Measuring Disparity

Hand-on Training Session on the Preparation of EFA Mid-Decade Assessment Report
4-5 February 2006
Yangon, MYANMAR

Mid-Decade Assessment: Equity Issues

- Quality, access and equity are the most important issues in education
- How can we measure equity in education?
- Is there equal access to education:
  - For girls and boys?
  - Across different regions of a country?
  - Within different sub-populations?
- How can we measure equal access to education?
- How do we include the excluded?

Equality in the Six EFA Goals

- Goal 1: Expanding and improving comprehensive early childhood care and education, especially for the most vulnerable and disadvantaged children.
- Goal 2: Ensuring that by 2015 all children, particularly girls, children in difficult circumstances and those belonging to ethnic minorities, have access to and complete free and compulsory primary education of good quality.
- Goal 3: Ensuring that the learning needs of all young people and adults are met through equitable access to appropriate learning and life skills programs.

Equality of opportunity in Education

- Goal 4: Achieving a 50 percent improvement in levels of adult literacy by 2015, especially for women, and equitable access to basic and continuing education for all adults.
- Goal 5: Eliminating gender disparities in primary and secondary education by 2005, and achieving gender equality in education by 2015, with a focus on ensuring girls' full and equal access to and achievement in basic education of good quality.
- Goal 6: Improving all aspects of the quality of education and ensuring excellence of all so that recognized and measurable learning outcomes are achieved by all, especially in literacy, numeracy and essential life skills.

Equity in the Six EFA Goals

- Goal 1: Expanding and improving comprehensive early childhood care and education, especially for the most vulnerable and disadvantaged children.
- Goal 2: Ensuring that by 2015 all children, particularly girls, children in difficult circumstances and those belonging to ethnic minorities, have access to and complete free and compulsory primary education of good quality.
- Goal 3: Ensuring that the learning needs of all young people and adults are met through equitable access to appropriate learning and life skills programs.

Definition of Disparity

- The word disparity means “a great difference”
  - Synonyms of disparity are: difference, inequality, discrepancy, disproportion, gap, inconsistency and lack of correspondence
  - Numerical concept
- In education it refers to lack of equality in quantitative term among different groups in acquiring education opportunities
- The word equality refers to the right of different groups of people to have a similar social position and have the same treatment.

The Millennium Development Goals re-affirmed the concerns of equality of opportunity in two of their objectives:

Goal 2: Ensure that, by 2015, children everywhere, boys and girls alike, will be able to complete a full course of primary schooling.

Goal 3: Eliminate gender disparity in primary and secondary education preferably by 2005 and in all levels of education no later than 2015.
Defining Disparity indicators

- Indicators of disparity measure the inequality between different groups of people or areas, with the objective of attaining equal opportunity for all in the area of education.
- Measurements of disparity should target access to education according to the following:
  - Sex: male-female
  - Regional: urban/rural, less developed/more developed
  - Social: caste system, occupation, socio-economic status, legal status (birth registration, citizenship)
  - Ethnic: ethnic, religious, language minorities
  - Disabilities

Identifying Disparities

- In preparation for the EFA Mid-Decade Assessment, countries should implement the collection and analysis of data for target groups at the sub-national level.
- Target Groups: the Marginalized and Disadvantaged
  - Women and girls
  - Ethnic minorities
  - Linguistic minorities
  - Untouchable Castes
  - Rural inhabitants
  - Migrants
  - People without legal status (birth registration, citizenship)
  - Children with disabilities
  - Working children
  - Children affected by HIV/AIDS

Measuring Disparities

- Disparity can be measured and described various ways and methods.
- Methods for Presentation
  - Comparing figures
  - Graphical method
  - Geographic (Thematic) Mapping

Methods for Measurement

- Absolute gap
- Percentage
- Ratio
- Range (max-min)
- Mean and Median
- Percentile and Quartile
- Representation Index (RI)
- Gender Parity Index (GPI)
- Gini Coefficient and Lorenz Curve

Comparing figures

- The aim is to compare two or more figures (or columns of numbers) to see the difference (gap) among groups.
- Here, figures for girls can be compared with those for boys to determine the difference.
- Simple and easy to use, BUT inefficient with a large number of data.

