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Methodological issues in the measurement of maternal mortality and morbidity



Training Course in Sexual and Reproductive Health Research
Geneva 2010

A woman in a pink dress stands in the center of a crowded, narrow alleyway in a slum. She is holding a tablet computer and looking at it. She is surrounded by a diverse group of people, including women and children. Some women are holding infants. The background shows makeshift buildings and laundry hanging on lines. The scene is brightly lit, suggesting daylight.

"...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:

Conceptual reasons

- ✓ Deaths among WRA
- ✓ Pregnancy status at or near the time of death
- ✓ Medical cause of death

Why is it difficult to measure maternal mortality?

Practical reasons

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

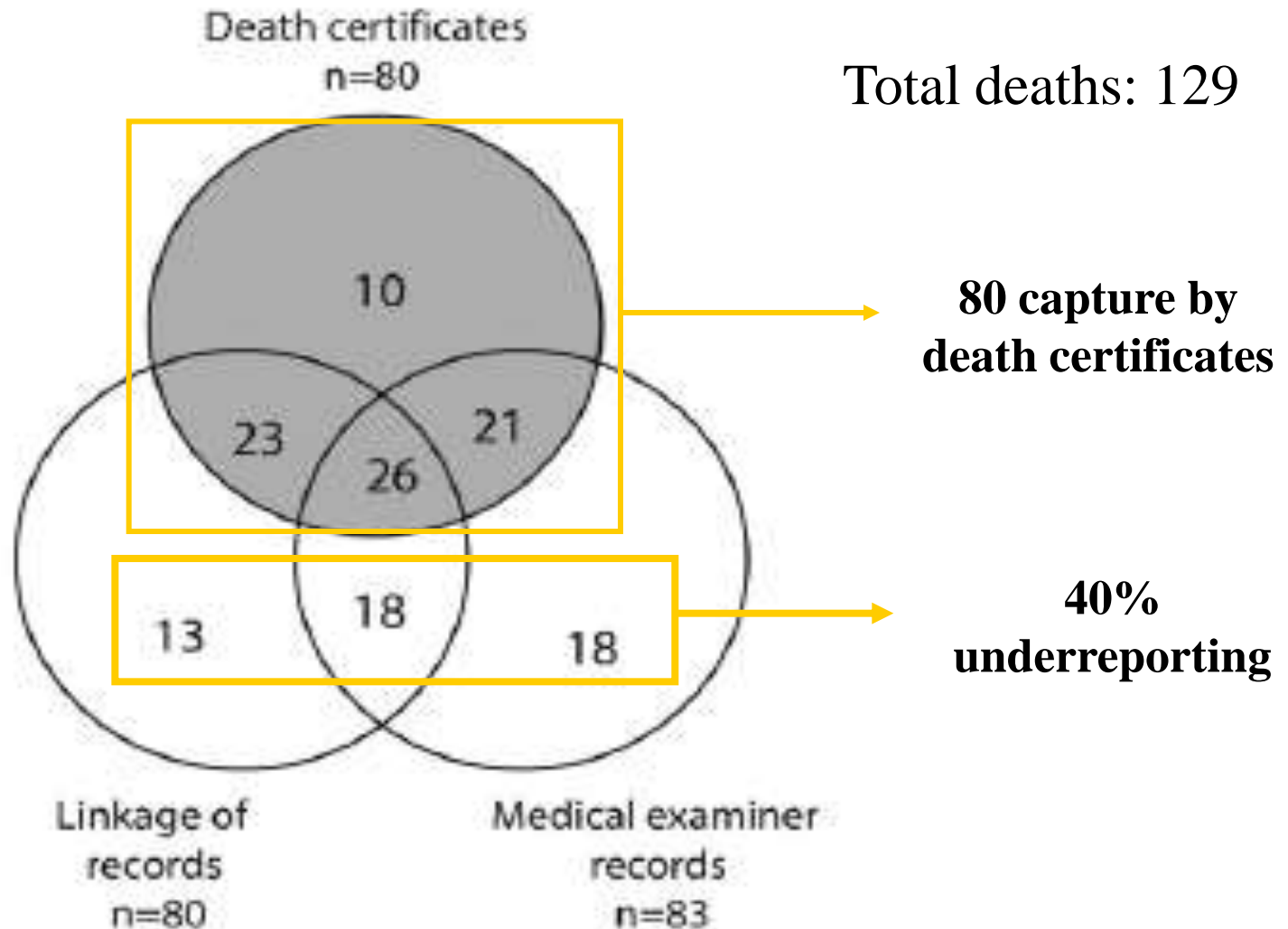
Published and revised MMR

Salabane B. IJE, 1999;28:64-69

Per 100 000 Live births	Published rates	Revised rates	P- values^a
Austria	5.7	9.4	0.002
Bavaria (G)	8.6	7.6	0.157
Denmark	7.4	9.8	0.083
Finland	6.9	9.9	0.083
Flanders (BE)	4.7	4.7	-
France	11.7	11.3	0.157
Hungary	7.5 ^b	11.9	0.004
The Netherlands	7.7	7.4	0.655
