Module 4: Measuring (step 3)

Poverty Measures

Topics

1. Why do we need poverty measures?

2. Headcount index.

3. Poverty gap and poverty gap index.

4. Squared poverty gap index.

5. Foster-Greer-Thorbecke measures.

6. Conclusions and recommendations.

1. Why do we need poverty measures?

Now that we have an indicator for well-being, and a poverty line, we need to use a measure to summarize the information. There are various measures typically used. They all have advantages and disadvantages. This Module reviews the most commonly used measures.

1. Why do we need poverty measures?

A note of caution:

In the module, the poverty estimates are calculated for **individuals** rather than **households**, since poverty is an individual status.

To do so, we make the critical assumption that all household members enjoy the same level of well-being, and that the individual's welfare status is that of his/her household. This assumption may not hold in many situations. It ignores intra-household inequality, which should not be neglected in the design of poverty reduction strategies.
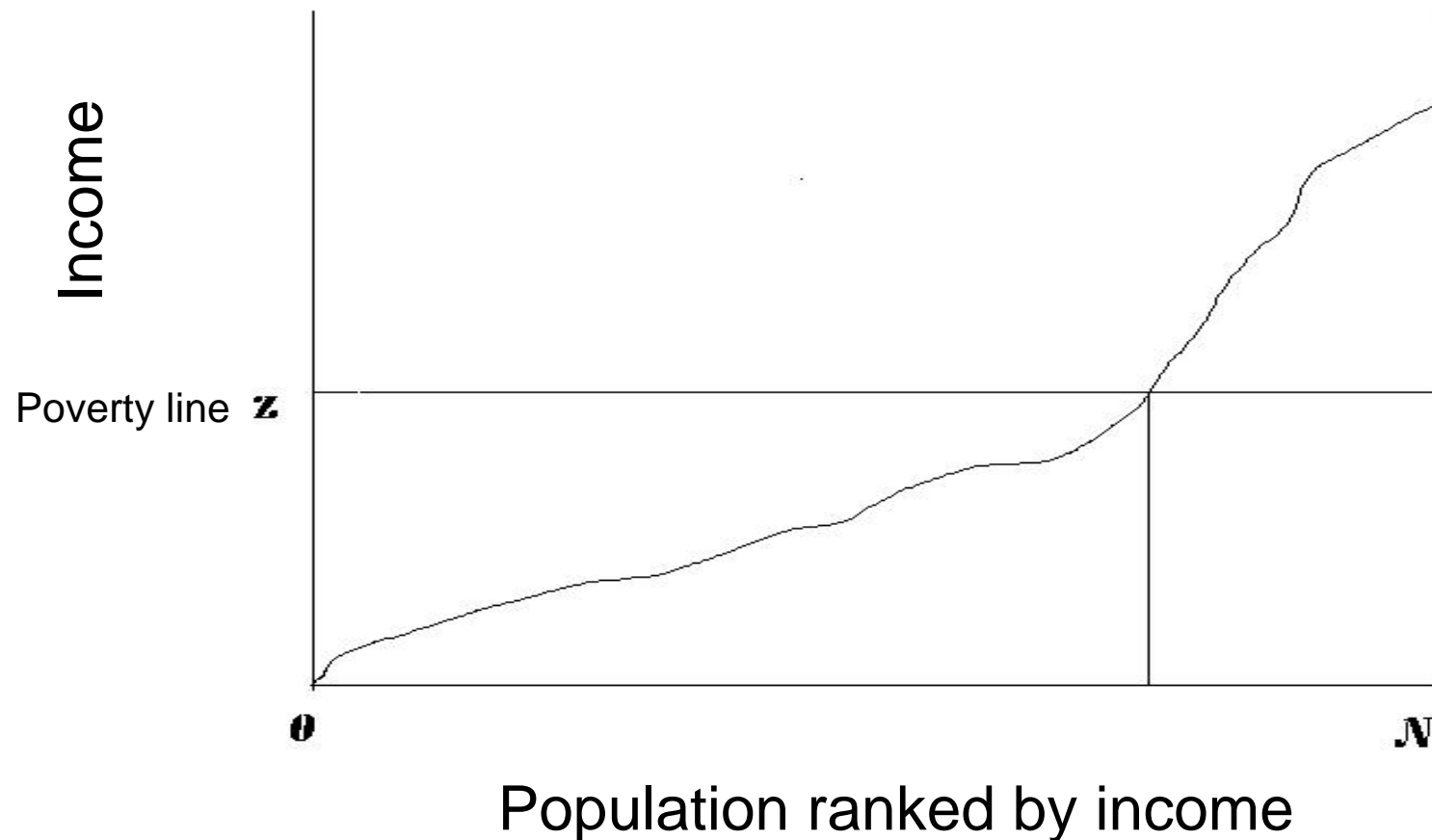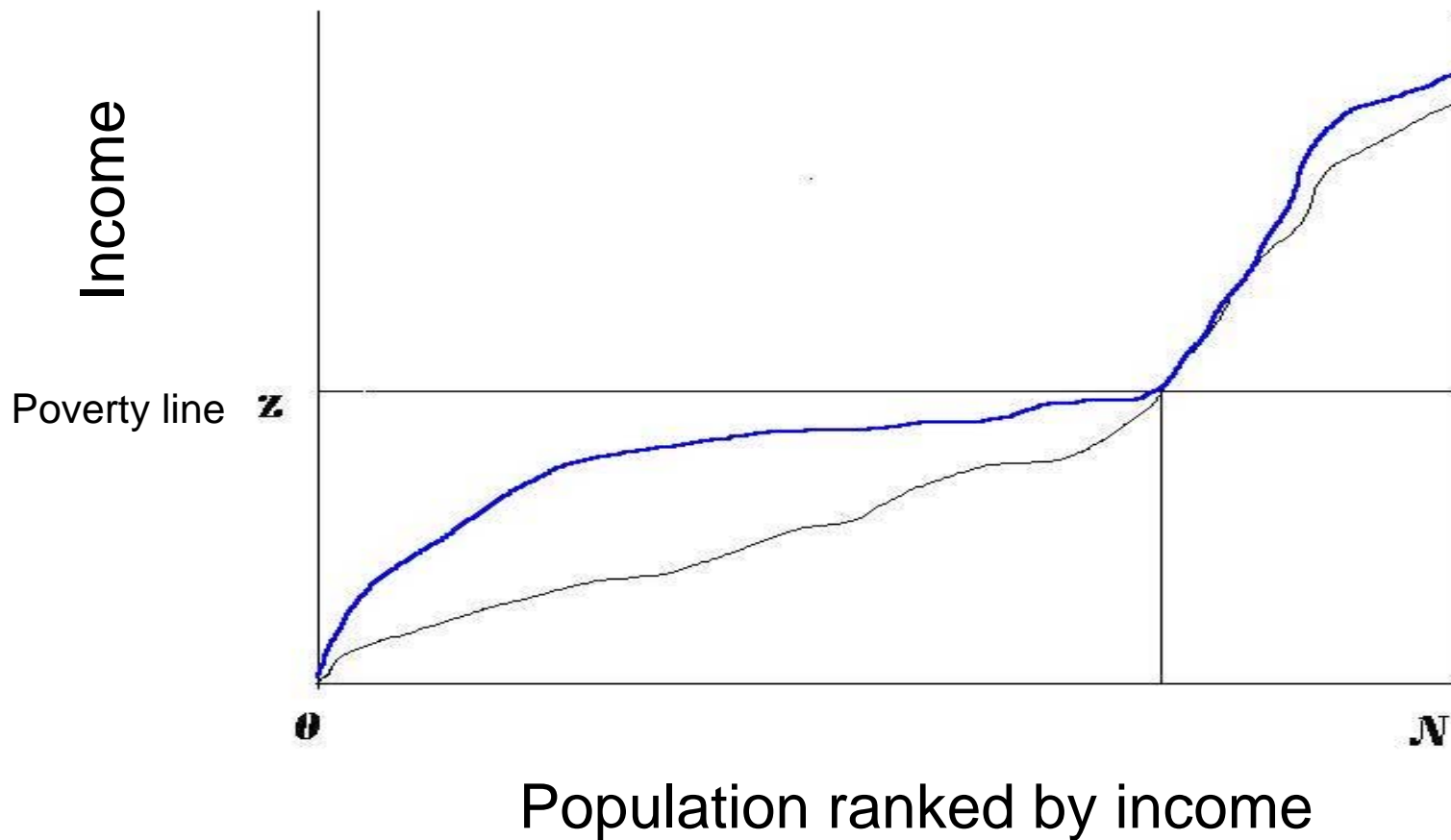
2. Headcount index. (1)