In the following table, comparing enrolment between boys and girls is not easy since there are several data points.

<table>
<thead>
<tr>
<th>Country</th>
<th>Total enrolment (at age 5)</th>
<th>Male</th>
<th>Female</th>
<th>Male-Female</th>
</tr>
</thead>
<tbody>
<tr>
<td>National</td>
<td>6,525,109</td>
<td>3,402,116</td>
<td>3,123,000</td>
<td>2.75</td>
</tr>
<tr>
<td>South East</td>
<td>1,470,883</td>
<td>767,415</td>
<td>703,468</td>
<td>1.09</td>
</tr>
<tr>
<td>North Central</td>
<td>1,713,050</td>
<td>927,733</td>
<td>785,317</td>
<td>1.19</td>
</tr>
<tr>
<td>Northwest</td>
<td>1,646,964</td>
<td>931,827</td>
<td>715,137</td>
<td>1.29</td>
</tr>
<tr>
<td>Northeast</td>
<td>1,282,253</td>
<td>703,920</td>
<td>578,333</td>
<td>1.22</td>
</tr>
<tr>
<td>South West</td>
<td>1,679,188</td>
<td>916,547</td>
<td>762,641</td>
<td>1.21</td>
</tr>
<tr>
<td>North East</td>
<td>2,223,583</td>
<td>1,145,329</td>
<td>1,078,254</td>
<td>1.03</td>
</tr>
<tr>
<td>West Central</td>
<td>1,051,368</td>
<td>538,317</td>
<td>513,051</td>
<td>1.05</td>
</tr>
<tr>
<td>East Central</td>
<td>1,203,328</td>
<td>663,857</td>
<td>539,471</td>
<td>1.24</td>
</tr>
<tr>
<td>Southeast</td>
<td>1,475,623</td>
<td>744,583</td>
<td>731,040</td>
<td>1.04</td>
</tr>
<tr>
<td>South West</td>
<td>1,053,420</td>
<td>530,857</td>
<td>522,563</td>
<td>1.04</td>
</tr>
<tr>
<td>North West</td>
<td>1,473,583</td>
<td>740,547</td>
<td>733,036</td>
<td>1.03</td>
</tr>
<tr>
<td>Central</td>
<td>1,582,583</td>
<td>797,920</td>
<td>784,663</td>
<td>1.02</td>
</tr>
<tr>
<td>West South</td>
<td>1,051,368</td>
<td>538,317</td>
<td>513,051</td>
<td>1.03</td>
</tr>
</tbody>
</table>

Source: UNICEF and UN Women's Report
Graphical Method

- As the name suggests, this method uses simple graphs to show the variation between regions; urban or rural; between genders, male or female; or between different ethnic or linguistic groups.
- Simple to create, extremely visual and quick to the point.
- The following are a few graphical representations for viewing gender equity in access to education through apparent intake rate (AIR).

Source: GMR 2005

Source: GMR 2002

Source: GMR 2002
Graphical Method

Radar Chart

- This method is used to show variations, differences and similarities between areas.
- It is extremely visual by using different color scheme and geographic topology.
- However, it is less suitable for details, as it shows primarily the outline of administrative or political boundaries.
- It requires an electronic “base map” and GIS software.

Geographic (Thematic) Mapping

- Thematic map can be created by:
  - Ranking the different regions of the country by an indicator (e.g. NER).
  - Dividing the index by class or interval (e.g. as shown on the map).
  - Attributing a color to each class interval.

