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Methodological issues in the measurement of maternal mortality and morbidity



A woman in a white short-sleeved shirt and a long pink skirt stands in the center of a crowded, narrow alleyway in a slum. She is holding a book or a tablet and looking down at it. She is surrounded by a large group of children of various ages, some looking at her with interest. The background shows the dense, makeshift structures of the slum, with colorful fabrics hanging from the buildings. The overall scene suggests a community health or education intervention in a low-income setting.

“...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?

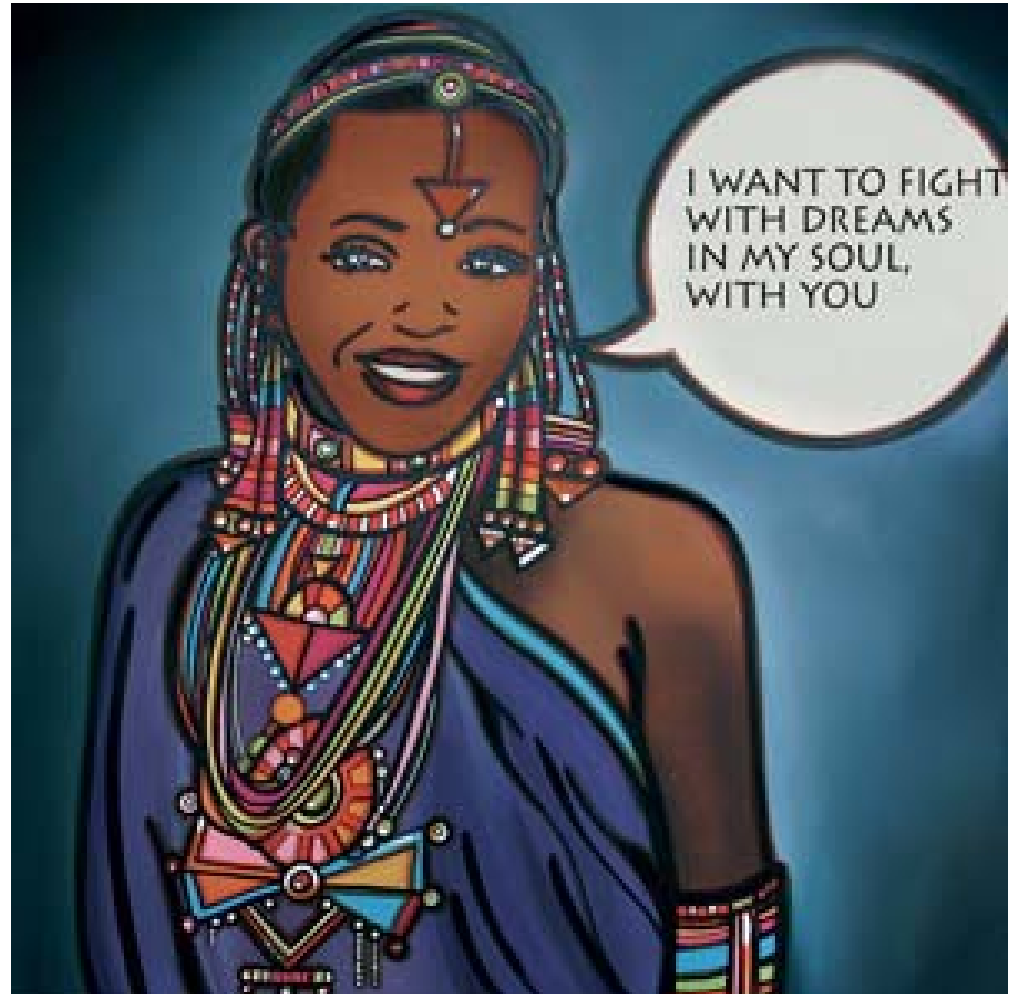
- ✓ What women die of
- ✓ Priority setting
- ✓ Evaluation of programmes' progress
- ✓ Preventable deaths that tell us more about the country

