

# Maternal Mortality: What are Women Dying from?

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## ABSTRACT

World Health Organization defines maternal death as the death of a woman while pregnant or within 42 days after delivery, irrespective of the duration and the location of pregnancy, and irrespective of the cause, as long as it is related to or aggravated by pregnancy or pregnancy's management, but not from accidental or incidental causes during pregnancy.<sup>1,2</sup> Specifically for the year 2017, worldwide, every day, approximately 810 women died from possibly preventable causes related to pregnancy and childbirth. It is very important to highlight that of all maternal deaths, 94% occur in low- and lower middle-income countries, something that reveals the disparities of the quality of healthcare services that are provided in the different areas of the world. Another tragedy is that women are dying from preventable and treatable disorders such as hemorrhage, hypertensive disorders, sepsis, and abortions which still in some areas of the world are performed under very unsafe conditions. Because of these unacceptable reasons and percentages of maternal mortality, it was decided that actions must be taken to optimize world's future health, and the Sustainable Development Goals were decided by countries from all-around the world. These are 17 goals to be achieved by 2030 to decrease maternal mortality and improve the healthcare quality provided to these women. In this article, we will present the global, European and Greek trends about maternal mortality in line with the major causes that are responsible for maternal mortality. Additionally, the reasons why women mainly in low-income countries do not have timely and appropriate healthcare will also be discussed.

**Keywords:** Delivery, Maternal mortality, Pregnancy.

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## INTRODUCTION

World Health Organization (WHO) defines maternal death as the death of a woman while pregnant or within 42 days after delivery, irrespective of the duration and site of the pregnancy, from any cause related to or aggravated by pregnancy or its management but not from accidental or incidental causes.<sup>1,2</sup> The latest statistics show that in 2017, every day, approximately 810 women died from possibly preventable causes related to pregnancy and childbirth. This is translated into a total of 295,000 women losing their lives in 2017 worldwide. Women who live in the rural areas, in poorer communities and women whose age is between 10 years and 14 years have a higher risk of pregnancy complications, and therefore, they have higher risk of mortality, associated with pregnancy or childbirth. What is important is that of all maternal deaths, 94% occur in low- and lower middle-income countries, with sub-Saharan Africa accounting for 66.5% (196,000 deaths annually) and Southern Asia for 19.5% (58,000 deaths annually) of all maternal deaths occurring globally. Again for the year 2017, maternal mortality rate (MMR) defined as the number of maternal deaths per 100,000 live births, in low-income countries was 462/100,000 live births, while in high-income countries, the same number was just 11/100,000 live births (Fig. 1). This fact highlights the huge gap between the "rich and the poor," and it is mirroring the disparities of healthcare provided in the different areas of the world. Therefore, the ascertainment that maternal death is "a tragedy for developing countries and a shame for developed countries" is more than accurate.

United Nations noticed the huge progress that was necessary to be done concerning poverty, hunger, disease, illiteracy, environmental degradation, and discrimination against women and stated in 1990 the Millennium Development Goals (MDGs). Millennium Development Goals were eight parameters of global health that had to be improved by the new millennium and specifically by 2015 (Fig. 2). Indeed, from 2000 to 2017, the maternal mortality ratio dropped by about 38% worldwide, with the highest achieved effort to be present in Southern Asia, where MMR declined

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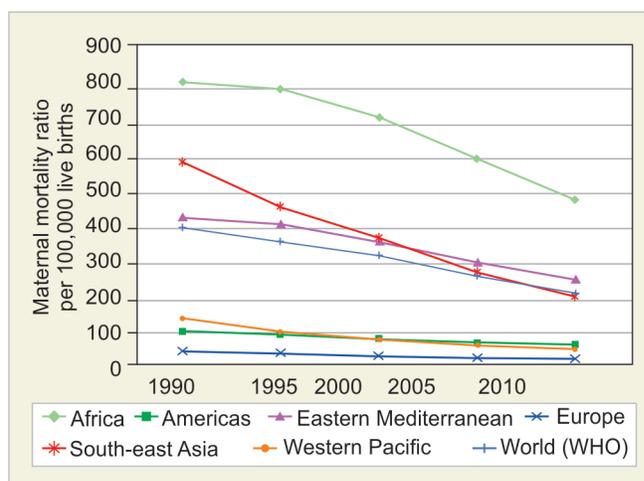
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by 60%. Sub-Saharan Africa showed also a respectable reduction of 40%, making the MMR overall reduction in the less-developed countries to be approximately 50%.<sup>3</sup> However, this number is