Norway	1.7	3.3	0.317
Portugal	7.6	9.0	0.157
UK	5.6	6.9	0.021
All countries	7.7	8.7	<0.001

Underreporting of maternal deaths

Horon IF. AJPH, 2005;95:478-482



Why is it difficult to measure maternal mortality?

Practical reasons

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Differentials in definitions

UK

Ectopic pregnancy
Abortion



**Early pregnancy
deaths**

USA

Ectopic pregnancy



Haemorrhage

USA

Septic abortion



Sepsis

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Maternal death ICD-10



“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

Indicators of maternal mortality:



✓ Number of maternal deaths

USA		440
Bangladesh		21 000

Source: WHO/UNICEF/UNFPA/The World Bank, 2007

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)

$$\text{MMRate} = \frac{\text{No. maternal deaths}}{\text{No. women 15-49}}$$

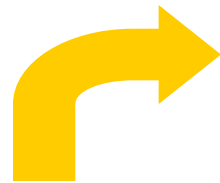
Indicators of maternal mortality:



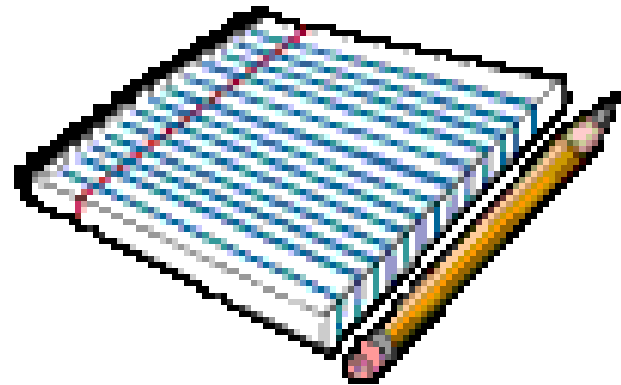
- ✓ Number of maternal deaths
- ✓ Maternal mortality Ratio (MMR)
- ✓ Maternal mortality Rate (MMRate)
- ✓ Lifetime risk of death (LTR)

$$\mathbf{LTR = 35 * MMRate}$$

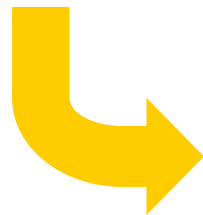
How do we measure maternal mortality?