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

Conceptual reasons

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

Practical reasons

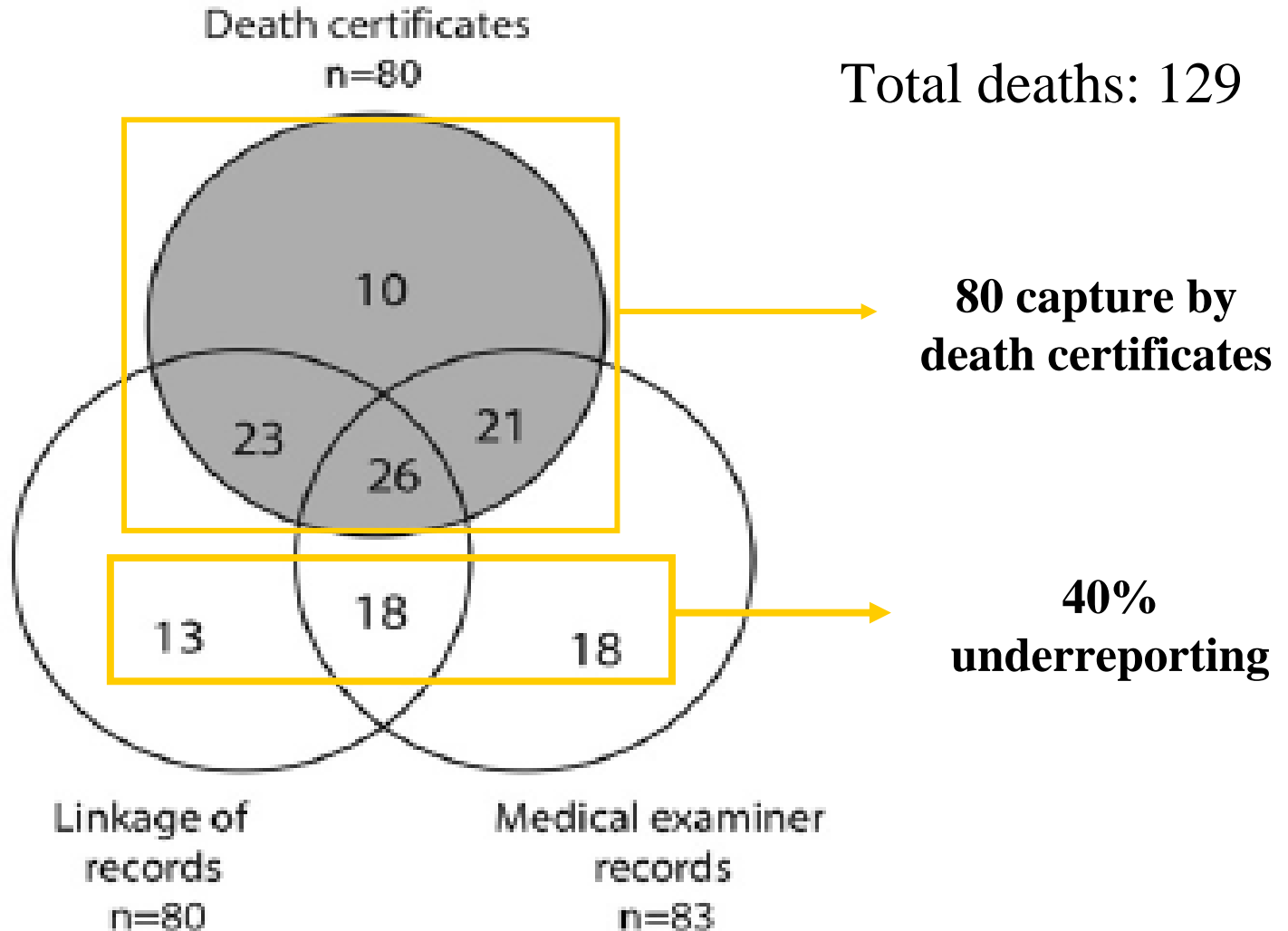
Published and revised MMR

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



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Practical reasons

Differentials in definitions



UK

Ectopic pregnancy
Abortion



**Early pregnancy
deaths**

USA

Ectopic pregnancy



Haemorrhage

USA

Septic abortion



Sepsis

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Practical reasons

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		660
Bangladesh		16 000

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)

