Maternal Mortality: The Epidemiological Perspective

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Every minute of every day, somewhere in the world, a woman dies as a result of complications arising during pregnancy and childbirth. The majority of these deaths are avoidable.

For every woman who dies, 20 more are injured.

Maternal death is a tragedy for individual women, for families, and for their communities.


What is a maternal death?
If she had not been pregnant, would she have died?


• Pregnancy related deaths are caused by:
  – Complications of the pregnancy itself
  – A chain of events initiated by the pregnancy
  – The aggravation of an unrelated condition or event by the physiologic effects of pregnancy
• Cases must be considered individually and are usually (but not always!) straightforward

What is a maternal death?
If she had not been pregnant, would she have died?


• Three questions need to be answered:
  – Is the condition or procedure that caused death unique to pregnancy?
  – Is the condition that caused death more likely to occur during or to be exacerbated by pregnancy?
  – What is the temporal relationship between the pregnancy, the condition and death?

What is a maternal or “pregnancy-associated” death?


• Death of a woman while pregnant or within 1 year (42 days for the WHO/NCHS definition) of termination of pregnancy, irrespective of cause
  – Pregnancy-related (cause related to or aggravated by pregnancy, but not from accidental or incidental causes)
  – Pregnancy-associated-but-not-pregnancy-related (cause unrelated to pregnancy)
  – Undetermined if pregnancy-related

Case Study #1

A 20-year-old female G2P1 with sickle cell anemia has an acute sickle crisis at 28 weeks gestation and dies on the second postpartum day.

Is this death related to pregnancy?

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*Is this death related to pregnancy?*
Yes


Case Study #2
A 20-year-old female G2P1 with sickle cell anemia has an acute sickle crisis at 28 weeks gestation and suffers a cardio-respiratory arrest during delivery. She is resuscitated and placed on life support. She survives for 4 months but eventually becomes septic and dies.

*Is this death related to pregnancy?*
Yes


Case Study #3
A 20-year-old female G2P1 with sickle cell anemia gives birth to a healthy baby girl at 37 weeks gestation. Eight months later she develops an acute sickle crisis and dies.

*Is this death related to pregnancy?*
No


Measures of pregnancy-related mortality: *Mortality ratio*

- Chance of dying due to complications of an individual pregnancy over a specific time period:

\[
\text{Number of pregnancy-related deaths} \times 100,000 \div \text{Number of live births}
\]
Measures of pregnancy-related mortality: **Mortality rate**

- Chance of a reproductive-age woman dying of pregnancy complications during a specific time period:

\[
\text{Number of pregnancy-related deaths} \times 100,000 \\
\text{Number of women of reproductive age}
\]

Measures of pregnancy-related mortality: **Proportional mortality rate**

- The extent to which pregnancy-related deaths contribute to mortality among women of reproductive age (15-49 years old) over a specific time period:

\[
\frac{\text{Number of pregnancy-related deaths}}{\text{Number of deaths to women of reproductive age}} \times 100
\]

Measures of pregnancy-related mortality: **Lifetime risk of maternal death**

- Probability of maternal death during a woman’s reproductive life, usually expressed in terms of odds

Maternal deaths are difficult to count

- Deciding whose death is “pregnancy-related” often involves a review committee—and such committees are a luxury not usually available in poor countries
- As a result, accurate statistics on such deaths are quite limited in poor countries

Some statistics

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<thead>
<tr>
<th>Maternal deaths</th>
<th>Stillbirths and newborn deaths</th>
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<tbody>
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<td>11-17% during childbirth</td>
<td>98% occur in low- and middle-income countries</td>
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"The care that can reduce maternal deaths and improve women’s health is also crucial of newborns’ survival and health."

The situation in the US


Lessons from the US data

- Maternal mortality is low, but...
  - It could be lower
  - It hasn’t decreased in the last 30 years
- Maternal mortality rate varies by:
  - Age
  - Birth order
  - Marital status
  - Racial/ethnic group
  - Prenatal care
Maternal mortality ratio per 100,000 live births: 2008


Estimates of maternal death by UN MDG regions, 2010

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<tr>
<th>Region</th>
<th>MMR</th>
<th>Number of maternal deaths</th>
<th>Lifetime risk of maternal death (1 in:)</th>
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<tbody>
<tr>
<td>World</td>
<td>210</td>
<td>287,000</td>
<td>180</td>
</tr>
<tr>
<td>Developed regions</td>
<td>16</td>
<td>2,200</td>
<td>3800</td>
</tr>
<tr>
<td>Developing regions</td>
<td>240</td>
<td>284,000</td>
<td>150</td>
</tr>
<tr>
<td>Northern Africa</td>
<td>78</td>
<td>2,800</td>
<td>470</td>
</tr>
<tr>
<td>Sub-Saharan Africa</td>
<td>500</td>
<td>162,000</td>
<td>39</td>
</tr>
<tr>
<td>Southern Asia</td>
<td>220</td>
<td>83,000</td>
<td>160</td>
</tr>
<tr>
<td>Southeastern Asia</td>
<td>150</td>
<td>17,000</td>
<td>290</td>
</tr>
<tr>
<td>Western Asia</td>
<td>71</td>
<td>3,500</td>
<td>430</td>
</tr>
<tr>
<td>Latin American and the Caribbean</td>
<td>80</td>
<td>8,800</td>
<td>520</td>
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This difference between developed and developing countries has long been cited as the "largest discrepancy of all public-health statistics", and is substantially greater than that for child or neonatal mortality.

Factors that contribute to maternal deaths in resource-poor countries

- Low status of women and some families
- Poverty at the family and/or community level
- Lack of access to modern family planning
- Child (young adolescent) marriages
- Polygamous (multi-wife) marriages
- Low community-level awareness of danger signs of pregnancy/labor
- Violence (homicide, suicide) in pregnancy
- Rural location (time/distance to health facilities)
- Unwillingness/inability to attend antenatal care
- Weak health systems


Rates of unintended and intended pregnancy, worldwide and by region, 2008

Geographical distribution of causes of maternal death

Types of birth

- Vaginal
  - Spontaneous
  - Assisted (e.g. forceps)
- Cesarean
  - Without labor
    - After a prior cesarean birth
    - Not after a prior cesarean birth
  - During labor

Maternal mortality ratio varies by income

Where pregnancy-related deaths occur

- Often in the hospital (receives the sickest women and has more accurate statistics)
- Types of cases:
  - Women who arrive too sick and late to benefit from emergency care
  - Women who could have been saved if they had received timely and effective interventions
  - Women admitted for normal delivery who subsequently developed serious complications and died with or without receiving emergency care

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Such cases indicate substandard care and may represent 1/3 of maternal deaths.
MDG 5:
To improve maternal health

- 5A: To reduce maternal mortality rate by 75% between 1990 and 2015
  - ↓ maternal mortality ratio
  - ↑ proportion of births attended by a skilled attendant

- 5B: To achieve universal access to reproductive health
  - ↑ use of modern contraceptives
  - ↓ births to women <20 y old
  - ↑ improve antenatal coverage and ↑ number of visits


Poor countries don’t care and neither do we, so the rate [of maternal mortality] isn’t going to go down.

If this condition [maternal mortality] affected men, governments would take action. Women are considered as machines, machines to produce babies.

--Nicholas Kristof, New York Times