Direct counting



Maternal mortality



Special surveys

Direct counting



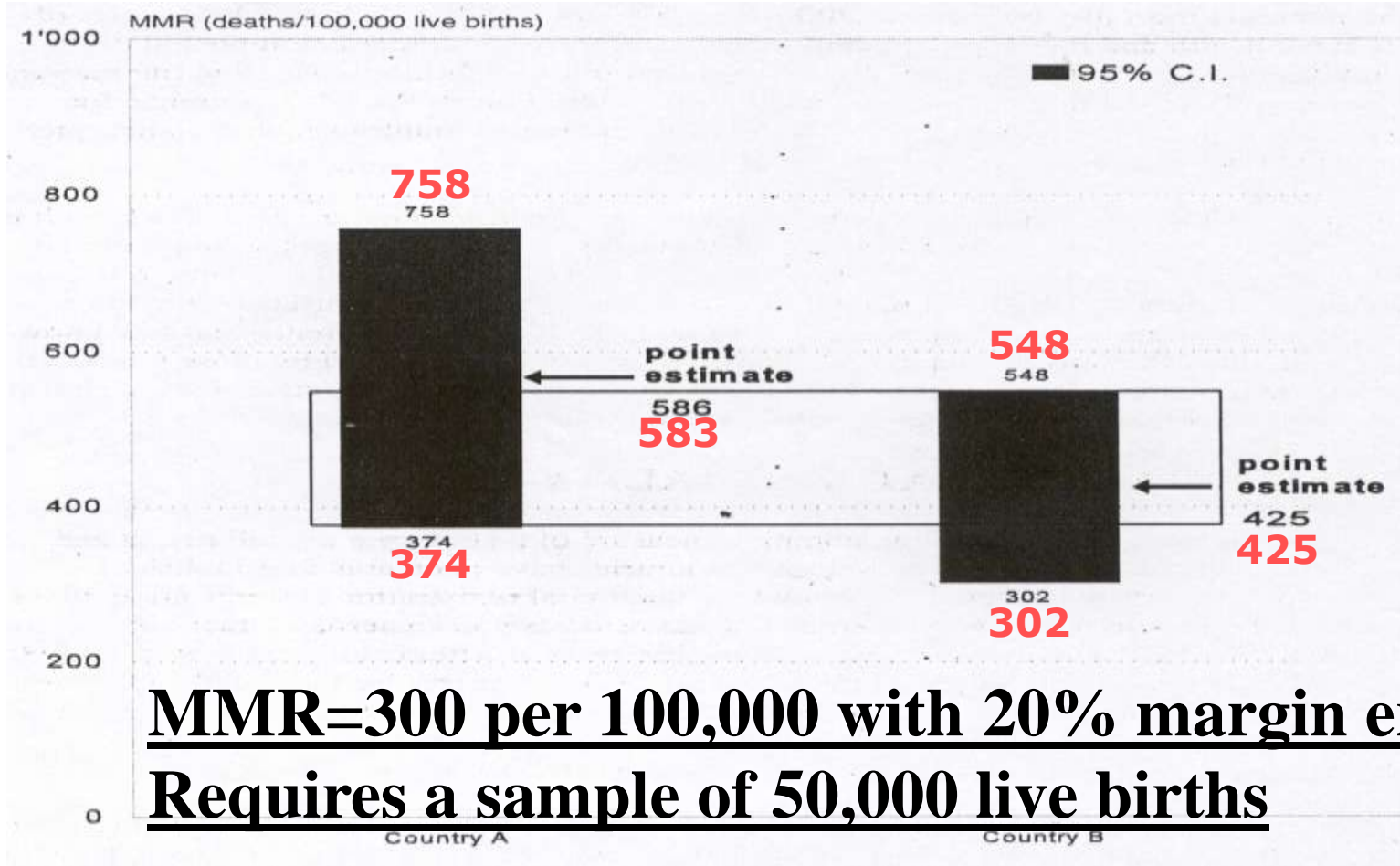
- ✓ Vital registration systems
- ✓ Hospital records
- ✓ Census

Special surveys



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

MMR using direct household survey: What do the estimates really mean?



Special surveys



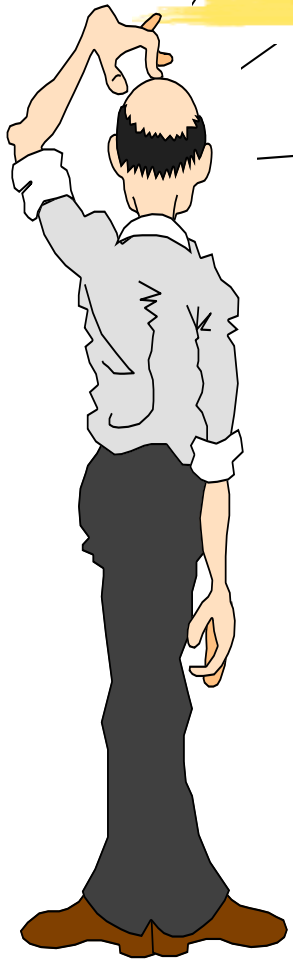
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Sisterhood methods