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

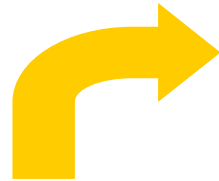
Indicators of maternal mortality:



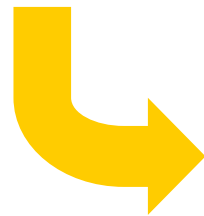
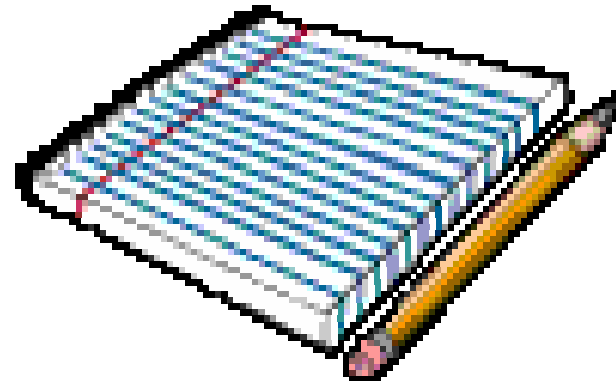
- ✓ Number of maternal deaths
- ✓ Maternal mortality Ratio (MMR)
- ✓ Maternal mortality Rate (MMRate)
- ✓ Lifetime risk of death (LTR)

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

How do we measure maternal mortality?



Direct counting



Special surveys

Maternal mortality

Direct counting



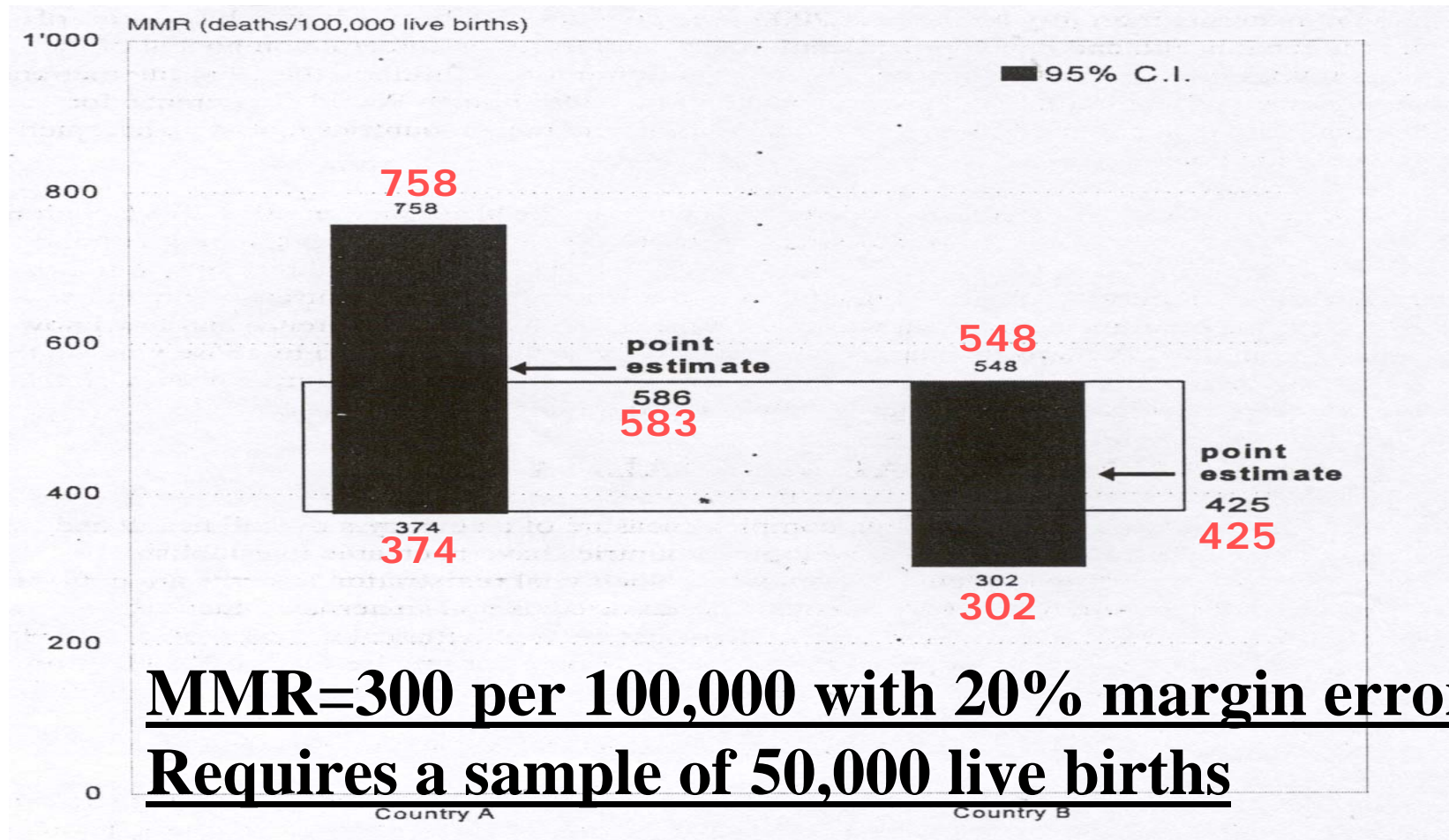
- ✓ Vital registration systems
- ✓ Hospital records
- ✓ Census