**Fig. 1:** Maternal mortality ratio per 100,000 live births, by WHO region, 1990–2010 (<https://www.afro.who.int>)

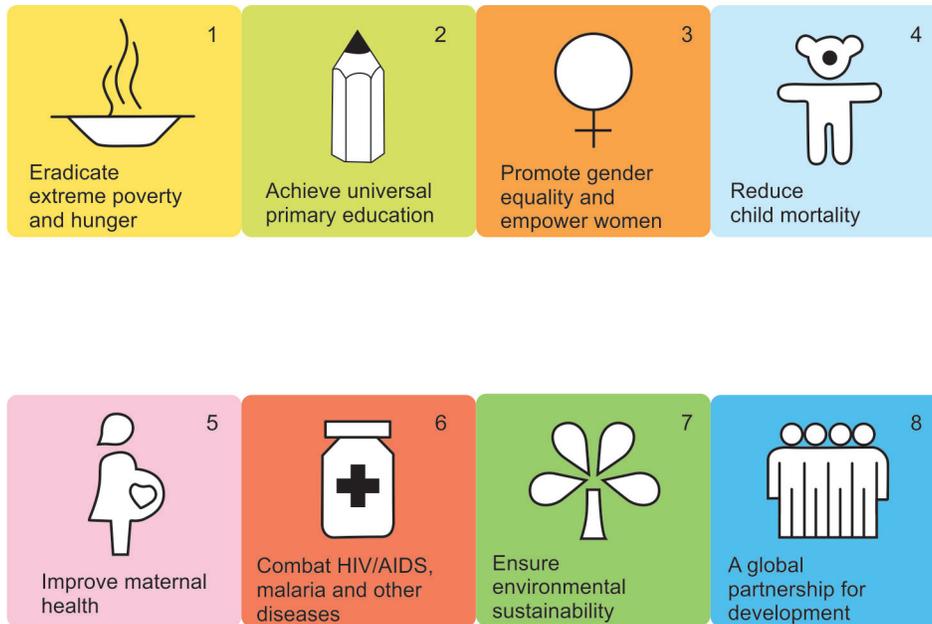


Fig. 2: The Millennium Development Goals, set up in 1990, by the United Nations (<https://www.mdgmonitor.org/outline-of-the-mdgs-notable-challenges>)

smaller than the percentage set by the MDGs, which was reduction of maternal mortality by two thirds.<sup>4</sup> In 2016, 17 new goals were suggested by a country-union to improve world's future health: the Sustainable Development Goals (SDGs), which set goals to be achieved by 2030. The third recommendation, SDG 3: "Ensure healthy lives and promote well-being for all at all ages," sets an ambitious target to accelerate maternal mortality reduction: "reducing the global MMR to less than 70 per 100,000 births, with no country having a MMR of more than twice the global average."

As the MDGs have not been achieved yet and SDGs have a long journey until they are accomplished, every person in the world, involved in healthcare systems, has to be responsible for making this world better for children, women, and for people who are living in the margin. Especially for women, skilled, evidence-based and holistic healthcare is more than necessary to be provided, to save thousands of lives. Additionally, significant importance has the identification and detection of the causes that lead a woman to die during pregnancy or childbirth, to design better intervention and prevention programs. While the obstetrical complications of pregnancy and delivery are not all predictable or preventable, they can be treatable. Therefore, the aim should be at least for the treatable causes, which have a leading part in maternal mortality, to be attempted to be significantly reduced.

