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, A and M0, 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 forsee?

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:

$M_0 = \mu(g_0(k)) = HA$ where $A = |c(k)|/qd$ 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.

$M_1 = \mu(g_1(k)) = HAG$ where $G = |g_1(k)|/|g_0(k)|$

$M_2 = \mu(g_2(k)) = HAS$ $S = |g_2(k)|/|g_0(k)|$