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)
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Sisterhood methods



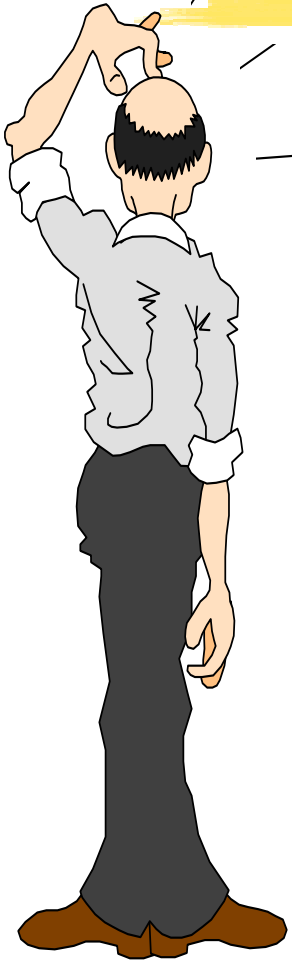
- ✓ Reduces sample sizes
- ✓ Estimates 10-13 years previous to the survey
- ✓ They measure pregnancy-related deaths
- ✓ No useful for monitoring changes

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

unicef 



Source: http://www.who.int/reproductive-health/publications/maternal_mortality_2000/index.html

