Measuring Maternal Mortality

From Research to Practice: Training in Sexual and Reproductive Health Research
2017

Dr. Karim Abawi
karim.abawi@gfmer.org

Maternal mortality, key facts

- Every day, approximately 830 women die from preventable causes related to pregnancy and childbirth.
- 99% of all maternal deaths occur in developing countries.
- Maternal mortality is higher in women living in rural areas and among poorer communities.
- Young adolescents face a higher risk of complications and death as a result of pregnancy than other women.
- Skilled care before, during and after childbirth can save the lives of women and newborn babies.
- Between 1990 and 2015, maternal mortality worldwide dropped by about 44%.
- Between 2016 and 2030, as part of the Sustainable Development Agenda, the target is to reduce the global maternal mortality ratio to less than 70 per 100 000 live births.

From Millennium development goals to Sustainable development goals

Millennium development goals (MDGs)
Since the creation of Millennium Development Goals (MDGs), the need for reliable information on the estimate of maternal death has been growing at national and international levels. (The MDG 5 was to improve maternal health. The targets to assess the MDG 5 were to reduce by three quarters, between 1990 and 2015, the maternal Mortality ratio and to achieve by 2015 universal access to reproductive health).

Sustainable Development Goals (SDG)
In reference to the tangible achievements in decreasing maternal mortality ratio (between 1990-2015), new target has been fixed to accelerate the decline in maternal mortality. One of the target of the Sustainable Development Goal 3 is «to reduce the global maternal mortality ratio to less than 70 per 100 000 births, with no country having a maternal mortality rate of more than twice the global average».

World Health Organization. Maternal mortality. Fact sheet Nº348. WHO. 2015.

Maternal mortality, key facts

Where do maternal deaths occur?

- The global maternal mortality estimates shows a significant disparity within regions, that reflects inequities in access to health services. Moreover there are disparities within countries.

- 99% of maternal death occurs in developing countries of which more than half in sub-Saharan Africa and one third in South Asia.

- In 2015 the maternal mortality ratio (MMR) was 239 per 100000 live birth in developing regions and 12 per 100000 in developed regions. It shows that the MMR in developing regions is almost 20 times higher than in developed regions.

- The risk of maternal mortality is higher among under 15 years old adolescent girls in developing countries (Because of complications in pregnancy and childbirth).

World Health Organization. Maternal mortality. Fact sheet Nº348. WHO. 2015.

Maternal mortality, key facts

In high-income countries, almost all women attend at least four antenatal care visits and receive care by skilled health worker during childbirth and postpartum, whereas in low-income countries, only 40% of all pregnant women receive the recommended antenatal care visits.

Barriers to access health care during pregnancy and childbirth

•Poverty

•Distance

•Lack of information

•Inadequate services

•Cultural practices

World Health Organization. Maternal mortality. Fact sheet Nº348. WHO. 2015.

Reliable data on causes of maternal death can be used for:

- Policy makers to set priorities based on reliable data and information and to appropriately allocate resources.

- Monitoring and Evaluation.

- Increasing awareness about safe motherhood.

- Encourage accountability.

- Appropriate advocacy.

- Help in raise funds.

WHO, UNICEF, UNFPA, World Bank Group and the United Nations Population Division. Trends in Maternal Mortality: 1990-2015. WHO. 2015.

Definition of Maternal Death

"The death of a woman while pregnant or within 42 days of termination of pregnancy, irrespective of the duration and site of the pregnancy, from any cause related to or aggravated by the pregnancy or its management but not from accidental or incidental Causes".

WHO, UNICEF, UNFPA, World Bank Group and the United Nations Population Division. Trends in Maternal Mortality: 1990-2015. WHO. 2015.

Direct causes as result of obstetric complications of pregnant state, such as hemorrhage, eclampsia/pre-eclampsia, complications of anesthesia, caesarean section, incorrect treatment.

Indirect causes as consequence of previous existing diseases, diseases developed during pregnancy or aggravated by pregnancy, such as cardiac or renal diseases.

WHO, UNICEF, UNFPA, World Bank Group and the United Nations Population Division. Trends in Maternal Mortality: 1990-2015. WHO. 2015.