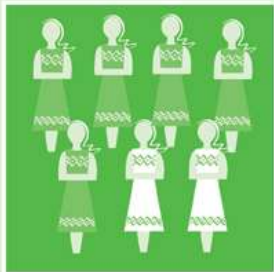
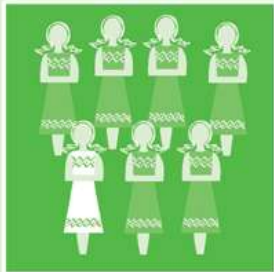


- ✓ Reduces sample sizes
- ✓ Estimates 10-13 years previous to the survey
- ✓ They measure pregnancy-related deaths
- ✓ No useful for monitoring changes

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



World Health Organization, Geneva



Maternal Mortality in 2005

Estimates developed by
WHO, UNICEF, UNFPA and The World Bank



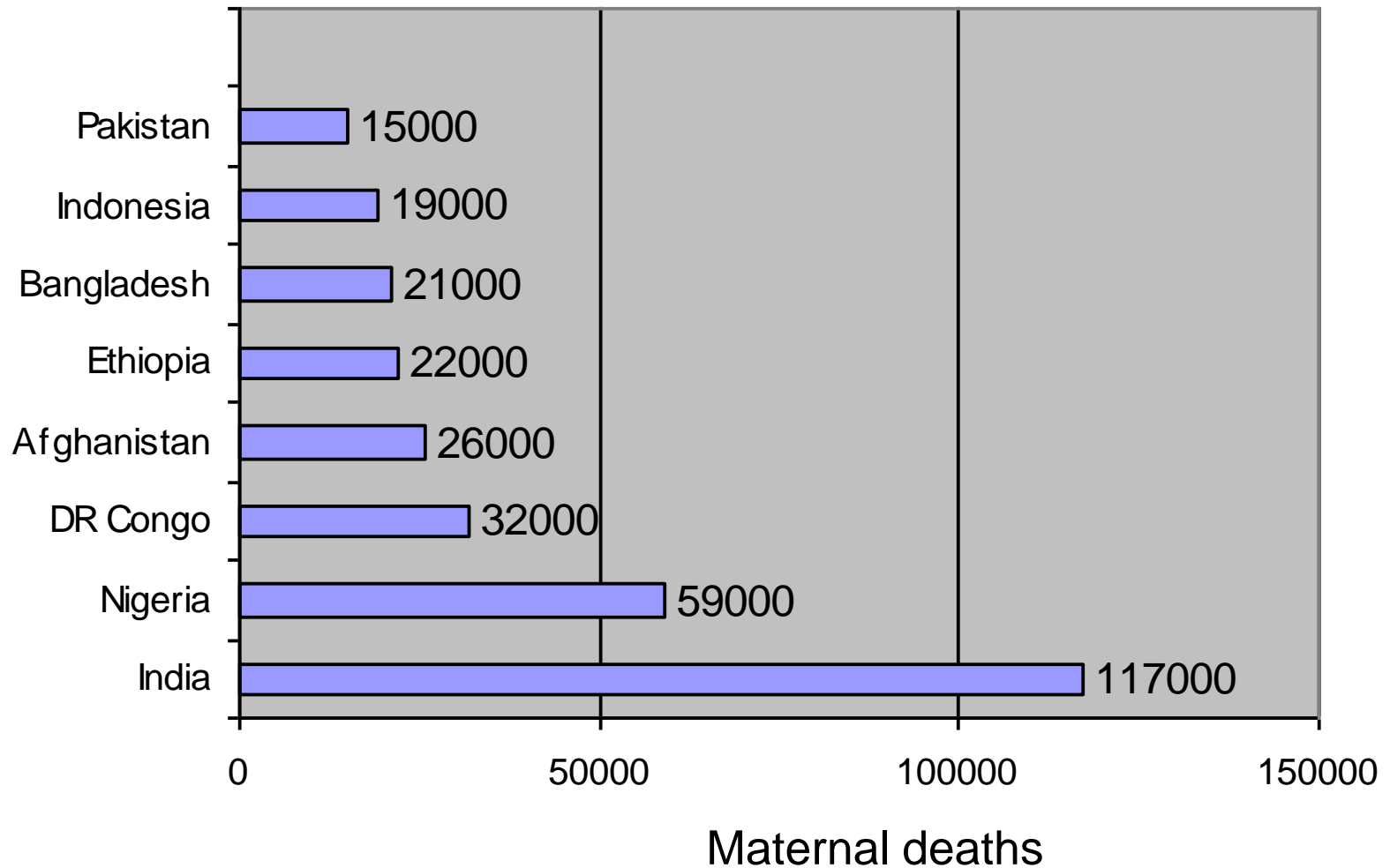
Maternal mortality estimates 2005

Region	MMRatio (maternal deaths per 100,000 live births)	Number of maternal deaths	Lifetime risk of maternal death, 1 in:
<i>World total</i>	400	536,000	92
<i>Developed countries</i>	9	960	7,300
<i>Countries of the commonwealth of independent states</i>	51	1,800	1,200
<i>Developing countries</i>	450	533,000	75