In this article, we will present the current trends in maternal mortality concerning the different MMRs around the world, the major causes that lead a woman to death, and their epidemiology in the different areas of the world. Additionally, the reasons that a woman cannot have access to the appropriate healthcare timely will also be discussed. Finally, some recommendations about simple solutions and development programs will be suggested.

### DATA COLLECTION FOR MEASURING MMR

An accurate, systematic data collection from countries all over the world could improve remarkably the monitoring of maternal mortality trends, identify the etiology of individual deaths, and

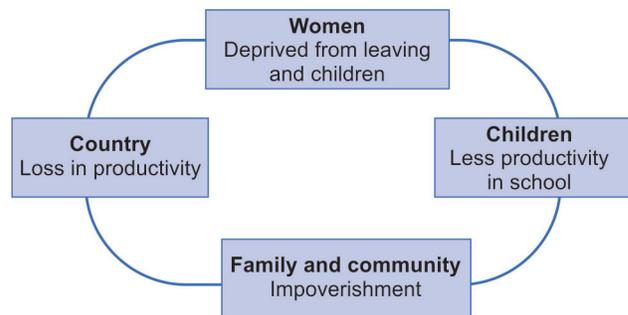


Fig. 3: The domino effect that follows each woman's death (modified by ISGlobal Barcelona Institute of Global Health - [www.isglobal.org/en/maternal-child-and-reproductive-health](http://www.isglobal.org/en/maternal-child-and-reproductive-health))

help to recognize the causes that lead a woman to death, to set the problem of maternal mortality in a more evidence-based basis. Therefore, the aim of developing appropriate interventional plans could be achieved and consequently lead to a significant improvement of the healthcare provided to women during pregnancy, delivery, and postpartum period.

Unfortunately, a systematic data collection for measuring maternal mortality accurately has not been achieved yet, and it appears that we are long away from achieving it, as we are still missing vital event data. For example, 80% of all births occur in countries where data regarding the causes of maternal death do not exist or are incomplete. More specifically, 27 countries do not have any data at all, 88 countries have lack or inadequate data, while only 65 countries offering complete data.

To achieve the ideal data collection recording system, first of all, the deaths recorded must be attributed directly or indirectly to pregnancy or childbirth, a medical certification or verbal autopsy is required, the pregnancy status at the time of the death must be recorded, and finally the medical cause of death must be stated.

## WHAT ARE WOMEN DYING FROM?

As mentioned above, the identification of the causes that lead to a woman's death during pregnancy or the postpartum period is more important than the reduction of maternal mortality, as the death of a pregnant woman is an incident that affects many parameters and the society as a whole. Figure 3 demonstrates the so-called domino effect which follows maternal death: women deprived a long, happy, and family life, their children's nutrition, school enrollment, and survival rates are suboptimal, family and community are less beneficial, and country loses approximately 15,000 dollars annually for every woman's death. If we count also the fact that for every woman who dies, 20 more are seriously injured or disabled, meaning that 9 million women suffer from some type of injury, the costs increase enormously. The result is the insufficiency of the government to take actions for reducing maternal deaths, setting the cycle back to the beginning.

In developing countries, hemorrhage and hypertensive disorders are the two leading causes of maternal mortality.<sup>5,6</sup> Approximately 73% of maternal mortality as a whole is due to direct obstetric causes.

### Hemorrhage

Globally, hemorrhage is the major cause of maternal mortality, accounting for the 27.1% of maternal deaths. The largest proportion of it (67%) is due to postpartum hemorrhage. A difference between developed and developing countries is noticed concerning hemorrhage: in northern Africa, hemorrhage is responsible for 36.9% of maternal deaths, while in Europe, only 16.3% of deaths are due to hemorrhage.

### Hypertensive Disorders

Hypertensive disorders including pregnancy hypertension, preexisting hypertension, preeclampsia, and eclampsia are responsible for the 14.0% of maternal deaths. These pregnancy complications are more common in Latin America and the Caribbean, as 22.1% of maternal deaths in these areas are due to hypertensive disorders.