Definition:

The headcount index is the proportion of the population for whom consumption (or other measures of living standard) is less than the poverty line.

2. Headcount index. (2)

Income

Poverty line z

0

N

Population ranked by income

2. Headcount index. (3)

Income

Poverty line z

0

N

Population ranked by income

2. Headcount index. (4)

Formal Definition:

$$HC = \frac{1}{N}\sum_{i=1}^{q} 1 = \frac{N_q}{N}$$

where N = total population

z = poverty line

y_i = consumption/expenditure of household i

$y_i, \ldots, y_q < z < y_{q+1} \ldots y_n$

N_q = number of poor in the population

2. Headcount index. (5)

Advantages (+) and disadvantages (-):

(+) simple to construct

(+) easy to understand.

(-) The headcount index ignores differences in well-being between different poor households. It assumes all poor are in the same situation.

2. Headcount index. (6)

(-) The headcount index does not take the intensity of poverty into account - insensitive to differences in the depth of poverty of the poor.

An example: assume the line is 125. The headcount index is the same for both countries, although poverty is greater in Country A.

Expenditure for each individual in country					Headcount
Country A	100	100	150	150	50%
Country B	124	124	150	150	50%

2. Headcount index. (7)

(-) Over time, the index does not change if individuals below the poverty line become poorer or richer, as long as they remain below the line

2. Headcount index. (8)

In terms of policy,

- A transfer to a very poor household would probably leave the headcount index unchanged (if poor remains below the line) even though poverty has overall lessened.

- The easiest way to reduce the headcount index is to target benefits to people just below the poverty line, because they are the ones who are cheapest to move across the line. Policies based on the headcount index might be sub-optimal.