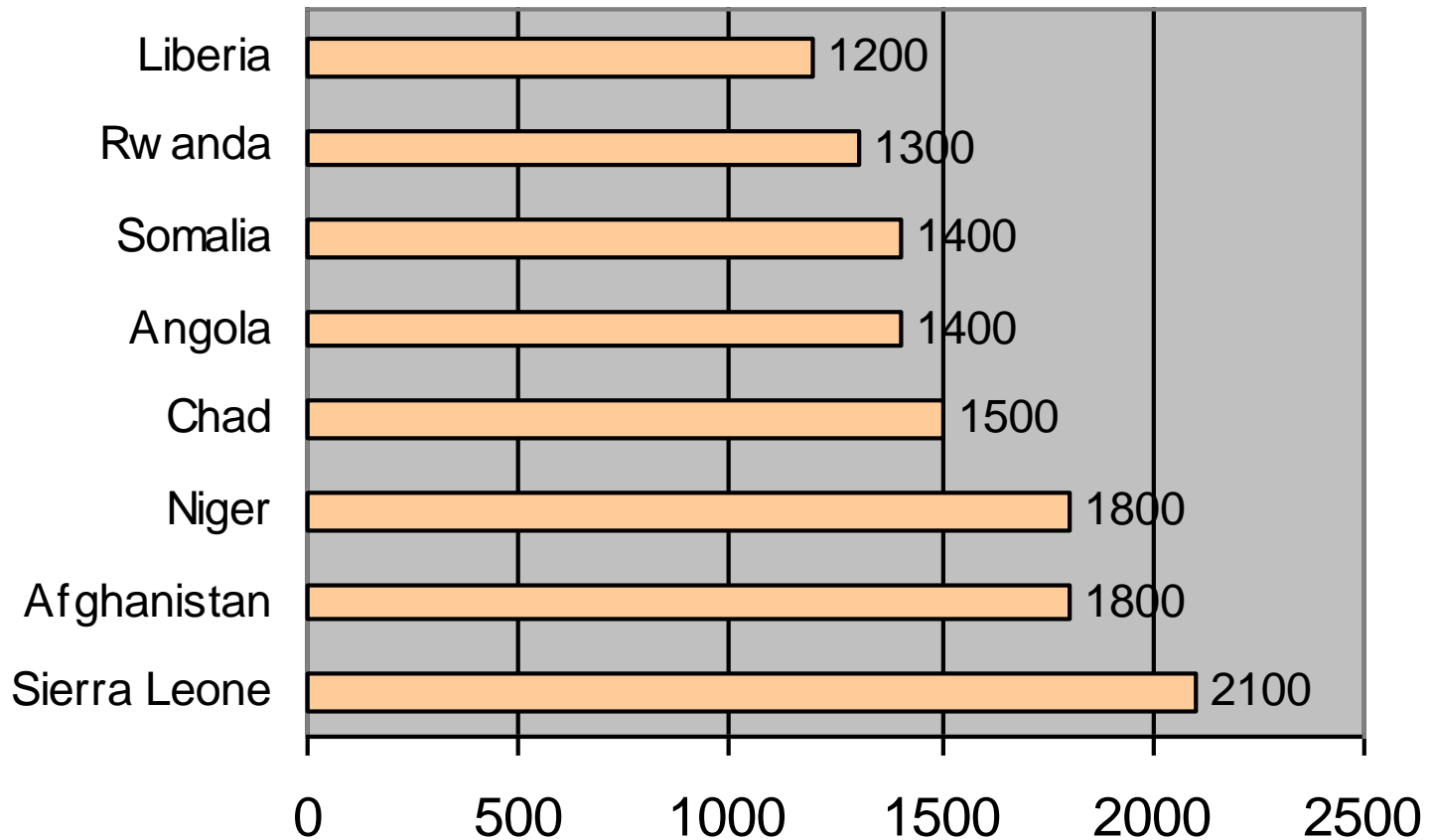
Source: WHO/UNICEF/UNFPA, 2007

Priority: ~60% of all maternal deaths



Source: WHO/UNICEF/UNFPA, 2007

Priority: Countries with highest MMRatios



Source: WHO/UNICEF/UNFPA, 2007

MMRatio

Difficulty in monitoring trends

Country	1990		1995	
	Deaths	MMRatio	Deaths	MMRatio
India	147,000 *	570	110,000 ***	440
Ethiopia	33,000 *	1400	46,000 *	1800
Indonesia	31,000 *	650	22,000 **	470
Bangladesh	33,000 *	850	20,000 *	600
Dem Rep of Congo	16,000 *	870	20,000 *	940
China	22,000 ***	95	13,000 ***	60