### Sepsis and Abortion

Sepsis is the third maternal mortality cause, being responsible for 10.7% of the MMR and unsafe abortion is following with 7.9% of maternal deaths, respectively. Concerning sepsis, there are rarely deaths due to this complication in the high-income countries, while the highest proportion of deaths due to sepsis were presented in southern Asia (13.7%). If we consider deaths due to abortions, the smallest proportion is noticed in eastern Asia, as abortion is widespread and not prohibited. In contrast, Latin America and the Caribbean (9.9%), and sub-Saharan Africa (9.6%), have more deaths due to abortions.

### Pulmonary Embolism

The remaining 12.8% is due to pulmonary embolism,<sup>5</sup> which is responsible for many maternal deaths in southeastern Asia (12.1%) and eastern Asia (11.5%).

### Indirect Causes

Concerning indirect causes, more than 70% of indirect causes that have the potential to lead a woman to death derived from preexisting disorders. Human immunodeficiency virus alone accounted for 5.5% of global maternal death, and it is one of the most common preexisting disorders. Obesity, diabetes, and malaria are other three

important indirect causes, responsible for the increased MMR. Looking at the numbers, indirect causes of maternal mortality are responsible for the 25% of the maternal deaths in low-income countries. The proportion of deaths due to indirect causes was highest in southern Asia (29.3%), followed by sub-Saharan Africa (28.6%).

## SAVING A WOMAN'S LIFE

There is evidence suggesting that the two-thirds of the maternal deaths are due to hemorrhage, obstructed labor, hypertensive disorders, sepsis, and complications from an unsafe abortion. All these complications can be treated by skilled healthcare assistants, as it has been described many times in the WHO interventions. A skilled healthcare worker can perform the right intervention timely and save not only the life of a woman but also to prevent the consequences domino effect caused by such an incident, as described above. However, it is commonly accepted that the ability of skilled attendants to provide appropriate care in the event of an emergency depends on the environment in which they work. Since the vast majority of maternal deaths are due to preventable and treatable disorders, "the death of a woman during pregnancy or childbirth is a violation of her rights to life and health."

According to WHO, 60–80% of maternal deaths could be avoided by improving the socioeconomic situation of the population. More specifically, the most widely available progress indicator is the proportion of women who deliver with the assistance of a skilled attendant. Additionally, having easy access to emergency healthcare, the safe and timely transportation of women who need emergency access to hospitals and the access to contraceptive services to reduce unwanted pregnancies are some intervention with vital importance for saving a woman's life. The simplest method to reduce maternal mortality is to improve the hygiene of the facility where a woman gives birth. Almost half of maternal deaths could have been avoided if the people who assisted these women during delivery or postpartum just followed the simple hygiene rules and washed their hands.

### Teen Pregnancy and Unwanted Pregnancies

Every year 16 million girls aged from 15 years to 19 years are giving birth in developing regions. Specifically in the United States during 2017, this number was 194,377 women, with a 7% reduction compared with 2016. World Health Organization estimates that the risk of death following pregnancy is twice higher for women between 15 years and 19 years than for those between the ages of 20 and 24, while for girls aged between 10 years and 14 years, the risk is five times higher. As the pelvis of teenage girls is underdeveloped, risk of medical complications such as obstetric fistula, infant mortality or obstructed labor ending with a complicated cesarean section is much more significant.

Abortions or unwanted pregnancies are serious threats to women's health. A total of 211 million pregnancies occur every year, with 46 million of them ending in induced abortions. Unfortunately, only 60% of the abortions are performed under safe conditions and 18 million induced abortions each year are performed by people lacking the necessary skills or they are performed in an environment lacking the minimal medical standards and hygiene requirements. This results in a total of 68,000 women dying every year annually after an unsafe abortion. These deaths could have been avoided if these women used effective contraception methods. Globally, 34 unsafe abortions

are performed per 1,000 women, with South America having the highest ratio, closely followed by eastern Africa (31 per 1,000 women), western Africa (25 per 1,000 women), central Africa (22 per 1,000 women), and South Asia (22 per 1,000 women).