2. Headcount index. (9)

Overall, the headcount index remains the most popular poverty measure. In order to ensure rigorous analysis, however, it is important to carry out sensitivity analysis (for instance, by calculating the measure for different poverty lines). See Module 6.
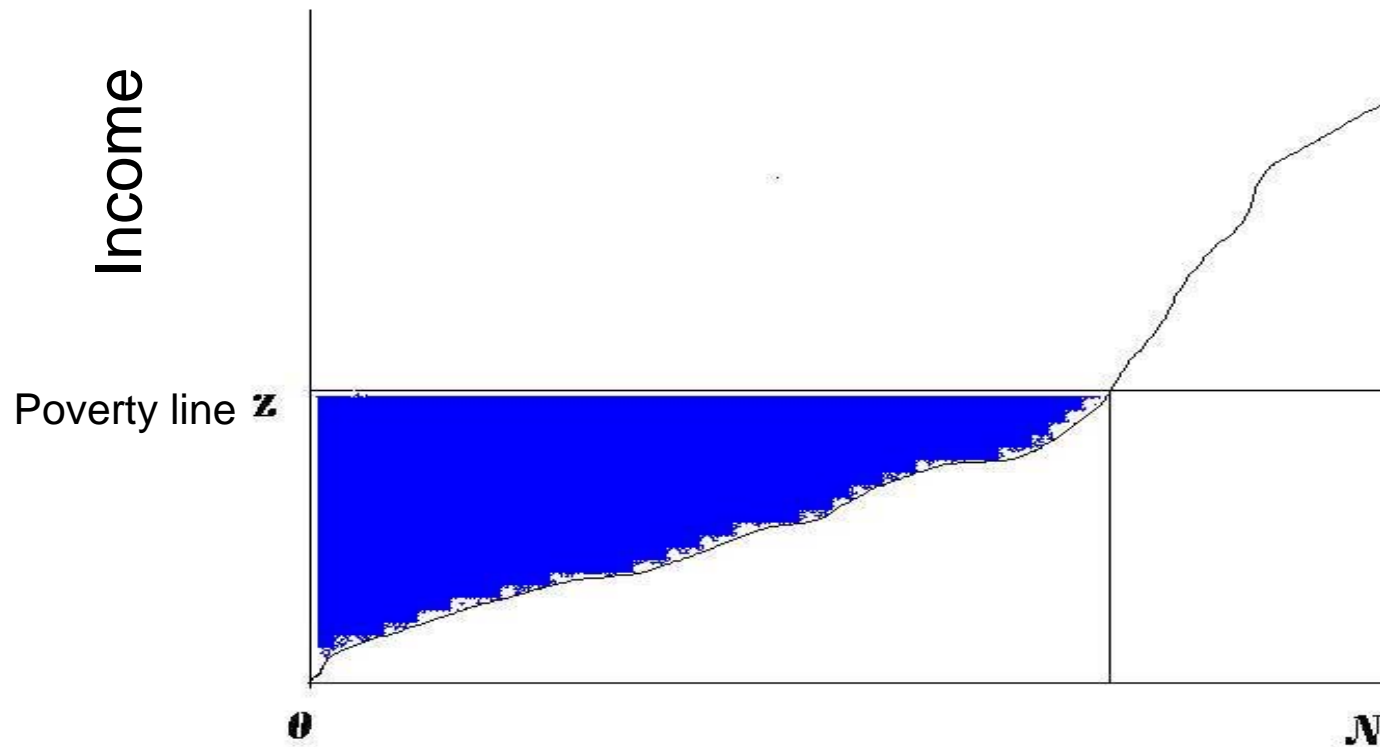
3. Poverty gap (PG) and PG index. (1)

Definition:

The poverty gap is the average, over all people, of the gaps between poor people's living standards and the poverty line. It indicates the average extent to which individuals fall below the poverty line (if they do).

The poverty gap index expresses the poverty gap as a percentage of the poverty line.

3. Poverty gap (PG) and PG index. (2)

Income

Poverty line **z**

0

N

Population ranked by income

3. Poverty gap (PG) and PG index. (3)

Formal Definition:

The poverty gap (*PG*) is defined as average difference between poor households' expenditure and the poverty line. The gap is considered to be zero for everyone else.

Using the same notation as before,

$$PG = \frac{1}{N} \sum_{i=1}^{q} (z - y_i)$$

3. Poverty gap (PG) and PG index. (4)

Formal Definition:

The poverty gap index (*PGI*) is defined as the ratio of the Poverty Gap (*PG*) to the poverty line. It is the poverty gap expressed as a percentage of the line.

Using the same notation as before:

$$PGI = \frac{1}{N} \sum_{i=1}^{q} \frac{(z - y_i)}{z}$$

3. Poverty gap (PG) and PG index. (5)

Advantages (+) and disadvantages (-):

(+) The PG or the PGI can be interpreted as the average shortfall of poor people. They show how much would have to be transferred to the poor to bring their expenditure up to the poverty line, and present it as an average (PG) or in terms of the poverty line (PGI).

…

3. Poverty gap (PG) and PG index. (6)

… The PG or PGI are the "minimum" cost for eliminating poverty with transfers (the cost to eliminate poverty with perfect targeting of the poor and no targeting costs or distortion effects).

(+) The poverty gap has the virtue that it does not imply that there is a discontinuity ("jump") at the poverty line.

3. Poverty gap (PG) and PG index. (7)

(-) The PG and PGI do not capture differences in the severity of poverty amongst the poor and ignore "inequality among the poor".

Example (poverty line = 125). A and B have the same PG and PGI, although it can be argued that poverty is worse in B, because of an extremely poor member.