Geographic (Thematic) Mapping

Presentation of household survey data

Primary Completion Rate – Viet Nam

- Methods of Measurement:
  - Absolute gap
  - Percentage
  - Ratio
  - Range (max-min)
  - Mean and Median
  - Percentile and Quartile
  - Representation Index (RI)
  - Gender Parity Index (GPI)
  - Gini Coefficient and Lorenz Curve.
Disparity in Illiteracy

Table 1: Estimated adult illiterate population aged 15 and over, by sex and by region, 1991

<table>
<thead>
<tr>
<th>Region</th>
<th>Male (Million)</th>
<th>Female (Million)</th>
<th>% Male</th>
<th>% Female</th>
<th>Sex Ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>Global Total</td>
<td>694.1</td>
<td>520.0</td>
<td>45.6</td>
<td>54.4</td>
<td>0.49</td>
</tr>
<tr>
<td>Developing regions of South Asia</td>
<td>141.0</td>
<td>111.0</td>
<td>58.0</td>
<td>42.0</td>
<td>1.46</td>
</tr>
<tr>
<td>Sub-Saharan Africa</td>
<td>377.1</td>
<td>315.0</td>
<td>48.7</td>
<td>51.3</td>
<td>0.96</td>
</tr>
<tr>
<td>Latin America &amp; Caribbean</td>
<td>32.0</td>
<td>13.0</td>
<td>31.6</td>
<td>68.4</td>
<td>1.54</td>
</tr>
<tr>
<td>European Countries</td>
<td>39.0</td>
<td>49.0</td>
<td>39.8</td>
<td>60.2</td>
<td>1.26</td>
</tr>
<tr>
<td>Developed Countries</td>
<td>31.0</td>
<td>38.0</td>
<td>44.7</td>
<td>55.3</td>
<td>1.26</td>
</tr>
</tbody>
</table>


The absolute gap (column 4) defined as the difference between the absolute number of male and female illiterates.

The percentage of female illiterates in the total number of illiterates (column 5).

The sex ratio (column 6), similar to the sex ratio used in demography, represents the ratio between the number of male and female illiterates.

Can also be expressed as a percentage, giving the number of illiterate men per 100 illiterate women.

The relative gap given by the formula (F-M)/F x 100 (column 7), which indicates the proportion of illiterate women that should be made literate to achieve parity with men.

Range

- Range (Maximum-Minimum):
  - Definition: the length of the smallest interval which contains all of the data.
  - Calculation: subtract smallest observation from greatest observation to observe dispersion.
  - Disparities: useful to measure disparities between haves and have-nots (i.e., male/female, urban/rural).
  - Limitation: does not distinguish between levels of achievement (range same for different levels).

Mean and Median

- Mean and Median:
  - Definition: the mean is the sum of all observations divided by the number of observations; the median is the number that separates the higher half of a sample from the lower half.
  - Disparities: useful to comparing differences in achievement among two groups.
  - Limitation: mean is based on all observations but median is more useful for large variations in group.

Range and Mean and Median

Figure 2A: Percentage of post-secondary school age children (2000), median value and variation suffer region.

Figure 5A: Disbursed countries by region and number of bilateral donors making education aid commitments, 2001-2002.
When presenting large amount of data, it may be useful to give a synthetic idea of the situation by providing the mean values (weighted or unweighted, depending on the type of analysis). However, since the mean may conceal important variations, it is also advisable, for a finer analysis, to provide the reader with the basic measures of variation, such as the highest and the lowest values, the range, the standard deviation (SD).

Summary statistics can be easily generated in EXCEL using – (Add-in: Analytical tool pack)

Tools -> Data Analysis -> Descriptive Statistics.

Percentile and Quartile

- 90 percentile – value of the variable which 90 percent of a distribution lie.
- Quartile – value of the variable which one quarter (lower quartile – 25 percentile) or three quarter (upper quartile – 75 percentile) of a distribution lie.
RI is one of the commonly used indicators in measuring disparities, especially in access to education (intake, enrolment, etc.) among different regions, different population groups and between boys and girls.

RI is the proportion of characteristics (the variable which we want to measure – enrolment in primary level or Grade-1 intake) divided by the proportion of criterion (the variable against which we compare the characteristic to measure – primary school-going age population or population age 6).