To avoid maternal deaths, it is vital to prevent unwanted pregnancies. Therefore, all women including adolescents must have access to family program services, the choice of contraception, safe abortion services to the full extent of the law, and quality postabortion care.

## WHY DO WOMEN NOT GET THE CARE THEY NEED AND THE SOLUTION?

Concerning the healthcare provided between pregnant women around the world, we face again a huge inequality: while in developed countries, the vast majority of pregnant women have at least four antenatal visits, they are attended by a skilled healthcare worker during parturition, and they received a well-prepared postpartum care, in developing countries, only 40% of pregnant women have access to the appropriate care during pregnancy, childbirth, or postpartum, according to WHO guidelines. In the rural and remote areas of the world, this is mainly due to the lack of trained midwives or healthcare workers, the remarkable distance from health facilities or the inadequate and low quality of the provided service.<sup>7</sup> Other factors that deprive women in less beneficial areas of the world to have the right healthcare is poverty, women do not get the right information, or due to cultural beliefs and practices, they prefer to give birth in a traditional way. This leads to millions of babies to be born without assistance.

The reasons that a woman does not receive timely and accurately assistance during pregnancy or childbirth can be grouped in three parameters, known as “the three delays.”

### Delay of Decision to Look for Skilled Assistance

A woman loses vital time to ask for skilled assistance, because she does not understand the danger and complications that her current situation may carry or because a powerful decision cannot be made. Additionally, tradition plays a key role for this delay: cultural prejudices and the resistance of the local “midwives” deprive from the women the timely and skilled care. Finally, even if the decision for asking a professional assistance is taken, the absence of economic resources deprives even more time for reaching a healthcare facility.

A recommendation that has the potential to reduce the time necessary for the decision to be made is the formation of campaigns and courses to the community, to teach women the basic lines in reproductive health. Moreover, some more professional courses can be developed which can be addressed to the traditional midwives teaching them the right methods of childbirth, to learn how to save vital time and therefore lives.

### Delay to Arrive at the Medical Center

The access to the closest medical center may not be easy. First, the patient and her driver have to get over the inaccessibility of the medical center, as passable roads and the adequate transport are totally absent. Moreover, they have to face also administrative inaccessibility. People in low-income countries ignore the health system function, and therefore, they cannot coordinate with it. Finally, the deficit of health centers and hospitals are making the arrival an odyssey. The solution for this second delay is to transfer the health facility close to distant villages. A maternal facility (hope house) where women can give birth to their babies, in a

safe, clean, and familiar environment, following WHO protocols is an ideal model. Furthermore, they can receive skilled healthcare assistance by workers or sentinels trained by courses or campaigns.

### Delay to Receive the Adequate Assistance at the Medical Center

As the patient arrives to the health facility, after a long journey, she has to face the last delay: the delay to receive adequate and timely assistance. This is mainly due to the absence of qualified staff, the absence of the appropriate technology—as modern technology is often lacking in underdeveloped countries—and the lack of organization and patient management of the medical center. Better medical supply by donators appears to be a good solution for this problem, in line with the correct organization of the medical center, just by following WHO recommendations.

It is a well-established fact that maternal and child health is WHO's priority. Many trained people all around the world are working hard with global standards having WHO assistance, to accelerate the improvement of healthcare in the area of antepartum, intrapartum, and postpartum care, to decrease MMRs. Furthermore, they are making huge efforts to increase research evidence and improve the data collection system concerning all causes of maternal deaths, reproductive and maternal morbidities, and related disabilities. Last but not least, there are campaigns running to provide evidence-based clinical and programmatic guidance even to the most remote areas of the world and to offer support on developing and implementing effective policy and programs.<sup>8</sup>

