How to measure inequalities in health?

Basic metrics for measuring health inequalities
What do we know so far?

• Health is a difficult concept

• We measure more specific indicators:
  ▪ Health status
    • Infant mortality rates, malnutrition prevalence
  ▪ Access and use of health services
    • Number of times you tried to get an appointment, number of medical appointments
  ▪ Coverage of health interventions
    • Prenatal care
    • Vaccines
Inequalities in health

• Many societies view health as a right and not as a commodity
• In this vision, each person has the right to have the best health status that they can achieve
• We are not the same and we have different health status
• But, if the differences between groups are...
  ▪ Systematic
  ▪ Produced by social and non-biological processes
  ▪ Admittedly unjust

  → INEQUITY
EQUALITY

http://interactioninstitute.org/illustrating-equality-vs-equity/
What is measured?

- Inequality is the measurable dimension in studies of health inequity
  - Differences, disparities, gaps in:
    - Health status, exposure to risk factors, access to and use of health services
  - In relation to several dimensions (or *stratifiers*)
    - Wealth, ethnicity, gender, education, age
- It can be absolute and relative
  - Comparing groups can be measured by:
    - Distance = absolute, by difference
    - Ratio = relative, by division
Average coverage in each wealth quintile in 54 “Countdown countries”

Figure 1: Mean coverage in each wealth quintile for the studied interventions in 54 Countdown countries

Coloured dots show the average coverage in each wealth quintile. Q1 is the 20% poorest wealth quintile, Q5 is the 20% richest. The distance between quintiles 1 and 5 represents absolute inequality. *Appendix p 1 specifies age ranges of children.

Systematic enough?

For each intervention, the coverage is higher in the richer quintiles and lower in the poorer quintiles.

Figure 1: Mean coverage in each wealth quintile for the studied interventions in 54 Countdown countries. Coloured dots show the average coverage in each wealth quintile. Q1 is the 20% poorest wealth quintile, Q5 is the 20% richest. The distance between quintiles 1 and 5 represents absolute inequality. *Appendix p1 specifies age ranges of children.
Multiple dimensions of inequalities

- Sex/gender
- Sexual orientation
- Age
- Ethnic group
- Education
- Area of residence
- Socioeconomic position
Problems for measuring stratifiers

• Sex and age - these are easy!
• Sexual orientation
  ▪ People may be reluctant to tell the truth
  ▪ Potential source for discrimination, including violence
  ▪ Usually requires special data collection strategies
• Ethnic group
  ▪ Potential source for discrimination, including violence
  ▪ Low availability of data
  ▪ Difficult to work with, sometimes, due to large variety
• Education
  ▪ Easy to ask, easy to answer, but subject to errors
• Place of residence, region - are also easy to collect
Measuring Socioeconomic Status

• Education (as SES proxy)
  ▪ Easy to measure, but produces unbalanced groups

• Income
  ▪ Measured with error, unstable in time, problematic in rural areas

• Consumption
  ▪ Popular among economists, stable over time, very difficult to measure

• Occupation
  ▪ Works well for rich countries but complicated in LMICs
DHS & MICS

• Wealth index is available
• Based on an asset list that includes:
  ▪ Household possessions
  ▪ Construction materials
  ▪ Infrastructure (water, sanitation, electricity)
• List of assets varies between surveys
• A score is derived using principal component analysis
• Quintiles of wealth index are calculated by household
  ▪ Poorer quintiles include more individuals, especially children
    • Higher fertility rates
HOW TO MEASURE INEQUALITIES?
The different flavours of inequalities...

• Simple measures vs. Complex measures

• Absolute measures vs. Relative measures

• Stratifiers with a natural order vs. No ordinal

• Weighted vs. Unweighted data
Measures of inequality

• There are dozens of measures available
  ▪ There is not one single winner!

• Simple measures - difference and ratio
  ▪ They do not take into account intermediate groups, only the extremes of distribution -> they are not sensitive to changes in part of the population
  ▪ It’s not always the extremes (e.g. poorest, richest) who will have lower/higher coverage

• More complex measures
  ▪ They take into account the entire population/distribution
  ▪ They are based on several ideas:
    • Concentration, variance, statistical models
The different flavors of inequalities...

- **Simple measures** establish comparisons of health between two groups (for example: the richest and the least rich)
  - Called *pairwise comparisons* or comparison of two groups
  - Main type of measure used in the monitoring of health inequalities
  - Intuitive and easy to understand
The different flavours of inequalities...

• Absolute and relative
  ▪ When comparing two groups, one can measure:
    • Distance = absolute, by difference
    • Reason = relative, by division

• Absolute inequality:
  ▪ How far is one group from the other?