Expenditure for each individual in country					PG	PGI
Country A	100	100	150	150	12.5	10%
Country B	80	120	150	150	12.5	10%

3. Poverty gap (PG) and PG index. (8)

(-) The PG and PGI are therefore insensitive to transfers among the poor. If the second poorest in country B (with 120) gave 20 to the poorest, the PG and PGI would not change (would be like in Country A).

➔ Conclusion: The PG and PGI complement the headcount index, but might not be sufficient. (need for sensitivity analysis – Module 6).

3. Poverty gap (PG) and PG index. (9)

- The minimum cost of eliminating poverty: (Z-μ_z)*q -- Perfect targeting.

  - The maximum cost of eliminating poverty: Z*q -- No targeting.
  - Ratio of minimum cost of eliminating poverty to the maximum cost with no targeting:

$$\frac{(Z - \mu_z) * q}{Z * q} = \frac{1}{n} \sum_{i=1}^{q} \frac{(Z - y_i)}{Z} = PG$$

4. Squared poverty gap index. (1)

Definition:

The squared poverty gap index is a weighted sum of poverty gaps (as a proportion of the poverty line), where the weights are the proportionate poverty gaps themselves.

(like the PG, but with weights given to each observation).

4. Squared poverty gap index. (2)

Formal Definition:

The squared poverty gap index (*SPGI*) is defined as the average of the square relative poverty gap of the poor. Taking previous notations,

$$SPGI = \frac{1}{N} \sum_{i=1}^{q} \left(\frac{z - y_i}{z} \right)^2$$

4. Squared poverty gap index. (3)

Advantages and disadvantages:

(+) the squared poverty gap index takes inequality among the poor into account. A transfer from a poor to an even poorer would reduce the index; a transfer from a very poor to a less poor would increase the index.

(-) the index is very difficult to read and interpret.

4. Squared poverty gap index. (4)

Expenditure for each individual in country					PG	PGI	SPG
Country A	100	100	150	150	12.5	10%	0.02
Country B	80	120	150	150	12.5	10%	0.03

5. Foster-Greer-Thorbecke class. (1)

The headcount index, the PG and PGI and the squared poverty gap index all belong to the Foster-Greer-Thorbecke class of measures. Using similar notation:

$$P_\alpha = \frac{1}{N} \sum_{i=1}^{q} \left(\frac{z - y_i}{z} \right)^\alpha$$

5. Foster-Greer-Thorbecke class. (2)

$$P_\alpha = \frac{1}{n}\sum_{i=1}^{q}\left(\frac{z-y_i}{z}\right)^\alpha \quad (\alpha \geq 0)$$

The measures are defined for $\alpha \geq 0$, and α is a measure of the sensitivity of the index to poverty.

If we use α=0, we have the headcount index

If we use α =1, we have the poverty gap index

If we use α =2, we have the squared poverty gap index.