*** RAMOS

** Sisterhood

* Model

Source: WHO/UNICEF/UNFPA, 2001

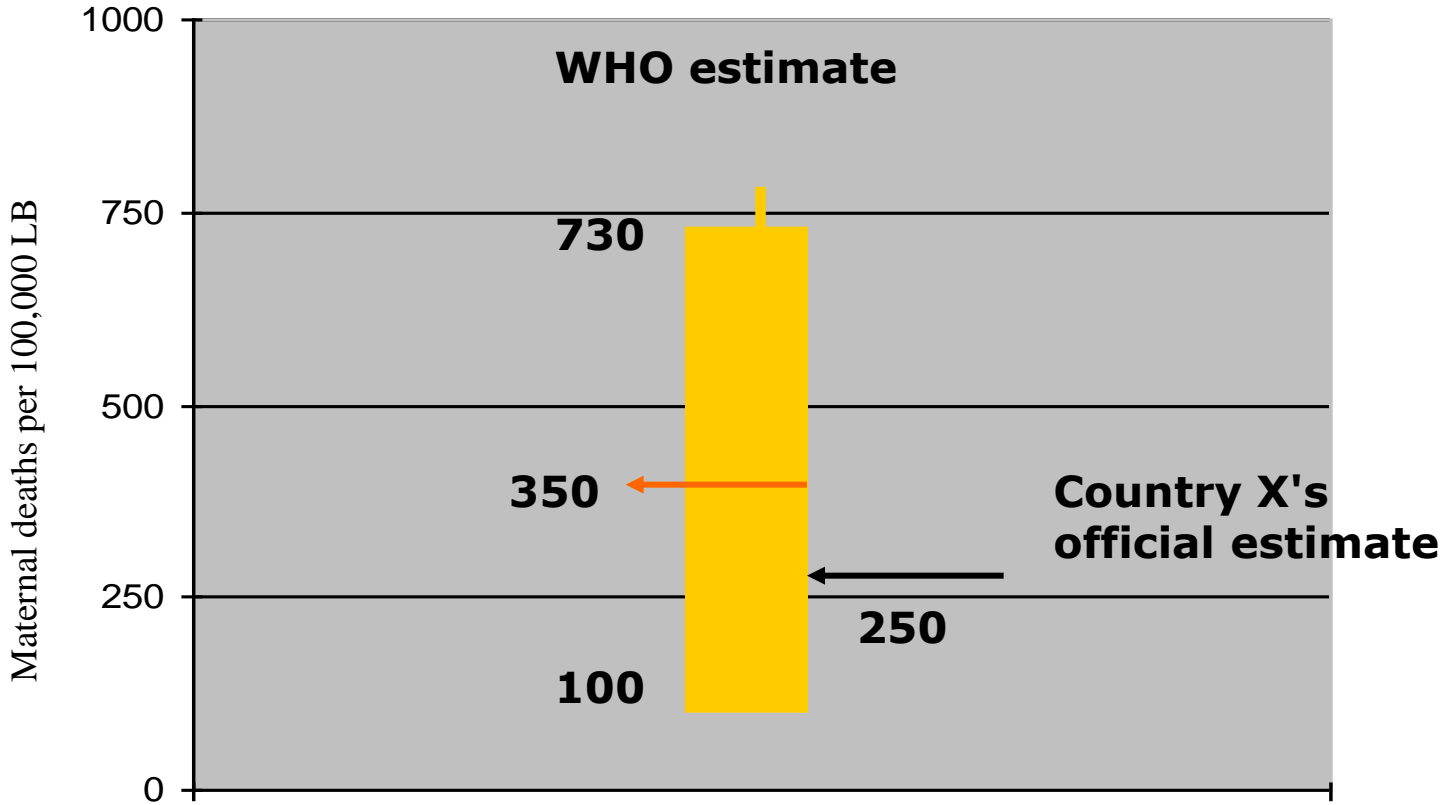
Difficulty in monitoring trends

Country	1990		1995		2000	
	Deaths	MMR	Deaths	MMR	Deaths	MMR
India	147,000*	570	110,000***	440	136,000 +	540
Ethiopia	33,000*	1400	46,000*	1800	24,000 **	850
Indonesia	31,000*	650	22,000**	470	10,000 *	230
Bangladesh	33,000*	850	20,000*	600	16,000 +	380
Dem Rep of Congo	16,000*	870	20,000*	940	24,000 *	990
