2017;130:366–373.
17. Creanga AA. Maternal mortality in the United States: a review of contemporary data and their limitations. *Clin Obstet Gynecol*. 2018;61:296–306.
18. Kuklina EV, Goodman DA. Severe maternal or near miss morbidity: implications for public health surveillance and clinical audit. *Clin Obstet Gynecol*. 2018;61:307–318.
19. Centers for Disease Control and Prevention. Severe Maternal Morbidity in the United States. https://www.cdc.gov/reproductivehealth/maternalinfanthealth/severematernalmorbidity.html.
20. CDC Foundation. Report from Nine Maternal Mortality Review Committees. https://www.cdcfoundation.org/sites/default/files/files/ReportfromNineMMRCs.pdf.
21. Centers for Disease Control and Prevention. Pregnancy Mortality Surveillance System. https://www.cdc.gov/reproductivehealth/maternalinfanthealth/pmss.html.
22. Council on Patient Safety in Women's Health Care. https://safehealthcareforeverywoman.org.
23. Geller SE, et al. A global view of severe maternal morbidity: moving beyond maternal mortality. *Reprod Health*. 2018;15(suppl 1):98.
24. Waterstone M, Bewley S, Wolfe C. Incidence and predictors of severe obstetric morbidity: case-control study. *BMJ*. 2001;322(7294):1089–1093.
25. AbouZahr C. Global burden of maternal death. In: British Medical Bulletin, ed. *Pregnancy: Reducing Maternal Death and Disability*. British Council: Oxford University Press; 2003:1–13.
26. United Nations Children's Fund (UNICEF). Every Child Alive: The Urgent Need to End Newborn Deaths. 2018. https://www.unicef.org/publications/index_102640.html.
27. Lawn JE, Blencowe H, Oza S, et al. Every newborn: progress, priorities, and potential beyond survival. *Lancet*. 2014;384:189–205.
28. Say L, Chou A, Gemmill A, et al. Global causes of maternal death: a WHO systematic analysis. *Lancet Glob Health*. 2014;2(6):e323–e333.
29. Calvert C, Ronsmans C. The contribution of HIV to pregnancy-related mortality: a systematic review and meta-analysis. *AIDS*. 2013;27:1631–1639.
30. Knight M, Nair M, Tuffnell D, et al. Saving Lives, Improving Mothers' Care: Lessons learned to inform maternity care from the UK and Ireland. Confidential Enquiries into Maternal Deaths and Morbidity 2013–15. Oxford: National Perinatal Epidemiology Unit, University of Oxford. 2017.
31. World Health Organization. Pregnant women must be able to access the right care at the right time. https://www.who.int/news-room/detail/07-11-2016-pregnant-women-must-be-able-to-access-the-right-care-at-the-right-time-says-who.
32. United Nations Population Fund. Setting Standards for Emergency Obstetric and Newborn Care. http://www.unfpa.org/resources/setting-standards-emergency-obstetric-and-newborn-care.
33. Gibbons L, Belizá J, Lauer J, Betrán A, Merialdi M. The Global Numbers and Costs of Additionally Needed and Unnecessary Caesarean Sections Performed per Year: Overuse as a Barrier to Universal Coverage. Geneva: WHO World Health Report. 2010; http://www.who.int/healthsystems/topics/financing/healthreport/30C-sectioncosts.pdf.
34. International Confederation of Midwives. The international day of the midwife. 2013. https://www.internationalmidwives.org/icm-events/idm-international-day-of-the-midwife.html.
35. Pereira C, Bugalho A, Bergström S, Vaz F, Cotiro M. A comparative study of caesarean deliveries by assistant medical officers and obstetricians in Mozambique. *BJOG*. 1996;103:508–512.
36. Van Den Broek N, Lewis G (eds) International Reviews: Quality of care. Supplement to BJOG Vol. 121, Supplement 4.
37. World Health Organization. Prevention and elimination of disrespect and abuse during childbirth. http://www.who.int/reproductivehealth/topics/maternal_perinatal/statement-childbirth/en.
38. Thaddeus S, Maine D. Too far to walk: maternal mortality in context. *Soc Sci Med*. 1994;38:1091–1110.
39. Lewis G. Reviewing maternal deaths to make pregnancy safer. In: Moodley J, ed. *Recent Advances in Obstetrics*. Vol. 22. Elsevier: est Practice & Research Clinical Obstetrics and Gynaecology; 2008:447–463. No. 3.
40. Institute of Health Equity. http://www.instituteofhealthequity.org/resources-reports/fair-society-healthy-lives-the-marmot-review.
41. Tunçalp Ö, Souza JP, Hindin MJ, et al. WHO Multicountry Survey on Maternal and Newborn Health Research Network. Education and severe maternal outcomes in developing countries: a multicountry cross-sectional survey. *BJOG*. 2014;121(suppl 1):57–65.
42. Kaplan A, Forbes M, Bonhoure I, et al. Female genital mutilation/cutting in The Gambia: long-term health consequences and complications during delivery and for the newborn. *Int J Womens Health*. 2013;5:323–331.
43. Global Library of Women's Medicine. www.GLOWM.com/.
44. Ahmed S, Li Q, Liu L, Tsui AO. Maternal deaths averted by contraceptive use: an analysis of 172 countries. *Lancet*. 2012;380:111–125.
45. Bearak J, Popinchalk A, Alkema L, Sedgh G. Global, regional, and subregional trends in unintended pregnancy and its outcomes from 1990 to 2014: estimates from a Bayesian hierarchical model. *Lancet Glob Health*. 2018;6:e380–e389.
46. Guttmacher Institute. Induced Abortion Worldwide. 2016; https://www.guttmacher.org/fact-sheet/induced-abortion-worldwide.
47. Cleland J, Conde-Agudelo A, Peterson H, Ross J, Tsui A. Contraception and health. *Lancet*. 2012;380:149–156.
48. Canning D, Schultz TP. The economic consequences of reproductive health and family planning. *Lancet*. 2012;380:165–171.
49. Singh S, Darroch JE. Adding it up: Costs and benefits of contraceptive services. Estimates for 2012. 2012. https://www.guttmacher.org/report/adding-it-costs-and-benefits-contraceptive-services-estimates-2012.
50. Gillespie D, Ahmed S, Tsui A, Radloff S. Unwanted fertility among the poor: an inequity? *Bull World Health Organ*. 2007;85:100–107.
51. Darroch JE, Singh S. Trends in contraceptive need and use in developing countries in 2003, 2008, and 2012: an analysis of national surveys. *Lancet*. 2013;381:1756–1762.
52. Ross JA, Winfrey WL. Contraceptive use, intention to use and unmet need during the extended postpartum period. *Int Fam Plan Perspect*. 2001;27:20–27.