## MATERNAL MORTALITY IN EUROPE

There is no doubt that in Europe maternal and perinatal mortality rates are reasonably low. More specifically, maternal mortality had declined noticeably in almost all countries since 1980. The MMR has decreased by almost half within the European region, between 2000 and 2015, from 33 to 16 deaths per 100,000 live births, respectively. Nevertheless, the highest national MMR in the region is now estimated to be an appalling 25 times the lowest. Despite the low MMR ratio presented in Europe, some subgroups of population are still facing higher possibilities for maternal death: women with “non-western” origin are at a 60% higher rate of maternal mortality. Furthermore, MMRs were particularly high in eastern European countries such as Belarus, Estonia, Latvia, and Slovenia, while the lowest is noted in southern countries (Spain, Italy, and Greece), followed by those of central Europe (Germany and Sweden). Age is another factor that increases MMR, as women older than 35 years are more prone to pregnancy complications and have higher mortality rates. If we consider that in Europe maternal age is increased, it is reasonable that MMR for women older than 35 years, is two times higher compared with women aged 25–34 years. Mode of deliver is also a significant indicator of MMR. Although mortality rates per mode of delivery are not provided from a large number of the participating countries, it seems that operative vaginal delivery leads to significantly higher mortality rates as well as emergency cesarean sections. In contrast, elective cesarean section does not carry high risk for the future mother (Fig. 4).<sup>9</sup>

Regarding data collection, even in European countries where the registration of deaths is routinely performed, still they remain underreported and identification of the true numbers of maternal deaths may require additional special investigation. In fact, only 11 states provided information on method of delivery and mortality, 21 states have provided information on morbidity of pregnant

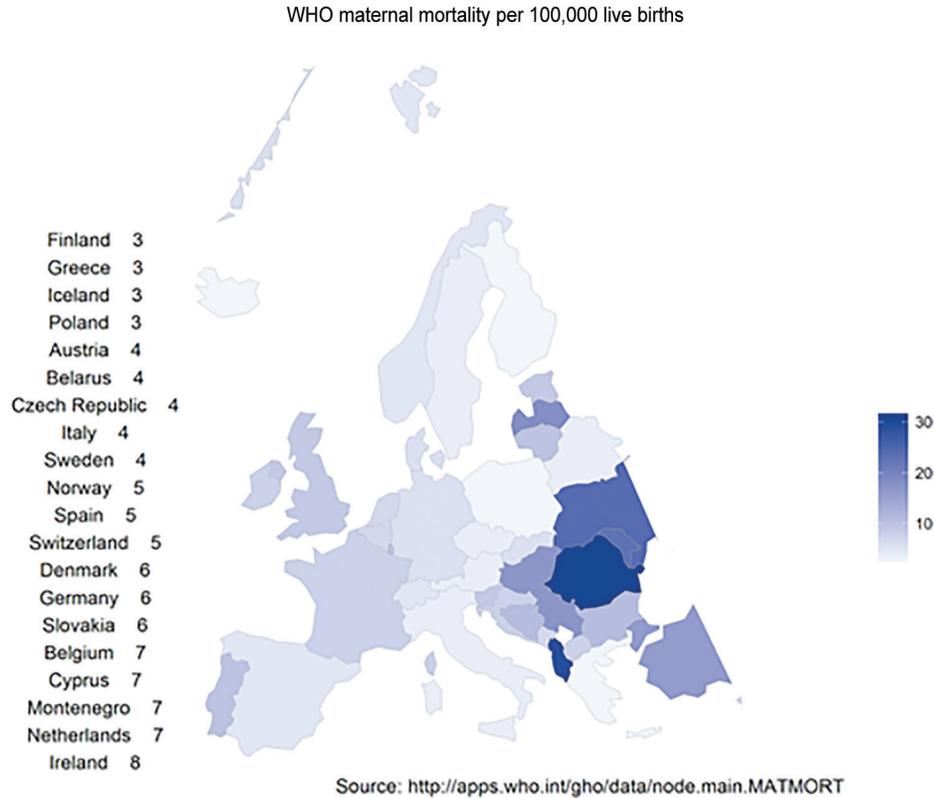


Fig. 4: Maternal mortality in Europe in 2016<sup>11</sup>

women during pregnancy and childbirth, while only 3 provided information for all classes.

