Methodological issues in the measurement of maternal mortality and morbidity
“...it’s not because countries are poor that they cannot afford good health information. It’s because they are poor that they cannot afford to be without it.”
Why is it important to monitor maternal mortality and morbidity?

- What women die of
- Priority setting
- Evaluation of programmes' progress
- Preventable deaths that tell us more about the country
MDGs
Goal 5: Improve maternal health

**Target:** Reduce the MMR by three-quarters, between 1990 and 2015

**Indicators:** MMR, SBA
Why is it difficult to measure maternal mortality?

It requires info about three components:

✓ Deaths among WRA
✓ Pregnancy status at or near the time of death
✓ Medical cause of death
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>
</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>
Underreporting of maternal deaths
Horon IF. AJPH, 2005;95:478-482

Total deaths: 129

80 capture by death certificates

40% underreporting
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
  \[\rightarrow\]
- Early pregnancy deaths

USA
- Ectopic pregnancy
  \[\rightarrow\]
- Haemorrhage

USA
- Septic abortion
  \[\rightarrow\]
- Sepsis
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
“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                          16 000

Source: WHO/UNICEF/UNFPA, 2004
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)

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

Direct counting

Maternal mortality

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?

**MMR** = 300 per 100,000 with 20% margin error

Requires a sample of 50,000 live births
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
Challenges?

- Different methodologies
- Precision - confidence intervals
- Timing of availability of data
- No data at all – same countries
Maternal Mortality in 2000:

Estimates developed by WHO, UNICEF, UNFPA

# 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>World total</td>
<td>400</td>
<td>529,000</td>
<td>74</td>
</tr>
<tr>
<td>More developed countries</td>
<td>20</td>
<td>2,500</td>
<td>2,800</td>
</tr>
<tr>
<td>Less developed countries</td>
<td>440</td>
<td>527,000</td>
<td>61</td>
</tr>
<tr>
<td>Least developed countries</td>
<td>1,000</td>
<td>230,000</td>
<td>16</td>
</tr>
</tbody>
</table>

Source: WHO/UNICEF/UNFPA, 2004
Priority: 
~60% of all maternal deaths

Source: WHO/UNICEF/UNFPA, 2004
Priority:
Countries with highest MMRatios

Source: WHO/UNICEF/UNFPA, 2004
Difficulty in monitoring trends

<table>
<thead>
<tr>
<th>Country</th>
<th>1990</th>
<th>1995</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Deaths</td>
<td>MMRatio</td>
</tr>
<tr>
<td>India</td>
<td>147,000 *</td>
<td>570</td>
</tr>
<tr>
<td>Ethiopia</td>
<td>33,000 *</td>
<td>1400</td>
</tr>
<tr>
<td>Indonesia</td>
<td>31,000 *</td>
<td>650</td>
</tr>
<tr>
<td>Bangladesh</td>
<td>33,000 *</td>
<td>850</td>
</tr>
<tr>
<td>Dem Rep of Congo</td>
<td>16,000 *</td>
<td>870</td>
</tr>
<tr>
<td>China</td>
<td>22,000 ***</td>
<td>95</td>
</tr>
</tbody>
</table>

*** RAMOS  
** Sisterhood  
* Model  

## Difficulty in monitoring trends

<table>
<thead>
<tr>
<th></th>
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<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>India</td>
<td>147,000*</td>
<td>570</td>
<td>110,000***</td>
<td>440</td>
<td>136,000+</td>
<td>540</td>
</tr>
<tr>
<td>Ethiopia</td>
<td>33,000*</td>
<td>1400</td>
<td>46,000*</td>
<td>1800</td>
<td>24,000**</td>
<td>850</td>
</tr>
<tr>
<td>Indonesia</td>
<td>31,000*</td>
<td>650</td>
<td>22,000**</td>
<td>470</td>
<td>10,000*</td>
<td>230</td>
</tr>
<tr>
<td>Bangladesh</td>
<td>33,000*</td>
<td>850</td>
<td>20,000*</td>
<td>600</td>
<td>16,000+</td>
<td>380</td>
</tr>
<tr>
<td>Dem Rep of Congo</td>
<td>16,000*</td>
<td>870</td>
<td>20,000*</td>
<td>940</td>
<td>24,000*</td>
<td>990</td>
</tr>
<tr>
<td>China</td>
<td>22,000***</td>
<td>95</td>
<td>13,000***</td>
<td>60</td>
<td>11,000***</td>
<td>56</td>
</tr>
</tbody>
</table>

*** RAMOS  
** Sisterhood  
* Model  
+Direct survey

Source: WHO/UNICEF/UNFPA, 2004
What does the estimate really mean?

Maternal deaths per 100,000 LB

WHO estimate

Country X's official estimate

250
Measuring maternal mortality: New approaches/tools

✓ Sampling Service Sites (SSS)
✓ MAternal DEaths from Informants (MADE-IN)
✓ Follow-On-Review tool (MADE-FOR)
✓ Rapid Ascertainment Process for Institutional Deaths (RAPID)
✓ Interpretation of Verbal Autopsy-Maternal (InterVA-M)

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
  ✓ Medically-diagnosed diseases
✓ Clinical examinations
✓ Laboratory measurements
✓ Interview-based diagnosis
Differentials in definitions

- Haemorrhage
- Pre-eclampsia/eclampsia
- Abortion
“What gets measured gets done”

WHO Director General,
4 January 2007
Art for Health

(http://www.who.int/reproductive-health/artforhealth/index.htm)

- Disparities
- Increase information
- Greater advocacy
- Greater support
- Increase awareness through contemporary art