It is designed essentially to show whether any given group of children is receiving more or less schooling opportunities compared to what they would normally have.

If a given group of children receives the same schooling opportunities as the entire country, the index will be 100%.

When the schooling facilities are not evenly distributed among the regions or for some groups of children, the index will be less than 100%.

RI is calculated as following:

$RI = \frac{\text{Share of same group (or region) of children in total school age population}}{\text{Share of a group (or region) of children in total enrolment}}$
Representation Index (RI)

<table>
<thead>
<tr>
<th>Region</th>
<th>Total Enrolment (all ages)</th>
<th>Regional (all ages) enrolment</th>
<th>Official school age population (Primary)</th>
<th>Regional (all ages) population</th>
<th>Representation Index (RI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Central Coast</td>
<td>871,497</td>
<td>9.5%</td>
<td>869,610</td>
<td>9.5%</td>
<td>99.9%</td>
</tr>
<tr>
<td>Central Highlands</td>
<td>599,965</td>
<td>5.3%</td>
<td>597,832</td>
<td>5.3%</td>
<td>99.7%</td>
</tr>
<tr>
<td>Mekong Delta</td>
<td>2,267,770</td>
<td>21.8%</td>
<td>2,277,296</td>
<td>21.9%</td>
<td>99.9%</td>
</tr>
<tr>
<td>North Central</td>
<td>1,608,971</td>
<td>15.5%</td>
<td>1,629,994</td>
<td>15.7%</td>
<td>99.8%</td>
</tr>
<tr>
<td>Northwest</td>
<td>1,976,834</td>
<td>18.0%</td>
<td>1,966,809</td>
<td>18.0%</td>
<td>99.9%</td>
</tr>
<tr>
<td>Northeast</td>
<td>856,567</td>
<td>9.7%</td>
<td>854,367</td>
<td>9.7%</td>
<td>99.9%</td>
</tr>
<tr>
<td>Red River Delta</td>
<td>9,683,450</td>
<td>96.7%</td>
<td>9,599,577</td>
<td>96.7%</td>
<td>99.9%</td>
</tr>
<tr>
<td>Southwest</td>
<td>1,896,182</td>
<td>18.0%</td>
<td>1,906,299</td>
<td>18.0%</td>
<td>99.9%</td>
</tr>
<tr>
<td>Total</td>
<td>10,057,570</td>
<td>100%</td>
<td>9,871,995</td>
<td>100%</td>
<td>99.9%</td>
</tr>
</tbody>
</table>

- RI reveals that Central Highlands had the highest participation in primary level compared to other regions and Southeast region registered the lowest representation.

Gender Parity Index (GPI)

- Gender Parity Index (GPI) is most widely used index in assessing gender differences.

- GPI is calculated as the ratio of the selected indicator's value for girls divided by that for boys.

- A value of less than one indicates the difference in favor of boys, whereas a value close to one indicates that parity has been achieved.

- Gender parity is sometimes considered to have been attained when the GPI lies between 0.97 and 1.03.

- *Global monitoring report 2003-4

Gender Parity Index (GPI)

- Gender disparity in Literacy (Viet Nam)

- \[ \text{GPI} = \frac{\text{Value of indicator for Girls (Female)}}{\text{Value of indicator for Boys (Male)}} \]

- A value of less than one indicates the difference in favor of boys, whereas a value close to one indicates that parity has been achieved.

- Gender parity is sometimes considered to have been attained when the GPI lies between 0.97 and 1.03.

- *Global monitoring report 2003-4

Lorenz Curve and Gini Coefficient

- Lorenz Curve is normally used by economists to measure income disparity (inequality) among households.

- Using this method, statisticians are able to calculate the disparity in enrolment across grades.

- The Gini Coefficient is the mathematical expression of the area between the line of equality and the Lorenz Curve.

- In case of perfect equality the Gini Coefficient is "0" (zero) and in the opposite case of complete inequality the Gini Coefficient is "1."
The Gini coefficient is a measure of statistical dispersion intended to represent income inequality within a nation or a social group. It is calculated as the area between the Lorenz curve and a 45-degree line divided by the total area under the 45-degree line.