52a. Kidder E, Sonneveldt E, Hardee K. *Who receives PAC services? Evidence from 14 countries*. Washington, DC: The Futures Group; 2004.

53. Åhman E, Shah IH. New estimates and trends regarding unsafe abortion mortality. *Int J Gynaecol Obstet*. 2011;115(2):121–126.
54. World Health Organization. *Unsafe Abortion: Global and Regional Estimates of the Incidence of Unsafe Abortion and Associated Mortality in 2008*. 6th ed. Geneva: World Health Organization; 2011.

54a. Center for Reproductive Rights. *A Global View of Abortion Rights*. New York: Center for Reproductive Rights; 2014. https://reproductiverights.org/document/a-global-view-of-abortion-rights.

55. Sedgh G, Singh S, Shah IH, Åhman E, Henshaw SK, Bankole A. Induced abortion: incidence and trends worldwide from 1995 to 2008. *Lancet*. 2012;379(9816):625–632.
56. World Health Organization. *Safe Abortion: Technical and Policy Guidance for Health Systems*. 2nd ed. Geneva: WHO; 2012.
57. Grimes D, Benson J, Singh S, et al. Unsafe abortion: the preventable pandemic. *Lancet*. 2006;368:1908–1919.

Downloaded for kate bresnahan (k.bresnahan@elsevier.com) at Elsevier - Demonstration Account from ClinicalKey.com by Elsevier on January 19, 2023. For personal use only. No other uses without permission. Copyright ©2023. Elsevier Inc. All rights reserved.