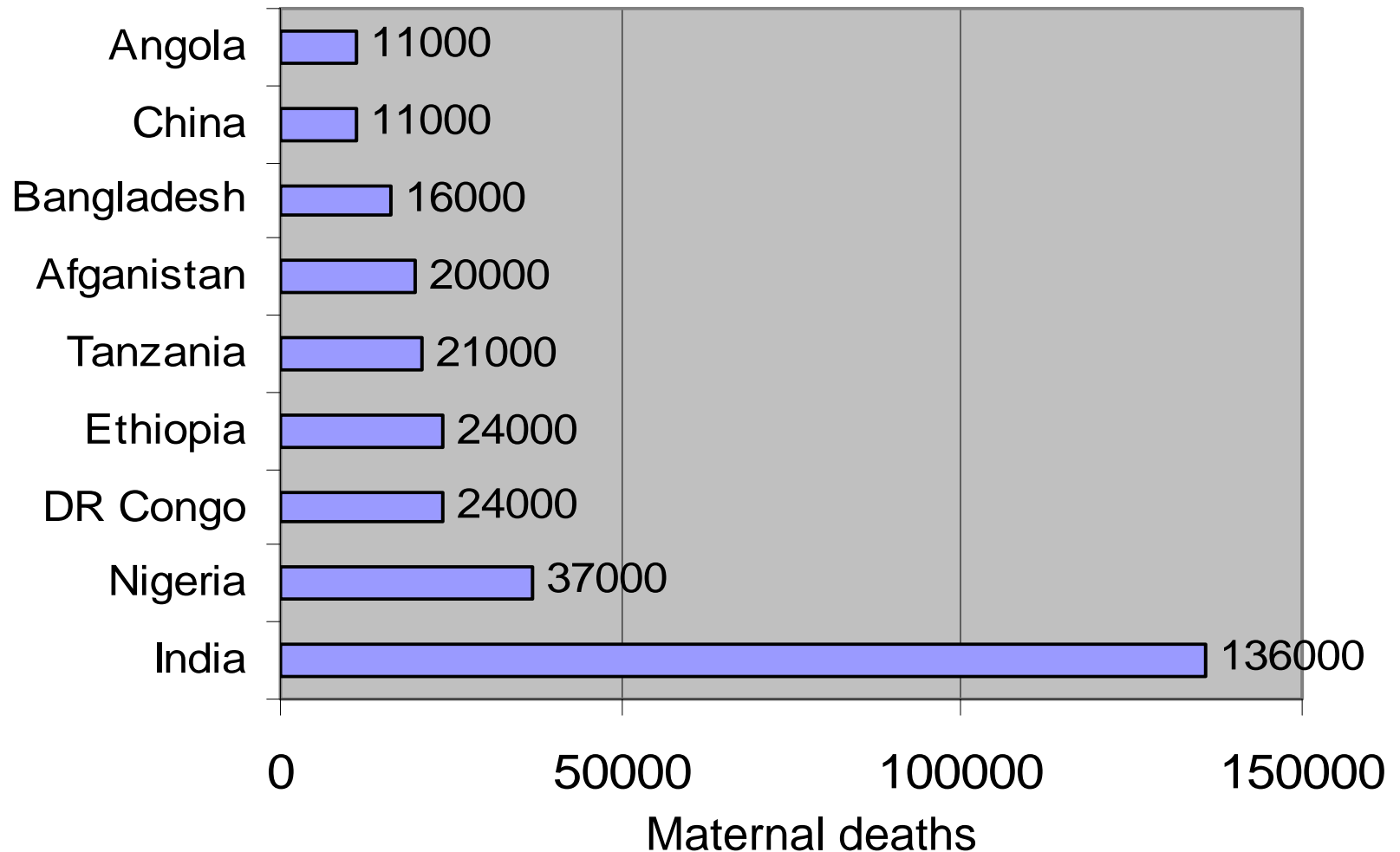
Maternal mortality estimates 2000

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	529,000	74
<i>More developed countries</i>	20	2,500	2,800
<i>Less developed countries</i>	440	527,000	61
<i>Least developed countries</i>	1,000	230,000	16