### Table

<table>
<thead>
<tr>
<th>Education Levels</th>
<th>% P</th>
<th>Cum % P</th>
<th>% Ideal</th>
<th>Cum % Ideal</th>
<th>IC*(EI)</th>
<th>IC*(EI-1)</th>
<th>P-G</th>
</tr>
</thead>
<tbody>
<tr>
<td>Below primary and other</td>
<td>0.31</td>
<td>0.31</td>
<td>0.167</td>
<td>0.167</td>
<td>0.167</td>
<td>0.167</td>
<td>1.00</td>
</tr>
<tr>
<td>Primary</td>
<td>0.28</td>
<td>0.59</td>
<td>0.167</td>
<td>0.167</td>
<td>0.167</td>
<td>0.167</td>
<td>1.00</td>
</tr>
<tr>
<td>Lower secondary</td>
<td>0.26</td>
<td>0.85</td>
<td>0.167</td>
<td>0.167</td>
<td>0.167</td>
<td>0.167</td>
<td>1.00</td>
</tr>
<tr>
<td>Upper secondary</td>
<td>0.20</td>
<td>0.97</td>
<td>0.167</td>
<td>0.167</td>
<td>0.167</td>
<td>0.167</td>
<td>1.00</td>
</tr>
<tr>
<td>Vocational/technical</td>
<td>0.03</td>
<td>0.99</td>
<td>0.167</td>
<td>0.167</td>
<td>0.167</td>
<td>0.167</td>
<td>1.00</td>
</tr>
<tr>
<td>University graduate</td>
<td>0.03</td>
<td>1.00</td>
<td>0.167</td>
<td>0.167</td>
<td>0.167</td>
<td>0.167</td>
<td>1.00</td>
</tr>
<tr>
<td>Total</td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1.00</td>
</tr>
</tbody>
</table>

### Lorenz Curve

1. **Lorenz Curve**: Project A shows the cumulative percentage of population against cumulative percentage of income. The curve is compared with the equity line (a straight line at a 45-degree angle) to measure income inequality. Points below the equity line indicate that income is more concentrated among the lower income earners.

2. **Gini Coefficient**: The Gini coefficient is calculated as the area between the Lorenz curve and the equity line divided by the total area under the equity line. A Gini coefficient of 0 indicates perfect equality (everyone has the same income), while a coefficient of 1 indicates perfect inequality (one person has all the income).

3. **Calculation**: For each income level, the cumulative percentage of income (IC) is compared with the cumulative percentage of population (EI). The difference (IC*(EI-1)) is summed up to calculate the Gini coefficient. The formula for the Gini coefficient is: $G = \frac{\sum (E_i - I_i) \cdot I_{i+1}}{\sum E_i \cdot I_i}$

4. **Interpretation**: A Gini coefficient of 0.30 indicates a moderate level of income inequality, while a coefficient of 0.50 indicates a high level of income inequality.

### Graph

- **X-axis**: Cumulative percentage of population
- **Y-axis**: Cumulative percentage of income
- The Lorenz curve is compared with the equity line (45-degree line)
- The Gini coefficient is represented by the area between the Lorenz curve and the equity line.

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50. **Lorenz Curve and Gini Coefficient**

51. **Lorenz Curve and Gini Coefficient**

52. **Lorenz Curve (LC) and Gini Coefficient**

53. **Lorenz Curve (LC) and Gini Coefficient**

54. **Lorenz Curve and Gini Coefficient**
## Final Thoughts

- The 2000 Education for All (EFA) Assessment revealed that considerable progress has been made in improving access and participation to education.
- However, there are still excluded and marginalized groups that do not have access to education.
- Gender disparities, urban/rural divide, and differences among regions or ethnic/linguistic minorities is still evident.
- Governments are committed to increase efforts to close the gap, and commitments were made to increase equality in education by 2015.
- The “measurements of disparities” are useful tools in monitoring equality in education.