5. Foster-Greer-Thorbecke class. (3)

The figure below shows the relationship between individual poverty (as implied by the various poverty measures) and well-being (as recorded) for HC, PGI and SPGI.
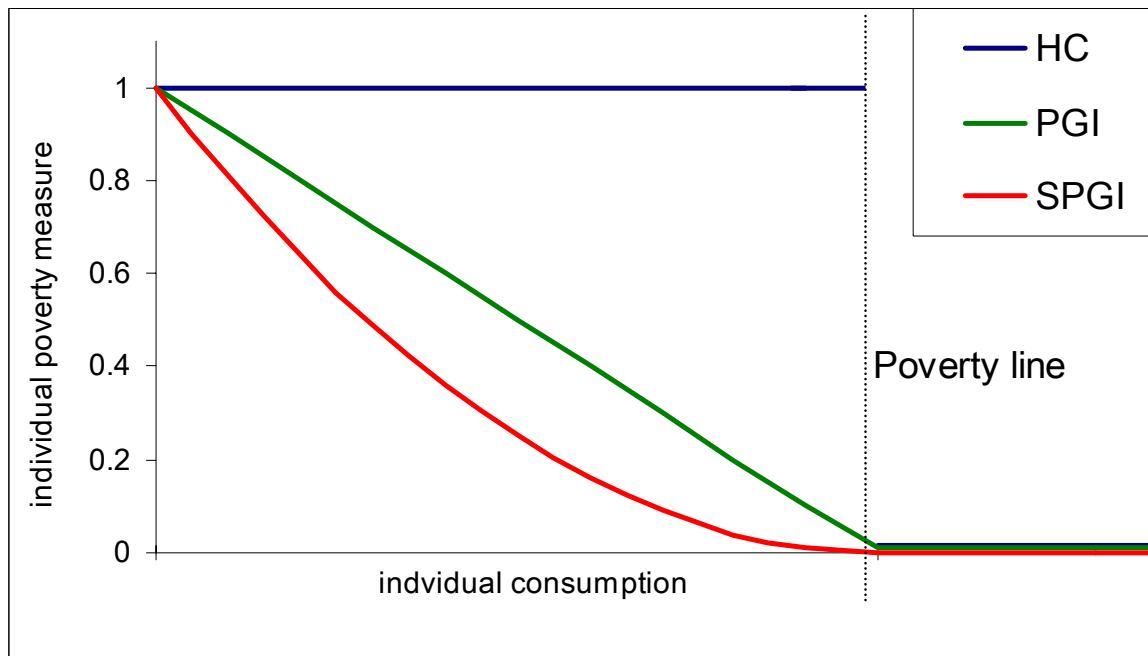
It shows that the PGI is more sensitive to the well-being of the poorest than HC; and the SPGI more than PGI.

6. Conclusions and recommendations. (1)

There are other measures, less commonly used, but we limit our review to the three most common ones.

The three measures should be combined, since using them would give different focuses to policies (see next slide).

6. Conclusions and recommendations. (2)

HC treats all the poor similarly (individuals in groups A, B and C are given a value of 1).

PG gives a value relative to the distance to the poverty line (those in Group B have on average twice the value of those in A).

SPG gives a value of the squared distance (those in Group B have on average a value 4 times that of those A).

Income

Poverty line

1

2

3

Group A: just below the line

Group B: "average" poor.

Group C: very poor.
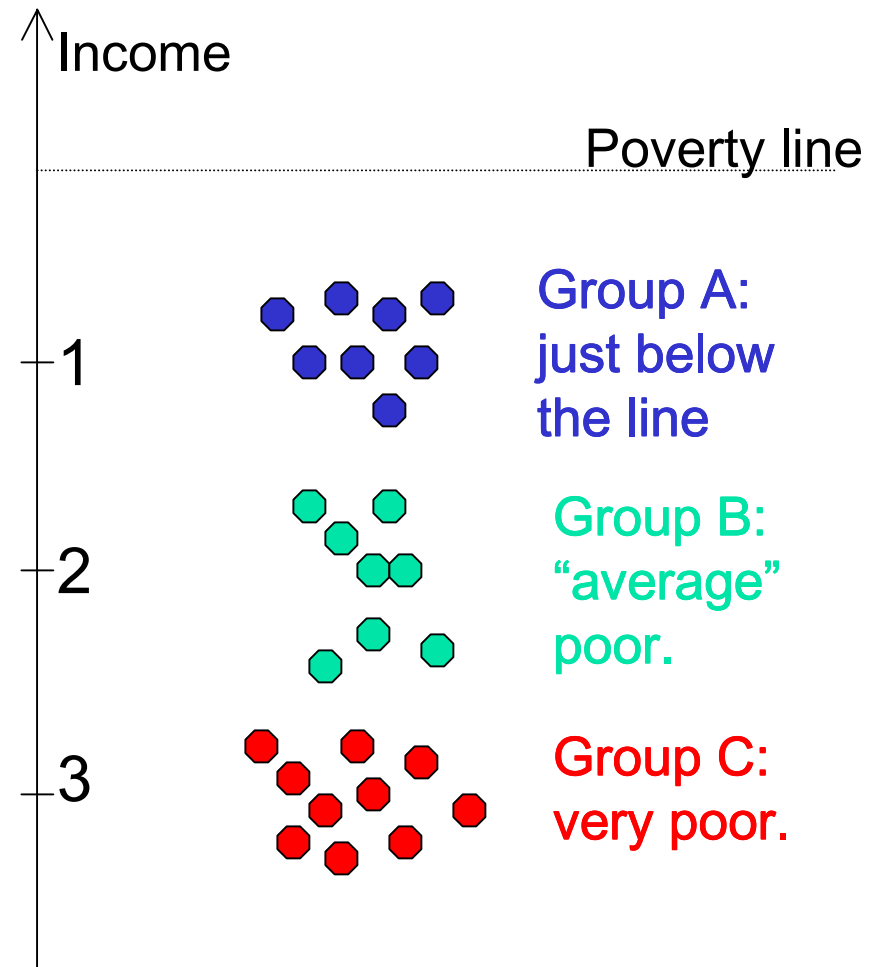
6. Conclusions and recommendations. (3)