Alternative Definitions

Pregnancy-related Death:

The death of a woman while pregnant or within 42 days of termination of pregnancy, irrespective of the cause of death.

Late maternal death:
The death of a woman from direct or indirect obstetric causes, more than 42 days but less than one year after termination of pregnancy.

The first alternative definition allows to measure maternal death, where accurate information, based on medical certificate in not available.

The second definition allows to identify deaths that occur between six weeks and one year postpartum. This method is used in countries with developed registration system.

WHO, UNICEF, UNFPA, World Bank Group and the United Nations Population Division. Trends in Maternal Mortality: 1990-2015. WHO. 2015.

Challenges with definitions

- Despite the standard definitions accurate identification of the causes of maternal deaths is challenging.

- It is particularly difficult in setting where delivery mostly occur at home.

- It is difficult to identify maternal death precisely in setting without complete recording of deaths in civil registration.

- In most developing countries the death certificate indicating the cause of death does not exist and attribution of death as maternal death is very difficult.

- Even if the civil registration exists, the pregnancy status may not have been known and the death not have been reported as maternal death, even if the women were pregnant.

WHO, UNICEF, UNFPA, World Bank Group and the United Nations Population Division. Trends in Maternal Mortality: 1990-2015. WHO. 2015.

Coding of maternal death: ICD- MM

- In order to guide countries to reduce errors in coding maternal death and to better attribute the causes of maternal death, WHO published Application of ICD-10 to death during pregnancy, childbirth and the puerperium: ICD Maternal Mortality (ICD-MM).

- For example, the coding of maternal deaths among HIV-positive women may be due to:

- **Obstetric causes***: Such as haemorrhage or hypertensive disorders in pregnancy (In ICD-10-MM it is reported as direct maternal deaths).

- **The interaction between human immunodeficiency virus (HIV) and pregnancy**: which is an aggravating effect of pregnancy on HIV. The interaction between pregnancy and HIV is the underlying cause of death (in ICD-10 MM, it is reported as AIDS-related indirect cause of maternal death).

- **Acquired immunodeficiency syndrome (AIDS***): In these cases the death is the result of HIV complications (in ICD-10 MM it is not reported as maternal death. They are referred as AIDS deaths).

WHO, UNICEF, UNFPA, World Bank Group and the United Nations Population Division. Trends in Maternal Mortality: 1990-2015. WHO. 2015.

Statistical measures of maternal mortality

Maternal Mortality Ratio

Number of maternal death during a given time-period per 100 000 live birth during the same time-period.

Maternal Mortality Rate:

Number of maternal death in a given period per 100 000 women of reproductive age during the same time-period.

Adult Lifetime risk of maternal death:

The probability that a 15-year-old woman will die eventually from a maternal cause.

The proportion of deaths among women of reproductive age that are due to maternal causes (PM)

The number of maternal deaths in a given time period divided by the total deaths among women aged 15–49 years.

Approaches to measuring maternal mortality

1. Civil Registration System:

It is a routine, permanent, national and legal source of data and information on vital life events, such as live births, deaths, foetal deaths, marriages and divorces).

Advantages:
- Representative of entire population.
- Does not require special data collection.
- Provides annual statistics on maternal death at national and regional levels.
- Provides cause-specific estimate of maternal mortality.
- Provide data on birth.
- Ideal for monitoring & evaluation.

Limitation
- Poor quality, under-estimation of maternal deaths, attribution of incorrect cause of death.
- It exists only in 78 countries covering only 35% of world population.

WHO, UNICEF, UNFPA, World Bank Group and the United Nations Population Division. Trends in Maternal Mortality: 1990-2015. WHO. 2015.

2. Household Survey

It is an appropriate important data collection platforms for maternal deaths in settings where routine information collection systems are weak or does not exist.

Advantages:
- Sampling ensures that the target populations are representative.
- Household surveys can also collect information on causes time, place, health care seeking behaviour prior to death.

Limitation:
- Survey identifies pregnancy-related death, not maternal death.
- In epidemiologic terms, maternal deaths are rare events, survey to measure their magnitude requires a large sample size.
- Even with large sample size, the obtained results could be uncertain because of wide confidence interval.