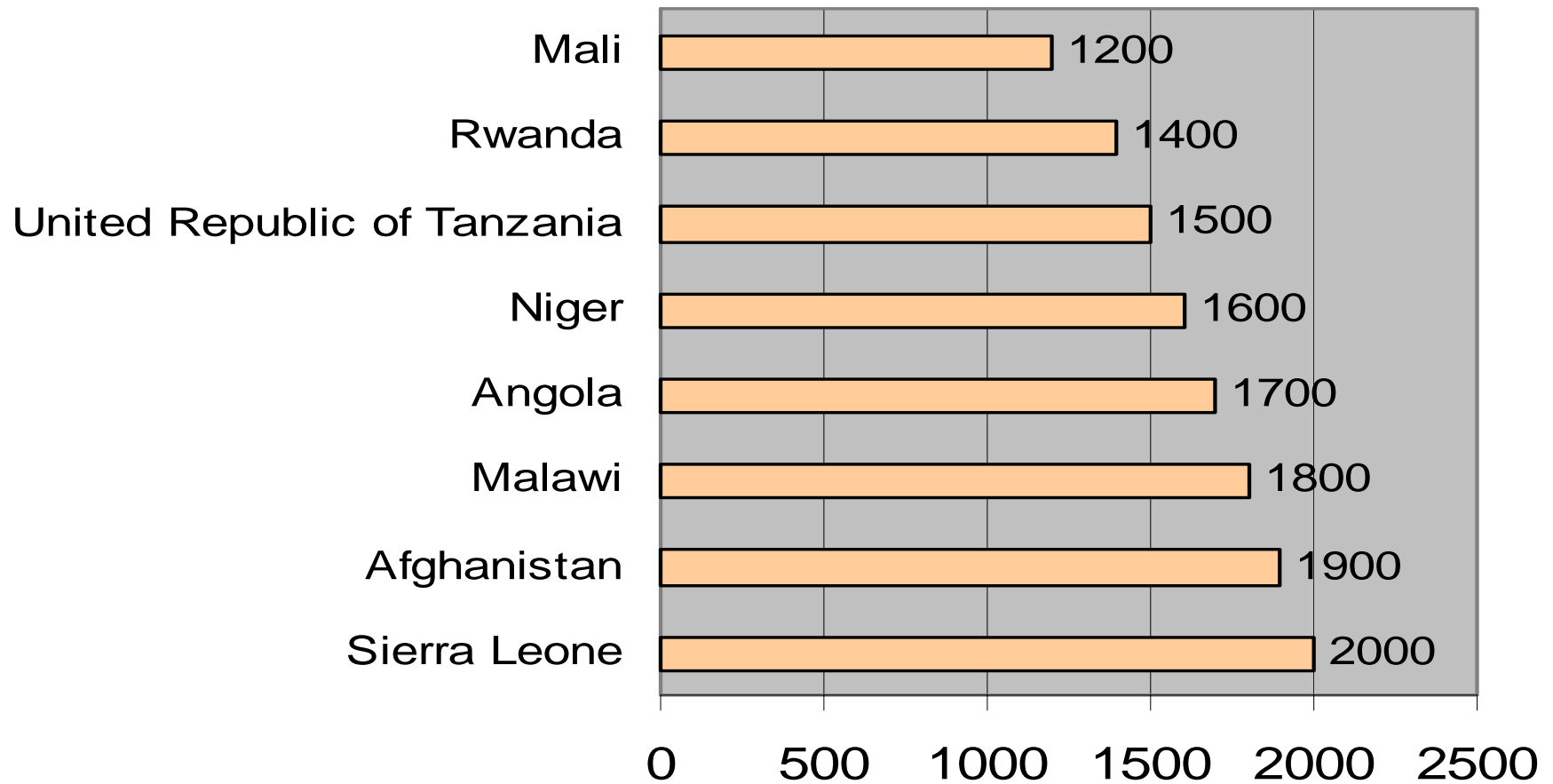
Source: WHO/UNICEF/UNFPA, 2004

Priority: ~60% of all maternal deaths



Source: WHO/UNICEF/UNFPA, 2004

Priority: Countries with highest MMRatios



Source: WHO/UNICEF/UNFPA, 2004

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

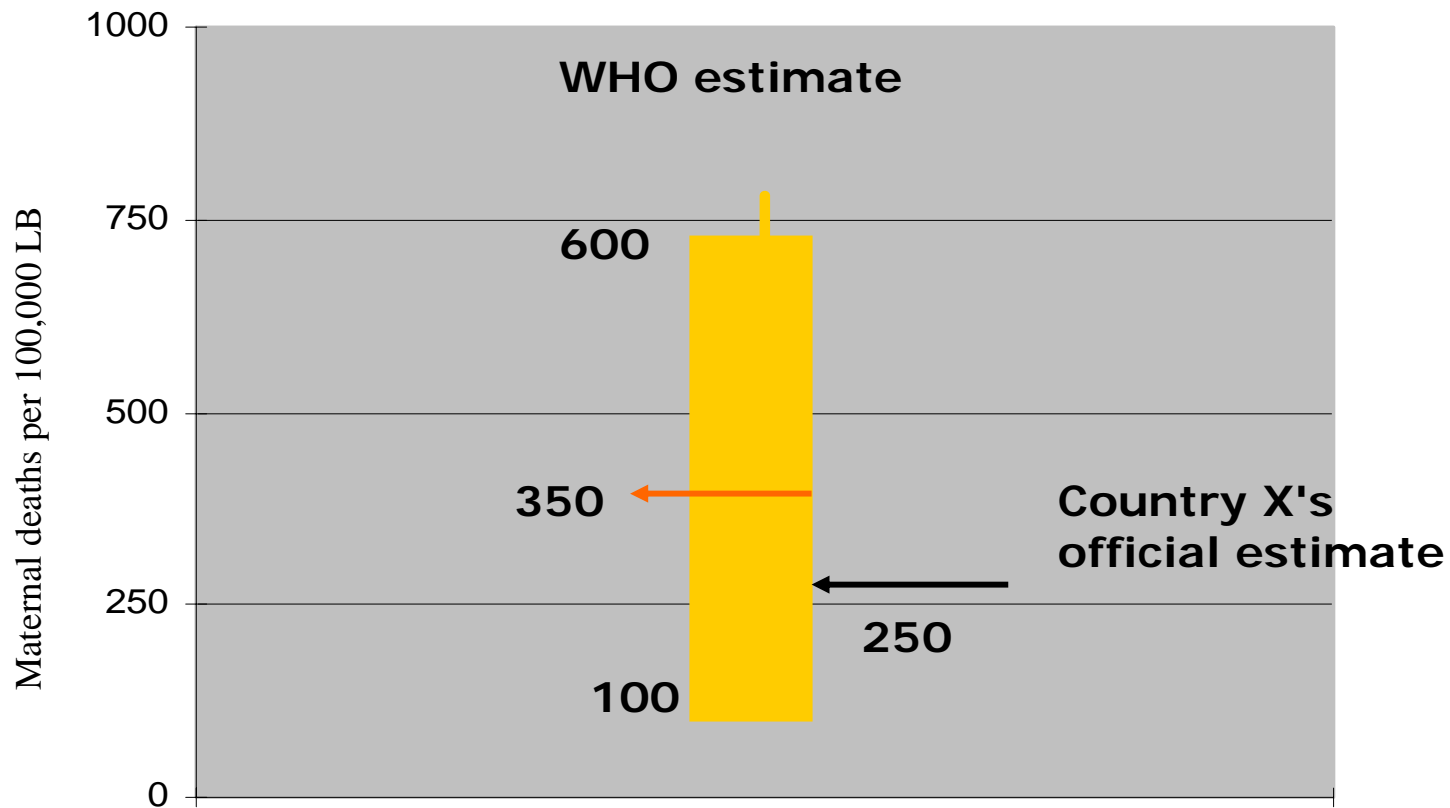
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Bangladesh	33,000*	850	20,000*	600	16,000 +	380
Dem Rep of Congo	16,000*	870	20,000*	940	24,000 *	990
China	22,000***	95	13,000***	60	11,000 ***	56


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

Source: WHO/UNICEF/UNFPA, 2004

What does the estimate really mean?



Measuring maternal 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