Using HC as criteria, policies would focus on group A (the easiest to get out of poverty).

Using PG or PGI, focus would be on A, B and C.

Using SPG, focus would be on group C.

Income

Poverty line

Group A: just below the line

Group B: "average" poor.

Group C: very poor.
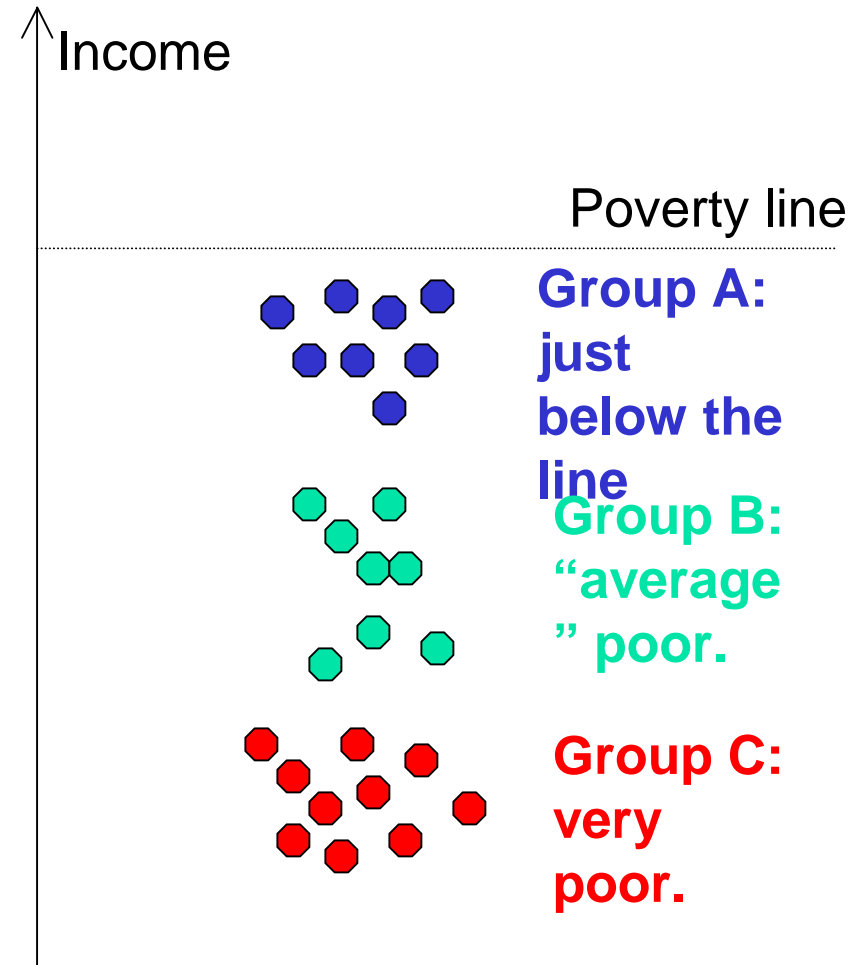
6. Conclusions and recommendations. (4)

The overall recommendation is to combine the headcount, PG/PGI and SPGI when analyzing poverty. If conclusions do not hold for the three measures, one has to be careful when interpreting the findings.