Episode 2: Measures of Pregnancy-Related and Maternal Mortality

Goal

- To understand the key measures of maternal mortality and how to calculate them.

Measures of Maternal Mortality

- **MMR or MMRatio:** Maternal mortality ratio.

- **MMRate:** Maternal mortality rate.

- **PM or PMDF:** Proportion of maternal deaths among deaths to women of reproductive age.

- **LTR:** Lifetime risk of maternal death.

  Can be calculated either for *Maternal* deaths or *Pregnancy-Related* deaths.

  Important to specify which is being used, since the definition is different.

Maternal Mortality Ratio (MMR or MMRatio)

$$MMR = \left(\frac{Number\ of\ Maternal\ Deaths}{Number\ of\ Live\ Births}\right) * 100{,}000$$

- The primary target for SDG 3.1 is expressed in terms of reducing MMR.

- Approximate global range 5 to 1,000 per 100,000 live births.

- Designed to express direct or indirect obstetric risk.

- Often confused with maternal mortality rate.

- If using pregnancy-related deaths in the numerator, this becomes Pregnancy-Related Mortality Rate or PRMR.

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Maternal Mortality Rate (MMRate)

$$MMRate = \left(\frac{Number\ of\ Maternal\ Deaths}{Woman-Years\ Lived\ at\ ages\ 15-49} \right) * 1,000$$

- The MMRate is a cause-specific death rate.
- Allows for comparison with other causes of death.
- The MMRate is often an intermediate step in the calculation of the MMR.

Proportion Maternal (PM)

$$PM = \frac{Number\ of\ Maternal\ Deaths}{All\ Female\ Deaths\ at\ Ages\ 15-49}$$

- The proportion of maternal deaths among all female deaths during reproductive ages (15-49).

- Range: <1% in developed countries

        to

        ~ 45% in developing countries

Lifetime Risk of Maternal Death

- Probability that a woman who reaches reproductive age would die eventually from a maternal cause, taking into account competing causes of death.

- Range from around 1 in 20 to 1 in 45,000.

$$LTR = \frac{T_{15} - T_{50}}{\ell_{15}} * \left(\frac{MMRate}{1000} \right)$$

T_{15} = Life table person-years lived above age 15

T_{50} = Life table person-years lived above age 50

ℓ_{15} = Survivors to age 15

How the Measures Are Related

$$MMR = \frac{Number\ of\ maternal\ deaths}{Number\ of\ live\ births} = PM * \frac{All\ female\ deaths\ (15-49)}{Number\ of\ live\ births}$$

$$MMRate = \frac{Number\ of\ maternal\ deaths}{Woman\ years\ lived\ (15-49)} = PM * \frac{All\ female\ deaths\ (15-49)}{Woman\ years\ lived\ (15-49)}$$

$$GFR = \frac{Number\ of\ live\ births}{Woman\ years\ lived\ (15-49)}$$

$$MMR = \frac{MMRate}{GFR}$$

MMR = Maternal Mortality Ratio
PM = Proportion Maternal
MMRate = Maternal Mortality Rate
GFR = General Fertility Rate

Comparing Indicators:
Demographic Health Survey Data

Country	Pregnancy-Related Mortality Ratio (per 100,000 Live Births)	Pregnancy-Related Mortality Rate (per 1,000 Women 15-49)	Proportion Pregnancy-Related (%)	Lifetime Risk (%)
Democratic Republic of Congo 2007	553	1.107	19.0	3.5
Malawi 2004	975	1.989	16.8	5.7
Mali 2006	439	1.026	27.1	3.4
Zambia 2007	584	1.169	8.7	3.3

Source: DHS data

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MMR Considerations

- Not age-standardized.
    - Strong association of per-pregnancy risk and age.
    - Less comparable across countries.
- Risk is per 100,000 events (so a value of e.g. 553 implies misleading accuracy).
- Cause-specific death indicator.
    - More demanding data-wise than other summary mortality indicators.

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MMR Considerations

- Does not reflect the fact that women may face this risk per birth several times over her lifespan.

- Changes in the MMR are a result of changes in any or all of the following:
  - Risk of maternal deaths
  - Distribution of births by risk factors
  - Age distribution of women

- Interplay between maternal mortality and fertility is not entirely clear.

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