Methodological issues in the measurement of maternal mortality and morbidity
Why is it important to monitor maternal mortality and morbidity?

- What women die of
- Priority setting
- Evaluation of progress
Why is it difficult to measure maternal mortality?

- Rare event
- Lack of vital statistics
- Attribution of cause is not reliable underestimates
- Differentials in definitions
- Differentials in interpretation
Published and revised MMR
Salabane B. IJE, 1999;28:64-69

<table>
<thead>
<tr>
<th>Per 100 000 Live births</th>
<th>Published rates</th>
<th>Revised rates</th>
<th>$P$-values$^a$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Austria</td>
<td>5.7</td>
<td>9.4</td>
<td>0.002</td>
</tr>
<tr>
<td>Bavaria (G)</td>
<td>8.6</td>
<td>7.6</td>
<td>0.157</td>
</tr>
<tr>
<td>Denmark</td>
<td>7.4</td>
<td>9.8</td>
<td>0.083</td>
</tr>
<tr>
<td>Finland</td>
<td>6.9</td>
<td>9.9</td>
<td>0.083</td>
</tr>
<tr>
<td>Flanders (BE)</td>
<td>4.7</td>
<td>4.7</td>
<td>-</td>
</tr>
<tr>
<td>France</td>
<td>11.7</td>
<td>11.3</td>
<td>0.157</td>
</tr>
<tr>
<td>Hungary</td>
<td>7.5$^b$</td>
<td>11.9</td>
<td>0.004</td>
</tr>
<tr>
<td>The Netherlands</td>
<td>7.7</td>
<td>7.4</td>
<td>0.655</td>
</tr>
<tr>
<td>Norway</td>
<td>1.7</td>
<td>3.3</td>
<td>0.317</td>
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<tr>
<td>Portugal</td>
<td>7.6</td>
<td>9.0</td>
<td>0.157</td>
</tr>
<tr>
<td>UK</td>
<td>5.6</td>
<td>6.9</td>
<td>0.021</td>
</tr>
<tr>
<td><strong>All countries</strong></td>
<td><strong>7.7</strong></td>
<td><strong>8.7</strong></td>
<td><strong>&lt;0.001</strong></td>
</tr>
</tbody>
</table>
Why is it difficult to measure maternal mortality?

- Rare event
- Lack of vital statistics
- Attribution of cause is not reliable underestimates
- Differentials in definitions
- Differentials in interpretation
Differentials in definitions

UK
- Ectopic pregnancy
- Abortion
  ➔ Early pregnancy deaths

USA
- Ectopic pregnancy ➔ Haemorrhage
- Septic abortion ➔ Sepsis
Why is it difficult to measure maternal mortality?

- Rare event
- Lack of vital statistics
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- Differentials in definitions
- Differentials in interpretation

underestimates
“A maternal death is the death of a women while pregnant or within 42 days of termination of pregnancy, irrespective of the duration and the site of the pregnancy, from any cause related to or aggravated by the pregnancy or its management, but not from accidental or incidental causes”
Maternal mortality: only 42 days?

- Late maternal death: ICD-10
- Modern medical care delays maternal death
- Focus on postpartum care

Source: Høj L et al. BJOG 2003;110:995-1000
Indicators of maternal mortality:

- Number of maternal deaths

USA 660
Bangladesh 16000

Indicators of maternal mortality:

- Number of maternal deaths
- Maternal mortality Ratio (MMR)

\[
\text{MMR} = \frac{\text{No. maternal deaths}}{\text{No. live births}}
\]
Indicators of maternal mortality:

- Number of maternal deaths
- Maternal mortality Ratio (MMR)
- Maternal mortality Rate (MMRate)

\[
\text{MMRate} = \frac{\text{No. maternal deaths}}{\text{No. women 15-49}}
\]
Indicators of maternal mortality:

- Number of maternal deaths
- Maternal mortality Ratio (MMR)
- Maternal mortality Rate (MMRate)
- Lifetime risk of death (LTR)

\[ \text{LTR} = 35 \times \text{MMRate} \]
How do we measure maternal mortality?