The process of normal delivery has changed a lot through the years, and the normal process of birth has been “medicalized” so that a lot of interventions take place during labor many of them unnecessary and in some cases even harmful. Screening tests in prenatal diagnosis are plenty but in many occasions they are being abused, while in the hands of not well trained medical staff they fail to do what they are designed to do and fail to predict obstetrical complications.

If we consider the causes of maternal mortality in Europe, we will realize that they do not differ significantly from those in low-income countries: hemorrhage, amniotic fluid embolism, and other direct obstetrical complications account for the majority of reasons leading to maternal mortality. The main cause of death from any known direct obstetric complication remains bleeding during childbirth at a rate of 13.1% in the European Union. The other main causes are thromboembolic events (10.1%), complications associated with hypertensive disease of pregnancy (9.2%), and from amniotic fluid embolism (10.6%).<sup>10</sup>

### MATERNAL MORTALITY IN GREECE

Greece has one of the lowest maternal mortality ratios globally. For the past 8 years (between the years 2011 and 2018), there were 3 maternal deaths per 100,000 live births. Michas et al.<sup>11</sup> mentioned in their survey that although Greece faces a major economic crisis in 2008, maternal mortality did not follow the general decline, but it remained stably low. Maternal mortality showed a decisive trend since 1980 (Fig. 5). If we consider MMR in different age groups, the highest MMR is presented in the group of women older than 45

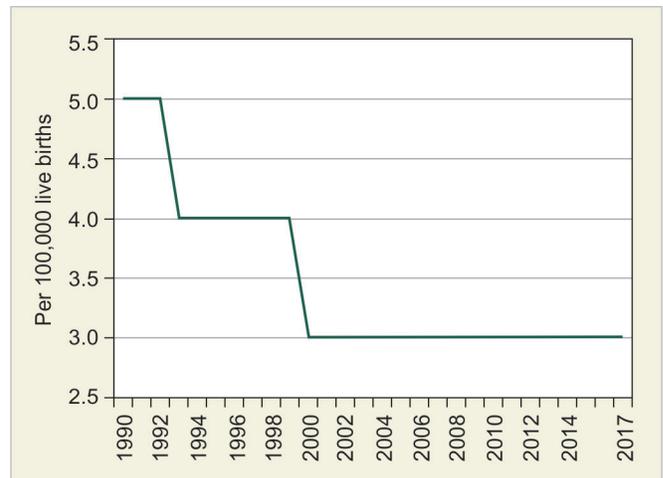


Fig. 5: Maternal mortality ratio and percentage change in Greece (1990–2017) as presented by Michas et al.<sup>11</sup>

years (38 deaths per 100,000 live births), while the lowest is noticed in the 20–34 years group (2.1/10,000). In between there are the adolescent group (6.1) and the 35–44 years group (4.32).

The first five disorders that are responsible for more than 75% of maternal deaths in Greece are hemorrhage, embolism, obstetric trauma, cardiac disease, and hypertensive disorders. To achieve further reduction of maternal mortality in Greece, preconception counseling and support is necessary to be performed, especially for women carrying medical conditions such as diabetes, epilepsy, obesity, cardiac disease, mental illness, or autoimmune disorders.

Antenatal services should be accessible and welcoming to all women, aiming the first visit before 12 weeks of gestation.

## CONCLUSION

In conclusion, there is a need to repeat that there is a huge gap between the different countries of the world concerning maternal deaths and access to healthcare, which highlights also the discrepancies between the “rich and the poor.” Another fact that must be emphasized is that women are dying from causes preventable and treatable, making this tragedy bigger. Maternal mortality has to decline, and WHO makes huge efforts to achieve the SDGs. First, the current situation of a country should be assessed, and specific challenges should be identified such as national laws. Traditions must be modified in a way that could help patients feel familiar with the health assistance and traditional midwives to be trained by courses and campaigns organized by skilled healthcare providers, to offer the best possible care to their fellow villagers. These are some simple solutions that could play a key role to reduce maternal deaths, making this world better and more hopeful.

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