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

- What women die of
- Priorization
- 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
<table>
<thead>
<tr>
<th>Country</th>
<th>Published rates</th>
<th>Revised rates</th>
<th>P-values*</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>7.5b</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>
</tr>
<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
- Differentials in definitions
- Differentials in interpretation
Differentials in definitions

UK
- Ectopic pregnancy
- Abortion

Early pregnancy deaths

USA
- Ectopic pregnancy

Haemorrhage

USA
- Septic abortion

Sepsis
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
Maternal death
ICD-10

“A maternal death is the death of a woman 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”
Indicators to measure maternal mortality

✓ Maternal mortality ratio (MMR)
✓ Maternal mortality rate (MMRate)
✓ Proportion of deaths women of reproductive age that are due to maternal causes (PMDF)
✓ Maternal Lifetime Risk (LTR)
**MMR**

\[
\text{MMR} = \frac{\text{no. of maternal deaths}}{\text{no. of live births}} \times 100,000
\]

**MMRate**

\[
\text{MMRate} = \frac{\text{no. of maternal deaths}}{\text{no. of women aged 15 – 49}} \times 100,000
\]
PMDF

\[
PMDF = \frac{\text{no. of maternal deaths}}{\text{no. of deaths of women aged 15 – 49}} \times 100
\]

Maternal Life Time Risk

\[
LTR = 35 \times \text{MMRate}
\]
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 estimates

## 1995

<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>515,000</td>
<td>75</td>
</tr>
<tr>
<td><strong>More developed countries</strong></td>
<td>21</td>
<td>2,800</td>
<td>2,500</td>
</tr>
<tr>
<td><strong>Less developed countries</strong></td>
<td>440</td>
<td>512,000</td>
<td>60</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:
61% of all maternal deaths occur in 10 countries

Priority: Countries with highest MMRatios

## Difficulty in monitoring trends

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></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>

Legend:  
*** 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