58. Countdown to 2030: Women's, Children's, & Adolescents' Health. http://www.countdown2030mnch.org.
59. Fathalla M. *Ten Propositions for Safe Motherhood for All Women Adapted and Abridged From IJOG*. Vol. 72. 2011:207–213.
60. Vogel JP, Souza JP, Mori R, et al. WHO Multicountry Survey on Maternal and Newborn Health Research Network. Maternal complications and perinatal mortality: findings of the World Health Organization Multicountry Survey on Maternal and Newborn Health. *BJOG*. 2014;121:76–88.
61. Scott S, Kendall L, Gomez P, et al. Effect of maternal death on child survival in rural West Africa: 25 years of prospective surveillance data in The Gambia. *PLoS ONE*. 2017;12:e0172286.
62. Kyei-Onanjiri M, Carolan-Olah M, Awoonor-Williams JK, McCann TV. Review of emergency obstetric care interventions in health facilities in the Upper East Region of Ghana: a questionnaire survey. *BMC Health Serv Res*. 2018;18:184.
63. Evans DB, Edejer TT, Adam T, Lim SS. Methods to assess the costs and health effects of interventions for improving health in developing countries. *BMJ*. 2005;331:1137–1140.
64. Kubio C, Tierney G, Quaye T, et al. Blood transfusion practice in a rural hospital in Northern Ghana, Damongo, West Gonja District. *Transfusion*. 2012;52:2161–2166.
65. World Health Organization. Essential Medicines. http://www.who.int/topics/essential_medicines/en/.
66. Smith JM, Gubin R, Holston MM, Fullerton J, Prata N. Misoprostol for postpartum hemorrhage prevention at home birth: an integrative review of global implementation experience to date. *BMC Pregnancy Childbirth*. 2013;13:44.
67. Geller S, Carnahan L, Akosah E, et al. Community-based distribution of misoprostol to prevent postpartum haemorrhage at home births: results from operations research in rural Ghana. *BJOG*. 2014;121:319–325.
68. Durham J, Phengsavanh A, Sychareun V, et al. Misoprostol for the prevention of postpartum hemorrhage during home births in rural Lao PDR: establishing a pilot program for community distribution. *Int J Womens Health*. 2018;10:215–227.
69. Trial WOMAN. Collaborators. Effect of early tranexamic acid administration on mortality, hysterectomy, and other morbidities in women with post-partum haemorrhage (WOMAN): an international, randomised, double-blind, placebo-controlled trial. *Lancet*. 2017;389:2105–2116.
70. Li B, Miners A, Shakur H, Roberts I. Tranexamic acid for treatment of women with post-partum haemorrhage in Nigeria and Pakistan: a cost-effectiveness analysis of data from the WOMAN trial. *Lancet Glob Health*. 2018;6:e222–e228.
71. Vogel JP, Oladapo OT, Dowswell T, Gülmezoglu AM. Updated WHO recommendation on intravenous tranexamic acid for the treatment of post-partum haemorrhage. *Lancet Glob Health*. 2018;6:e18–e19.
72. Revert M, Rozenberg P, Cottenet J, Quantin C. Intrauterine balloon tamponade for severe postpartum hemorrhage. *Obstet Gynecol*. 2018;13:143–149.
73. Burke TF, Danso-Bamfo S, Guha M, Oguttu M, Tarimo V, Nelson BD. Shock progression and survival after use of a condom uterine balloon tamponade package in women with uncontrolled postpartum hemorrhage. *Int J Gynaecol Obstet*. 2017;139:34–38.
74. Mvundura M, Kokonya D, Abu-Haydar E, et al. Cost-effectiveness of condom uterine balloon tamponade to control severe postpartum hemorrhagein Kenya. *Int J Gynaecol Obstet*. 2017;137:185–191.
75. United Nations Population Fund. Setting standards for emergency obstetric and newborn care. October 2014. http://www.unfpa.org/resources/setting-standards-emergency-obstetric-and-newborn-care.
76. Downing J, El Ayadi A, Miller S, et al. Cost-effectiveness of the non-pneumatic anti-shock garment (NASG): evidence from a cluster randomized controlled trial in Zambia and Zimbabwe. *BMC Health Serv Res*. 2015;15:37.
77. Jordan K, Butrick E, Yamey G, Miller S. Barriers and facilitators to scaling up the Non-Pneumatic Anti-Shock garment for treating obstetric hemorrhage: a qualitative study. *PLoS ONE*. 2016;11:e0150739.
78. Adu-Bonsaffoh K, Samuel OA. Maternal deaths attributable to hypertensive disorders in a tertiary hospital in Ghana. *Int J Gynaecol Obstet*. 2013;123:110–113.
79. Bilano VL, Ota E, Ganchimeg T, Mori R, Souza JP. Risk factors of pre-eclampsia/eclampsia and its adverse outcomes in low- and middle-income countries: a WHO secondary analysis. *PLoS ONE*. 2014;9:e91198.
80. Abalos E, Cuesta C, Carroli G, et al. WHO Multicountry Survey on Maternal and Newborn Health Research Network. Pre-eclampsia, eclampsia and adverse maternal and perinatal outcomes: a secondary analysis of the World Health Organization Multicountry Survey. *BJOG*. 2014;121(suppl 1):14–24.
81. Payne BA, Hutcheon JA, Ansermino JM, et al. A risk prediction model for the assessment and triage of women with hypertensive disorders of pregnancy in low-resourced settings: the miniPIERS (Pre-eclampsia Integrated Estimate of RiSk) multi-country prospective cohort study. *PLoS Med*. 2014;11:e1001589.
82. Gordon R, Magee LA, Payne B, et al. Magnesium sulphate for the management of preeclampsia and eclampsia in low and middle-income countries: a systematic review of tested dosing regimens. *J Obstet Gynaecol Can*. 2014;36:154–163.
83. Okonofua FE, Ogu RN, Fabamwo AO, et al. Training health workers for magnesium sulfate use reduces case fatality from eclampsia: results from a multicenter trial. *Acta Obstet Gynecol Scand*. 2013;92:716–720.
84. McLaren ZM, Sharp A, Hessburg JP, et al. Cost effectiveness of medical devices to diagnose pre-eclampsia in low-resource settings. *Dev Eng*. 2017;2:99–106.
85. World Health Organization. Preventing diarrhoea through better water, sanitation and hygiene: exposures and impacts in low- and middle-income countries. 2014. www.who.int/water_sanitation_health/diseases-risks/gbd_poor_water/en/.
86. Benova L, Cumming O, Campbell OM. Systematic review and meta-analysis: association between water and sanitation environment and maternal mortality. *Trop Med Int Health*. 2014;19:368–387.
87. Caruso BA, Sevilimedu V, Fung IC, Patkar A, Baker KK. Gender disparities in water, sanitation, and global health. *Lancet*. 2015;386:650–651.
88. Yahaya SJ, Bukar M. Knowledge of symptoms and signs of puerperal sepsis in a community in north-eastern Nigeria: a cross-sectional study. *J Obstet Gynaecol*. 2013;33:152–154.
89. World Health Organization. Care of a normal newborn baby. NNF Teaching Aids: Newborn Care. http://www.newbornwhocc.org/pdf/teaching-aids/normalnewborn.pdf.
90. Program for Appropriate Technology in Health (PATH). Basic delivery kit guide. https://path.azureedge.net/media/documents/MCHN_BDKG_Section_1.pdf.
91. Seward N, Osrin D, Li L, et al. Association between clean delivery kit use, clean delivery practices, and neonatal survival: pooled analysis of data from three sites in South Asia. *PLoS Med*. 2012;9:e1001180.
92. Hundley VA, Avan BI. Are birth kits a good idea? A systematic review of the evidence. *Midwifery*. 2012;28:204–215.
93. Lewis G, de Bernis L. *Obstetric Fistula: Guiding Principles for Clinical Management and Programme Development*. Geneva: World Health Organisation; 2006.
94. UNFPA, FIGO, Columbia University sponsored Second Meeting of the Working Group for the Prevention and Treatment of Obstetric Fistula. Addis Ababa. 2002.
95. Stanton C, Holtz S, Ahmed S. Challenges in measuring obstetric fistula. *Int J Gynecol Obstet*. 2007;99:S4–S9.
96. Abraham W, Berhan Y. Predictors of labor abnormalities in university hospital: unmatched case control study. *BMC Pregnancy Childbirth*. 2014;14:256.
97. United States Agency for International Development (USAID). The Partograph: An Essential Tool for Decision-Making during Labor. http://pdf.usaid.gov/pdf_docs/PNACT388.pdf.
98. Hillary CJ, Osman NI, Hilton P, Chapple CR. The aetiology, treatment, and outcome of urogenital fistulae managed in well- and low-resourced countries: a systematic review. *Eur Urol*. 2016;70:478–492.

