Exercises on MPI

Part I: Paper-Based Exercise on AF Measures

Given the following matrix of distribution of three dimensions (income, years of education, BMI and access to clean water):

\[
X = \begin{bmatrix}
6 & 3 & 18 & 1 \\
8 & 4 & 20 & 1 \\
12 & 6 & 17 & 0 \\
20 & 8 & 16 & 1 \\
5 & 3 & 16 & 0
\end{bmatrix}
\]

\[
z = \begin{bmatrix}
10 & 6 & 18.5 & 1
\end{bmatrix}
\]

a) Calculate H, M0 and A assuming k=2 and equal weights and verify the relationship between them. Interpret each measure.

b) Which is the contribution of the group of the first three people to overall poverty? Interpret.

c) What is the censored headcount ratio in each indicator and what does it mean? How does it differ from the ‘raw’ censored headcounts?

d) Which is the contribution of each dimension to M0?

e) What happens to H, M0, M1 and M2 if individual 1 becomes deprived in water? What happens to each of the mentioned measures if individual 1 experiences an income loss?

f) Re-do points a-c using ranking weights: assigning a weight of 1.5 to income and education and 0.5 to water and BMI.

g) (optional*) You may try re-doing a-c using M1 and M2 rather than M0. Which inconvenience do you foresee?

Some useful steps for calculation:

1. From the achievement matrix, build the deprivation matrix
2. Build the ‘weighted’ deprivation matrix
3. Compute the deprivation score for each individual
4. Determine whether each individual is poor or not according with your selected k-value
5. Define the (weighted) poverty matrix (which is weighted deprivation matrix censoring the deprivations of those who are not poor)
6. Now you are ready to compute MPI: it is just the mean of the weighted poverty matrix.

Also recall that:

\[
M_0 = \mu(g_0(k)) = HA \quad \text{where} \quad A = \|c(k)\|/qd \\
M_1 = \mu(g_1(k)) = HAG \quad \text{where} \quad G = \|g_1(k)\|/g_0(k) \\
M_2 = \mu(g_2(k)) = HAS \quad S = \|g_2(k)\|/g_0(k)
\]

Please note that the bars \(\|c(k)\|\) denote summation of the elements of a vector or the elements of a matrix. In this case we are adding up all the elements of the censored vector of deprivation counts.
Part II: Make your own national MPI (for group discussion)

Suppose that you have been commissioned to design and compute a national MPI. You may want to think in the particular case of the country or region you are working at. Think about the following questions:

a) Which dimensions and indicators would you include and why? How would you base your selection and communicate it to the local government and the public?

b) What sort of data would you need to compute your National MPI? Is that sort of data already available for this country or would you need to design a new survey?

c) What sort of variable will you have: all cardinal? All ordinal? A Mix? How will you deal with this? Which of the AF measures do you plan to use? M0? M1? M2? Why?

d) How would you fix your deprivation cut-offs? How would you base your selection and communicate it to the local government and the public?

Part III: Exercise on MPI with Excel

The MPI is the M0 measure composed of three dimensions and ten indicators. Suppose a population of 8 households and 24 people with the achievement matrix presented in the Excel file “Calculating_MPI.xls”. Recall that each education and health indicator weights 10/6 whereas each living standard indicator weights 10/18. With this information:

A: Computation of MPI

a) Compute the MPI (recall that for MPI \( k=3 \))

b) In the weighted deprivation matrix, identify the different possible combinations in deprivations for an individual to be identified as MPI poor.

c) Compute H and A

d) Verify the relationship between the three measures.

e) Interpret each measure.

B: Decomposition

a) What is the MPI, H and A in rural and in urban areas, and how is the contribution of each of these areas to the overall MPI? Verify the decomposition formula.

b) What is the censored headcount ratio in each indicator? What does it mean and how does it differ from the ‘raw’ headcount ratio?

c) What is the contribution of deprivation in each indicator to overall poverty?