- Direct counting
- Special surveys
Direct counting

- Vital registration systems
- Hospital records
- Census
Special surveys

・ Reproductive Age Mortality Studies (RAMOS)

・ Direct household survey methods

・ Direct/Indirect sisterhood methods
MMR using direct household survey: What do the estimate really mean?
Special surveys

- Reproductive Age Mortality Studies (RAMOS)
- Direct household survey methods
- Direct/Indirect sisterhood methods
Sisterhood methods

- Reduces sample sizes
- Estimates 10-13 years previous to the survey
- They measure pregnancy-related deaths
- No useful for monitoring changes
Techniques to ascertain cause of death

- Verbal autopsy
- Confidential enquiry
Problems?

- Different methodologies
- Precision - confidence intervals
- Timing of availability of data
Maternal Mortality in 1995:
Estimates developed by
WHO, UNICEF, UNFPA

World Health Organization, Geneva
UNFPA, Reproductive Health and Research
United Nations Children's Fund
United Nations Population Fund
## Maternal mortality estimates 2000

<table>
<thead>
<tr>
<th>Region</th>
<th>MMRatio (maternal deaths per 100,000 live births)</th>
<th>Number of maternal deaths</th>
<th>Lifetime risk of maternal death, 1 in:</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>World total</strong></td>
<td>400</td>
<td>529,000</td>
<td>74</td>
</tr>
<tr>
<td><strong>More developed countries</strong></td>
<td>20</td>
<td>2,500</td>
<td>2,800</td>
</tr>
<tr>
<td><strong>Less developed countries</strong></td>
<td>440</td>
<td>527,000</td>
<td>61</td>
</tr>
<tr>
<td><strong>Least developed countries</strong></td>
<td>1,000</td>
<td>230,000</td>
<td>16</td>
</tr>
</tbody>
</table>

Priority:
~60% of all maternal deaths

- India: 136000
- Nigeria: 37000
- DR Congo: 24000
- Ethiopia: 24000
- Tanzania: 21000
- Afghanistan: 20000
- Bangladesh: 16000
- China: 11000
- Angola: 11000
- Bangladesh: 16000

Priority:
Countries with highest MMRatios

**Difficulty in monitoring trends**

<table>
<thead>
<tr>
<th>Country</th>
<th>1990 Deaths</th>
<th>MMRatio</th>
<th>1995 Deaths</th>
<th>MMRatio</th>
</tr>
</thead>
<tbody>
<tr>
<td>India</td>
<td>147,000</td>
<td>570</td>
<td>110,000</td>
<td>440</td>
</tr>
<tr>
<td>Ethiopia</td>
<td>33,000</td>
<td>1400</td>
<td>46,000</td>
<td>1800</td>
</tr>
<tr>
<td>Indonesia</td>
<td>31,000</td>
<td>650</td>
<td>22,000</td>
<td>470</td>
</tr>
<tr>
<td>Bangladesh</td>
<td>33,000</td>
<td>850</td>
<td>20,000</td>
<td>600</td>
</tr>
<tr>
<td>Dem Rep of Congo</td>
<td>16,000</td>
<td>870</td>
<td>20,000</td>
<td>940</td>
</tr>
<tr>
<td>China</td>
<td>22,000</td>
<td>95</td>
<td>13,000</td>
<td>60</td>
</tr>
</tbody>
</table>

*** RAMOS  
** Sisterhood  
* Model

Measuring maternal morbidity

✓ Hospital-based
✓ Community-based
Hospital-based

- Not all women use hospitals
- Assuming diagnostic correct
- Assuming completeness of records
Community-based

- Interview surveys
- Clinical examinations
- Laboratory measurements
Differentials in definitions

- Haemorrhage
- Pre-eclampsia/eclampsia
- Abortion