Downloaded for kate bresnahan (k.bresnahan@elsevier.com) at Elsevier - Demonstration Account from ClinicalKey.com by Elsevier on January 19, 2023. For personal use only. No other uses without permission. Copyright ©2023. Elsevier Inc. All rights reserved.

99. Wall LL. Preventing obstetric fistulas in low-resource countries: insights from a Haddon matrix. *Obstet Gynecol Surv*. 2012;67:111–121.
100. Baker Z, Bellows B, Bach R, Warren C. Barriers to obstetric fistula treatment in low-income countries: a systematic review. *Trop Med Int Health*. 2017;22:938–959.
101. Faces of Dignity: seven stories of girls and women with fistula. Dar es Salam, Tanzania: Women's Dignity Project. 2003.
102. Moran NF, Moodley J. The effect of HIV infection on maternal health and mortality. *Int J Gynaecol Obstet*. 2012;119:S26–S29.
103. Shulman CE, Dorman EK. Importance and prevention of malaria in pregnancy. *Trans R Soc Trop Med Hyg*. 2003;97:30–35.
104. Moore KA, Simpson JA, Scoullar MJL, McGready R, Fowkes FJI. Quantification of the association between malaria in pregnancy and stillbirth: a systematic review and meta-analysis. *Lancet Glob Health*. 2017;5:e1101–e1112.
105. Ayisi JG, van Eijk AM, ter Kuile FO, et al. The effect of dual infection with HIV and malaria on pregnancy outcome in western Kenya. *AIDS*. 2003;17:585–594.

Downloaded for kate bresnahan (k.bresnahan@elsevier.com) at Elsevier - Demonstration Account from ClinicalKey.com by Elsevier on January 19, 2023. For personal use only. No other uses without permission. Copyright ©2023. Elsevier Inc. All rights reserved.