China	22,000***	95	13,000***	60	11,000 ***	56

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

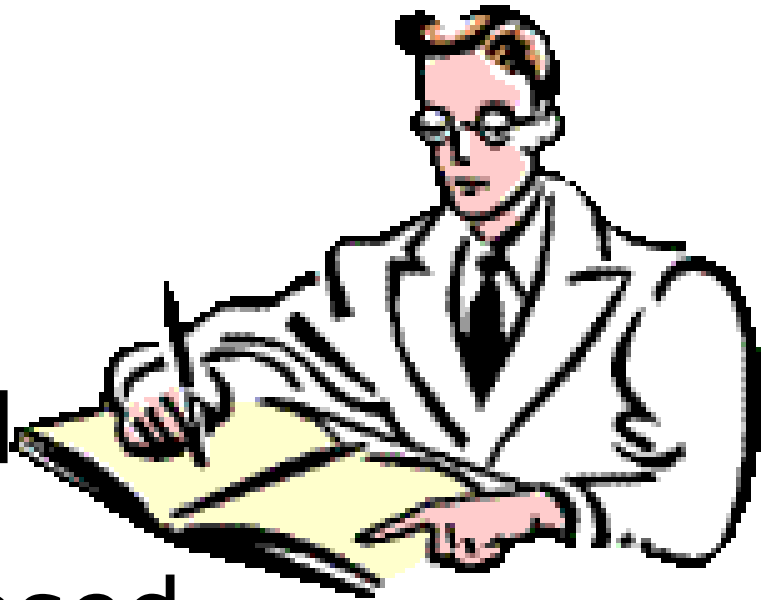
Source: WHO/UNICEF/UNFPA, 2004

What does the estimate really mean?



Measuring maternal morbidity

- ✓ Hospital-based
- ✓ Community-based



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)

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
- ✓ Change of image
- ✓ Increase awareness through contemporary art