• Relative Inequality:
  ▪ How many times is one group better than the other?
Absolute and relative measures of inequalities

- **Absolute inequality** reflects the magnitude of the difference in health between two groups
  - Absolute inequality retains the same unit of measure as the health indicator and conveys a concept of easy comprehension
  - Easy to spot visually

- **Relative inequality** shows proportional differences in health between groups
  - Tricky, because it depends a lot on the denominator
  - Can fool you on visual inspection
Ordered and non-ordered groups

• Ordered groups have an inherent positioning and can be classified
  ▪ Example: wealth, education

• Non-ordered groups are not based on criteria that can be logically classified
  ▪ Example: region, ethnicity, religion, place of residence
Two groups and more than two groups

• Some inequality stratifiers naturally generate two subgroups
  ▪ Example: sex, place of residence urban-rural

• Other inequality stratifiers may comprise multiple subgroups
  ▪ Example: wealth quintiles, geographic region

Simple measures are appropriate to make comparisons for two subgroups

Complex measures may be useful when there are more than two subgroup (even if more difficult to interpret)
Multiple groups

• When there are several subgroups, pairwise comparisons can be made between:
  ▪ Subgroups with higher and lower values of a health indicator
    • Example: richest v. poorest
  ▪ Specific pairs of subgroups, based on a selected reference subgroup or subgroups
    • Example: the comparison of each region with the capital region
    • Example: comparing each wealth quintile with the richest quintile
Full immunization coverage by wealth index

- East Europe & Central Asia
- East Asia & Pacific
- East & South Africa
- Latin America & Caribbean
- Middle East & North Africa
- South Asia
- West & Central Africa

Wealth quintiles:
- Q1 (poorest)
- Q2
- Q3
- Q4
- Q5 (richest)
Full immunization coverage (%)
Full immunization coverage (%)

- Latin America & Caribbean: 4%
- East Europe & Central Asia: 6.5%
- East & South Africa: 14.4%
- West & Central Africa: 16.1%
- East Asia & Pacific: 17.3%
- Middle East & North Africa: 19.8%
- South Asia: 22.2%

Difference Q5-Q1 (%)
Full immunization coverage (%)
## Examples: difference and ratio

**Table 1. Area-based inequality in antenatal care (at least four visits) in Colombia, DHS 1995, 2000, 2005 and 2010**

<table>
<thead>
<tr>
<th>Survey year</th>
<th>Coverage in rural area (%)</th>
<th>Coverage in urban area (%)</th>
<th>Difference (urban – rural) (percentage points)</th>
<th>Ratio (urban / rural)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1995</td>
<td>53.8</td>
<td>82.4</td>
<td>28.6</td>
<td>1.5</td>
</tr>
<tr>
<td>2000</td>
<td>64.7</td>
<td>84.9</td>
<td>20.2</td>
<td>1.3</td>
</tr>
<tr>
<td>2005</td>
<td>73.1</td>
<td>87.1</td>
<td>14.0</td>
<td>1.2</td>
</tr>
<tr>
<td>2010</td>
<td>80.5</td>
<td>90.3</td>
<td>9.8</td>
<td>1.1</td>
</tr>
</tbody>
</table>

**Table 2. Sex-based inequality in under-five mortality rates in Egypt, DHS 1995, 2000, 2005 and 2008**

<table>
<thead>
<tr>
<th>Survey year</th>
<th>Female (deaths per 1000 live births)</th>
<th>Male (deaths per 1000 live births)</th>
<th>Difference (male – female) (deaths per 1000 live births)</th>
<th>Ratio (male/female)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1995</td>
<td>98.9</td>
<td>92.1</td>
<td>–6.8</td>
<td>0.9</td>
</tr>
<tr>
<td>2000</td>
<td>69.3</td>
<td>68.6</td>
<td>–0.7</td>
<td>1.0</td>
</tr>
<tr>
<td>2005</td>
<td>46.3</td>
<td>52.1</td>
<td>5.8</td>
<td>1.1</td>
</tr>
<tr>
<td>2008</td>
<td>27.7</td>
<td>38.4</td>
<td>10.7</td>
<td>1.4</td>
</tr>
</tbody>
</table>

### Table 3 Wealth-based inequality in births attended by skilled health personnel in the Philippines, DHS 1998, 2003 and 2008

<table>
<thead>
<tr>
<th>Survey year</th>
<th>Quintile 1 (poorest) (%)</th>
<th>Quintile 2 (%)</th>
<th>Quintile 3 (%)</th>
<th>Quintile 4 (%)</th>
<th>Quintile 5 (richest) (%)</th>
<th>Difference (Q5 – Q1) (percentage points)</th>
<th>Ratio (Q5 / Q1)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1998</td>
<td>21.2</td>
<td>45.9</td>
<td>72.8</td>
<td>83.9</td>
<td>91.9</td>
<td>70.7</td>
<td>4.3</td>
</tr>
<tr>
<td>2003</td>
<td>25.1</td>
<td>51.4</td>
<td>72.4</td>
<td>84.4</td>
<td>92.3</td>
<td>67.2</td>
<td>3.7</td>
</tr>
<tr>
<td>2008</td>
<td>25.7</td>
<td>55.6</td>
<td>75.8</td>
<td>86.0</td>
<td>94.4</td>
<td>68.7</td>
<td>3.7</td>
</tr>
</tbody>
</table>

Let's start simply...

% people that never had been to a dentist

Age

Q1 (poorest)  Q5 (richest)

Inequalities measured differently

Inequalities by difference and ratio

Limitations of simple measures of inequalities

• Pairwise comparisons ignore all other subgroups that are not being compared

• Pairwise comparisons do not take into account the size of the subgroup
Limitations of simple measures of inequalities

• Challenges in interpretation due to changes in the population:
  - It may appear that the subgroup of more educated women had decreased health service coverage over time
    - In reality, this could be the result of an increase in education level without improvement in health services
  - The relative size of subgroups of the population should be reported together with the disaggregated average values of the health indicator
Special thanks to Aluisio J D Barros and María Clara Restrepo Méndez from the International Centre for Equity in Health, Federal University of Pelotas, Brazil for their help in developing the material for this presentation

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