WHO, UNICEF, UNFPA, World Bank Group and the United Nations Population Division. Trends in Maternal Mortality: 1990-2015. WHO. 2015.

3. Sisterhood methods

This method consists of obtaining information by interviewing a representative sample or respondents about the survival of all their adult sister in order to determine: the number of ever-married sisters, how many are alive, how many are dead and how many died during pregnancy, delivery or within six weeks of pregnancy.

Limitations

• It identifies pregnancy-related deaths, rather than maternal deaths.
• It provides retrospective rather than actual maternal mortality estimate (over 10 years prior to survey).
• It is less appropriate in settings with significant migration and population movement.
• It is difficult to get additional information about deaths (causes, risk factors, timing and etc. as sibling may not have such details).

WHO, UNICEF, UNFPA, World Bank Group and the United Nations Population Division. Trends in Maternal Mortality: 1990-2015. WHO. 2015.

4. Reproductive-age mortality studies (RAMOS)

It includes identifying and investigating the causes of all deaths of women of reproductive age in a defined geographical area /population. It requires the use of multiple sources of data, such as family members interview, vital registration, health facility records, death records, traditional birth attendants.

Advantages:
In the absence of reliable data collection of registration system, this method is more reliable and can provide subnational Maternal mortality ratios.

Limitations
- It could be long, complicated and expensive, especially if it is implemented on a large scale.
- The number of live birth used in computation and calculation of MMR may not be accurate, especially in places, where women deliver at home.

5. Verbal Autopsy

This method consists of interviewing family members, community members to assign the cause of death. It is used in settings where medical certification of cause of death is not available. It aims to identify maternal death that occur in community and the cause of maternal death.

Advantages:
- It is the only way to ascertain the cause of death, where the deaths happen outside of health facility.
- It can also capture information on social and community factors associated with a maternal death for example barriers to accessing obstetric care.

Limitations:
- Limited reliability of causes of death when reported by a lay-persons, which can be subjective.
- There is a risk of under or over-reporting of cause of death.
- Quality of data collection depends on the quality of training provided to field workers and interviewers and quality of the questionnaire.

WHO, UNICEF, UNFPA, World Bank Group and the United Nations Population Division. Trends in Maternal Mortality: 1990-2015. WHO. 2015.

6. Census

Advantage:

- No sampling errors.
- Ability to estimate differentials by socioeconomic, geographic variables.
- Well-developed formal evaluation methods.
- It allows identification of death in relatively short reference period (1-2 years).

Limitations

- Generally only held every 10 years, which limit the monitoring of maternal mortality.
- The basic data always need evaluation, and frequently need adjustment.
- The estimates (after adjustment) are for the intercensal period (long reference period.

WHO, UNICEF, UNFPA, World Bank Group and the United Nations Population Division. Trends in Maternal Mortality: 1990-2015. WHO. 2015.

Challenges in measuring maternal mortality

Despite the diversity in the definition of maternal mortality, the sources of data (death certificate, vital event certificate, medical record, autopsy report, civil registry, coding practice and classification), many studies estimate an underreporting of maternal mortality due to misclassification and incomplete death registration.

•**Misclassification** refers to incorrect coding in civil registration, due either to error in the medical certification of cause of death or error in applying the correct code.

•**Incompleteness** refers to incomplete death registration. Includes both the identification of individual deaths in each country and the national coverage of the register.

•**Underreporting** is a combination of misclassification and incompleteness.

WHO, UNICEF, UNFPA, World Bank Group and the United Nations Population Division. Trends in Maternal Mortality: 1990-2015. WHO. 2015.

Reference Documents

1. WHO, UNICEF, UNFPA, World Bank Group and the United Nations Population Division. Trends in Maternal Mortality: 1990-2015. WHO. 2015. Available from: http://www.who.int/reproductivehealth/publications/monitoring/maternal-mortality-2015/en/

2. World Health Organization. Maternal mortality. Fact sheet Nº348. WHO. 2016. Available from: http://www.who.int/mediacentre/factsheets/fs348/en/